Davis-BesseNPEm Resource

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Sent: Friday, September 17, 2010 9:28 AM
To: Cooper, Paula; Chanin, Jonathan
Subject: Safety and Environmental LRA
Attachments: Davis-Besse LRA.pdf; Davis-Besse Environmental Report.pdf

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Washington, D.C. 20555

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LICENSE RENEWAL APPLICATION

DAVIS-BESSE NUCLEAR POWER STATION

August 2010

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PREFACE

The following describes the content of the Davis-Besse Nuclear Power Station (Davis-Besse) License Renewal Application (hereinafter referred to as "this application" or "the application"). Abbreviated names and acronyms used throughout the application are defined at the end of this preface. Regulatory documents such as NUREG-1801, "Generic Aging Lessons Learned (GALL) Report", and 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (the License Renewal Rule), are referred to by the document number, i.e., NUREG-1801 and 10 CFR 54, respectively. Note that the use of blue font in the text of the application indicates that a hyperlink is provided for ease of navigation.

Section 1 provides the administrative information required by 10 CFR 54.17 and 10 CFR 54.19.

Section 2 describes the process for identification of structures and components subject to aging management review in the Davis-Besse integrated plant assessment. The results of applying the scoping methodology are provided in Table 2.2-1, Table 2.2-2, and Table 2.2-3. These tables provide listings of the mechanical systems, the electrical and instrumentation and control systems, and the structures within the scope of license renewal, respectively. Section 2 also provides descriptions of the in-scope systems and structures and their intended functions with tables identifying the components requiring aging management review and their component intended functions.

Section 3 contains the aging management review results for those mechanical, electrical, and structural components determined to be subject to aging management review. Section 3 is divided into six sections that address the areas of: (3.1) Reactor Vessel, Internals, and Reactor Coolant System, (3.2) Engineered Safety Features, (3.3) Auxiliary Systems, (3.4) Steam and Power Conversion Systems, (3.5) Containment, Structures, and Component Supports, and (3.6) Electrical and Instrumentation and Control Systems. The tables in Section 3 provide a summary of information concerning aging effects requiring management and applicable aging management programs for component and commodity groups subject to aging management review. The information presented in the tables is based on industry guidance for format and content of applications that rely on NUREG-1800, "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants", Revision 1, (the SRP-LR). The tables include comparisons with the evaluations documented in NUREG-1801, Revision 1.

Section 4 addresses time-limited aging analyses, as defined by 10 CFR 54.3. The review includes the identification of the component or subject of each time-limited aging analysis, and an explanation of the time-dependent aspects of the associated calculation or analysis. In compliance with 10 CFR 54.21(c), Section 4 demonstrates that either: (1) the analyses remain valid for the period of extended operation, (2) the analyses have been projected to the end of the period of extended operation, or (3) the effects of aging on the intended functions will be adequately managed for the period of extended operation.

In compliance with 10 CFR 54.21(d), Appendix A, Updated Safety Analysis Report Supplement, provides a summary description of the programs and activities credited for managing the effects of aging for the period of extended operation. A summary description of the evaluation of time-limited aging analyses for the period of extended operation is included. Appendix A also contains a listing of commitments associated with license renewal, including those related to aging management programs and time-limited aging analyses.

Appendix B, Aging Management Programs, describes the programs and activities that are credited for aging management. The programs and activities assure that the effects of aging will be managed such that the components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. Appendix B also addresses programs that are credited in the disposition of time-limited aging analyses.

The information contained in Section 2, Section 3, and Appendix B fulfills the requirements of 10 CFR 54.21(a).

Appendix C is not used.

Appendix D, Technical Specification Changes, concludes that no technical specification changes are necessary to manage the effects of aging during the period of extended operation. The information in Appendix D fulfills the requirements in 10 CFR 54.22.

Appendix E, Applicant's Environmental Report – Operating License Renewal Stage, provides the environmental review associated with the period of extended operation. The information in Appendix E fulfills the requirements in 10 CFR 54.23.

In accordance with 10 CFR 54.21(b), this application will be updated annually during the NRC review process.

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
ABS	Air Break Switch
AC	Alternating Current
A/C	Air Conditioning
ACAR	Aluminum Conductor Aluminum Reinforced
ACB	Air Circuit Breaker
ACI	American Concrete Institute
ACSR	Aluminum Conductor Steel Reinforced
AEM	Aging Effect / Mechanism
AFW	Auxiliary Feedwater
AMP	Aging Management Program
AMR	Aging Management Review
ANSI	American National Standards Institute
APCSB	Auxiliary Power Conversion Systems Branch
ART	Adjusted Reference Temperature
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	Anticipated Transients Without Scram
BAMT	Boric Acid Mix Tank
B&W	Babcock & Wilcox
BTP	Branch Technical Position
BWR	Boiling Water Reactor
BWST	Borated Water Storage Tank
C (ºC)	Degrees Celsius
CASS	Cast Austenitic Stainless Steel
CCW	Component Cooling Water
CD	Cooldown
CEA	Control Element Assembly
CFR	Code of Federal Regulations
CLB	Current Licensing Basis
CRD	Control Rod Drive
CRDC	Control Rod Drive Cooling
CRDM	Control Rod Drive Mechanism
CREVS	Control Room Emergency Ventilation System
CRGT	Control Rod Guide Tube
CSA	Core Support Assembly

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
CST	Condensate Storage Tank
CTS	Current Technical Specifications
Cu	Copper
CUF	Cumulative Usage Factor
CWRT	Clean Waste Receiving Tank
DBA	Design Basis Accident
DBAB	Davis-Besse Administration Building
DC	Direct Current
DFP	Fire Protection Diesel System
DH	Decay Heat Removal System
DHR	Decay Heat Removal and Low Pressure Injection
DMW	Dissimilar Metal Weld
DO	Dissolved Oxygen
DOR	Division of Operating Reactors
DOT	Department of Transportation
DWDT	Detergent Waste Drain Tank
EAF	Environmentally Assisted Fatigue
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EFPY	Effective Full Power Years
EMA	Equivalent Margin Analysis
EOC	End of Cycle
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EQ	Environmental Qualification
ESF	Engineered Safety Features
F (ºF)	Degrees Fahrenheit
FAC	Flow Accelerated Corrosion
F_{en}	Environmentally Assisted Fatigue Correction Factor
FENOC	FirstEnergy Nuclear Operating Company
FERC	Federal Energy Regulatory Commission
FP	Fire Protection
FSAR	Final Safety Analysis Report
ft-lb	Foot-Pound
FWST	Fire Water Storage Tank
GALL	Generic Aging Lessons Learned (the GALL Report is NUREG-1801)
GL	Generic Letter
GSI	Generic Safety Issue

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
HAZ	Heat-Affected Zone
HELB	High Energy Line Break
HEPA	High Efficiency Particulate Air
HPI	High Pressure Injection
HLCWT	High Level Cooling Water Tank
HPSI	High Pressure Safety Injection
HU	Heatup
HVAC	Heating, Ventilation, and Air Conditioning
H&V	Heating and Ventilation
IASCC	Irradiation Assisted Stress Corrosion Cracking
I&C	Instrumentation and Control
ID	Inside Diameter
ID.	Identification
IEEE	Institute of Electrical and Electronic Engineers
IGA	Intergranular Attack
IGSCC	Intergranular Stress Corrosion Cracking
IN	Information Notice
INPO	Institute of Nuclear Power Operations
IR	Insulation Resistance
ISG	Interim Staff Guidance
ISI	Inservice Inspection
ITS	Improved Technical Specifications
ksi	Kilo-pounds per square inch
kV	Kilovolt
kVA	Kilovolt Ampere
LAQT	Low Alloy Quenched and Tempered
LAS	Low Alloy Steel
LBB	Leak-Before-Break
lbs	Pounds
LCB	Lower Core Barrel
LER	Licensee Event Report
LLCWT	Low Level Cooling Water Tank
LO	Lubricating Oil
LOCA	Loss of Coolant Accident
LPI	Low Pressure Injection
LR-ISG	Interim Staff Guidance Associated with License Renewal
LRA	License Renewal Application
LTOP	Low-Temperature Overpressure Protection

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
LTS	Lower Internals Assembly to Thermal Shield
MCM	Thousand Circular Mils (wire gauge)
MDFP	Motor-Driven Feedwater Pump
MEAP	Material, Environment, Aging Effect and Program
MeV	Million Electron Volts
MIC	Microbiologically Influenced Corrosion
mil	One One-Thousandth of an Inch (1/1000 or 0.001 inches)
MIRVSP	Master Integrated Reactor Vessel Surveillance Program
ml	Milliliters
MRP	Materials Reliability Program (EPRI)
MRPM	Maintenance Rule Program Manual
MS	Main Steam
MSIP	Mechanical Stress Improvement Process
MSIV	Main Steam Isolation Valve
MSR	Moisture Separator Reheater
MU	Makeup and Purification System
MUR	Measurement Uncertainty Recapture (power uprate)
MWDT	Miscellaneous Waste Drain Tank
MWMT	Miscellaneous Waste Monitor Tank
MWt	Megawatts-thermal
MWe	Megawatts-electric
NA or N/A	Not Applicable
NBA	Nickel Based Alloy
NBF	Nozzle Belt Forging
NEI	Nuclear Energy Institute
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
Ni	Nickel
NN	Nitrogen System
NPS	Nominal Pipe Size
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
NSAS	Nonsafety-affecting-safety
NSR	Nonsafety-related
NSSS	Nuclear Steam Supply System
NUREG	Designation of publications prepared by the NRC staff
OD	Outside Diameter
OE	Operating Experience

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
OTSG	Once-Through Steam Generator
PCSP	Permanent Canal Seal Plate
P&IDs	Piping and Instrumentation Diagrams
PASS	Post-Accident Sampling System
pH	Concentration of Hydrogen Ions
ppm	Parts Per Million
psi	Pounds Per Square Inch
psig	Pounds Per Square Inch Gauge
P-T	Pressure-Temperature
PTLR	Pressure and Temperature Limits Report
PTS	Pressurized Thermal Shock
PWR	Pressurized Water Reactor
PWROG	Pressurized Water Reactor Owners Group
PWSCC	Primary Water Stress Corrosion Cracking
Q	Davis-Besse quality class designation for safety-related
QAPM	Quality Assurance Program Manual
RAIs	Requests for Additional Information
RC	Reactor Coolant
RCCA	Rod Control Cluster Assemblies
RCPB	Reactor Coolant Pressure Boundary
RCS	Reactor Coolant System
RCRA	Resource Conservation and Recovery Act of 1976
RG	Regulatory Guide
RPV	Reactor Pressure Vessel
RT_{NDT}	Reference Temperature for Nil-Ductility Transition
RT_{PTS}	Reference Temperature for Pressurized Thermal Shock
RV	Reactor Vessel
RVI	Reactor Vessel Internals
RVID2	Reactor Vessel Integrity Database
SAMA	Severe Accident Mitigation Alternatives
SAP	Davis-Besse configuration control database
SBO	Station Blackout
SBODG	Station Blackout Diesel Generator
SCC	Stress Corrosion Cracking
SER	Safety Evaluation Report
SFAS	Safety Features Actuation System
SPDSS	Station Plumbing, Drains, and Sumps System

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Description
SRP-LR	Standard Review Plan for License Renewal (the SRP-LR is NUREG-1800)
SS	Stainless Steel
SSCs	Systems, Structures, and Components (10 CFR 54.4(a))
SUFP	Startup Feed Pump
SW	Service Water
TLAA	Time-Limited Aging Analysis
TPCW	Turbine Plant Cooling Water
UCB	Upper Core Barrel
UCC	Underclad Cracking
U_{en}	Adjusted Cumulative Usage Factor
U.S.	United States
USAR	Updated Safety Analysis Report
USE	Upper Shelf Energy
USI	Unresolved Safety Issue
UT	Ultrasonic Testing
UTS	Upper Thermal Shield
UV	Ultraviolet
VAC	Volts alternating current
VDC	Volts direct current
WANO	World Association of Nuclear Operators
Zn	Zinc

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FIGURES

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1.0 ADMINISTRATIVE INFORMATION

Pursuant to Part 54 of Title 10 of the Code of Federal Regulations (10 CFR 54), this application seeks renewal, for an additional 20-year term, of the facility operating license for Davis-Besse Nuclear Power Station, Unit 1 (Davis-Besse). The current facility operating license (NPF-3) expires at midnight on April 22, 2017. This application also seeks renewal of the source material, special nuclear material, and by-product material licenses under 10 CFR Parts 30, 40, and 70 that are subsumed in or combined with the facility operating license.

This application is organized in accordance with Regulatory Guide 1.188, “Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses,” Revision 1, and is consistent with guidance provided by Nuclear Energy Institute (NEI) 95-10, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule,” Revision 6. In addition, a summary of those Nuclear Regulatory Commission (NRC) Interim Staff Guidance (LR-ISG) documents that remain open is presented in the application.

This application is intended to provide sufficient information for the NRC to complete its technical and environmental reviews pursuant to 10 CFR 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” and 10 CFR 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions,” respectively.

This application is designed to allow the NRC to make the findings required by 10 CFR 54.29, “Standards for issuance of a renewed license,” in support of the issuance of a renewed facility operating license for Davis-Besse.

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1.1 GENERAL INFORMATION

The following is the general information required by 10 CFR 54.17 and 10 CFR 54.19.

1.1.1 NAME OF APPLICANT

FirstEnergy Nuclear Operating Company (Davis-Besse Licensee, Operator and Applicant).

FirstEnergy Nuclear Operating Company makes this application acting on its own behalf and as agent for FirstEnergy Nuclear Generation Corp.

FirstEnergy Nuclear Generation Corp. (Davis-Besse Owner and Licensee).

1.1.2 ADDRESS OF APPLICANT

FirstEnergy Nuclear Operating Company
76 South Main Street
Akron, OH 44308

FirstEnergy Nuclear Generation Corp.
76 South Main Street
Akron, OH 44308

1.1.3 DESCRIPTION OF BUSINESS OF APPLICANT

FirstEnergy Nuclear Operating Company is engaged primarily in the business of operating nuclear generation facilities under the supervision and direction of the owner of the facilities.

FirstEnergy Nuclear Generation Corp. owns nuclear generation assets and sells the output of those assets, including from Davis-Besse, to FirstEnergy Solutions Corp.

1.1.4 ORGANIZATION AND MANAGEMENT OF APPLICANT

FirstEnergy Nuclear Operating Company is a wholly owned direct subsidiary of FirstEnergy Corp., a public utility holding company. The shares of common stock of FirstEnergy Corp. are publicly traded on the New York Stock Exchange and are widely held. The principal offices for FirstEnergy Nuclear Operating Company and FirstEnergy Corp. are located in Akron, Ohio. FirstEnergy Nuclear Operating Company and FirstEnergy Corp. are incorporated in the state of Ohio, and qualified to do business in the state of Pennsylvania.

FirstEnergy Nuclear Generation Corp. is a wholly owned direct subsidiary of FirstEnergy Solutions Corp., and a wholly owned second-tier subsidiary of FirstEnergy Corp. FirstEnergy Solutions Corp. is a wholly owned direct subsidiary of FirstEnergy Corp. The principal offices for FirstEnergy Nuclear Generation Corp. and FirstEnergy Solutions Corp. are located in Akron, Ohio. FirstEnergy Nuclear Generation Corp. and FirstEnergy Solutions Corp. are incorporated in the state of Ohio, and qualified to do business in the state of Pennsylvania. FirstEnergy Solutions Corp. is also qualified to do business in Delaware, Washington D.C., Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, New York, Oklahoma, Virginia, and West Virginia.

FirstEnergy Corp., FirstEnergy Solutions Corp., FirstEnergy Nuclear Generation Corp., and FirstEnergy Nuclear Operating Company are not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government.

The names and business addresses of the directors and principal officers of FirstEnergy Nuclear Operating Company and FirstEnergy Nuclear Generation Corp. are listed in the following tables. All persons are citizens of the United States.

FirstEnergy Nuclear Operating Company

Directors

Anthony J. Alexander	James H. Lash
William T. Cottle	Gary R. Leidich
Address (common to all above): 76 South Main Street; Akron, OH 44308	

Principal Officers

Name & Title	Address
Anthony J. Alexander Chief Executive Officer	76 South Main Street Akron, OH 44308
James H. Lash President and Chief Nuclear Officer	76 South Main Street Akron, OH 44308
Mark T. Clark Executive Vice President and Chief Financial Officer	76 South Main Street Akron, OH 44308
Leila L. Vespoli Executive Vice President and General Counsel	76 South Main Street Akron, OH 44308
Peter P. Sena III Senior Vice President and Chief Operating Officer	76 South Main Street Akron, OH 44308
Danny L. Pace Senior Vice President, Fleet Engineering	76 South Main Street Akron, OH 44308
Barry S. Allen Vice President, Davis-Besse	Davis-Besse Nuclear Power Station 5501 N. State Route 2 Oak Harbor, OH 43449
Mark B. Bezilla Vice President, Perry	Perry Nuclear Plant 10 Center Road Perry, OH 44081

FirstEnergy Nuclear Operating Company

Principal Officers (continued)

Name & Title	Address
Paul A. Harden Vice President, Beaver Valley	Beaver Valley Power Station P.O. Box 4 Shippingport, PA 15077
Donald A. Moul Vice President, Nuclear Support	76 South Main Street Akron, OH 44308
James F. Pearson Vice President and Treasurer	76 South Main Street Akron, OH 44308
Harvey L. Wagner Vice President and Controller	76 South Main Street Akron, OH 44308
Rhonda S. Ferguson Vice President and Corporate Secretary	76 South Main Street Akron, OH 44308

FirstEnergy Nuclear Generation Corp.

Directors

Anthony J. Alexander	Gary R. Leidich
James H. Lash	---
Address (common to all above): 76 South Main Street; Akron, OH 44308	

Principal Officers

Name & Title	**Address**
James H. Lash President and Chief Nuclear Officer	76 South Main Street Akron, OH 44308
Mark T. Clark Executive Vice President and Chief Financial Officer	76 South Main Street Akron, OH 44308
Leila L. Vespoli Executive Vice President and General Counsel	76 South Main Street Akron, OH 44308
Peter P. Sena III Senior Vice President and Chief Operating Officer	76 South Main Street Akron, OH 44308
Danny L. Pace Senior Vice President, Fleet Engineering	76 South Main Street Akron, OH 44308
James F. Pearson Vice President and Treasurer	76 South Main Street Akron, OH 44308
Harvey L. Wagner Vice President and Controller	76 South Main Street Akron, OH 44308
Rhonda S. Ferguson Vice President and Corporate Secretary	76 South Main Street Akron, OH 44308

1.1.5 CLASS AND PERIOD OF LICENSE SOUGHT

FirstEnergy Nuclear Operating Company requests renewal of the Class 103 facility operating license for Davis-Besse (facility operating license NPF-3) for a period of 20 years beyond the expiration of the current license term. License renewal would extend the facility operating license from midnight on April 22, 2017, to midnight on April 22, 2037. The facility would continue to be known as Davis-Besse Nuclear Power Station, Unit 1, and would continue to generate electric power during the period of extended operation.

This application also includes a request for renewal of the source material, special nuclear material, and by-product material licenses under 10 CFR Parts 30, 40, and 70 that are subsumed in or combined with the current facility operating license.

1.1.6 ALTERATION SCHEDULE

FirstEnergy Nuclear Operating Company does not propose to construct or alter any production or utilization facility in connection with this renewal application.

1.1.7 REGULATORY AGENCIES WITH JURISDICTION

Regulatory agencies with jurisdiction over Davis-Besse rates and services are as follows:

Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

U.S. Securities and Exchange Commission
100 F Street, NE
Washington, DC 20549

Public Utilities Commission of Ohio
180 East Broad Street
Columbus, OH 43215

1.1.8 LOCAL NEWS PUBLICATIONS

The news and trade publications which circulate in the area surrounding Davis-Besse, and which are considered appropriate to give reasonable notice of the renewal application to those municipalities, private utilities, public bodies, and cooperatives that might have a potential interest in the facility, are listed below.

Newsroom
Sandusky Register
314 West Market Street
Sandusky, OH 44870-5071

Newsroom
Port Clinton News Herald
115 West Second Street
P.O. Box 550
Port Clinton, OH 43452

Newsroom
The Advertiser-Tribune
320 Nelson Street
P.O. Box 778
Tiffin, OH 44883

Newsroom
The Blade
541 North Superior Street
Toledo, OH 43660

1.1.9 CONFORMING CHANGES TO STANDARD INDEMNITY AGREEMENT

10 CFR 54.19(b) requires that license renewal applications include "…conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." The current Indemnity Agreement (No. B-79) for Davis-Besse states, in Article VII, that the agreement shall terminate at the time of expiration of the license specified in Item 3 of the Attachment (to the agreement). Item 3 of the Attachment to the indemnity agreement, as revised by Amendment No. 1, lists Davis-Besse facility operating license number NPF-3. FirstEnergy Nuclear Operating Company has reviewed the original indemnity agreement and Amendments 1 through 7. Neither Article VII nor Item 3 of the attachment specifies an expiration date for license number NPF-3. Therefore, no changes to the indemnity agreement are deemed necessary as part of this application. Should the license number be changed by NRC upon issuance of the renewed license, FirstEnergy Nuclear Operating Company requests that NRC amend the indemnity agreement to include conforming changes to Item 3 of the attachment and other affected sections of the agreement.

1.1.10 RESTRICTED DATA AGREEMENT

This application does not contain restricted data or national security information, and FirstEnergy Nuclear Operating Company does not expect that any activity under the renewed license for Davis-Besse will involve such information. However, if such information were to become involved, FirstEnergy Nuclear Operating Company agrees that it will appropriately safeguard such information and not permit any individual to have access to, or any facility to possess, such information until the individual or facility has been approved under the provisions of 10 CFR Part 25 or 10 CFR Part 95.

1.2 PLANT DESCRIPTION

Davis-Besse Unit 1 is located on the southwestern shore of Lake Erie in Ottawa County in northwestern Ohio. The site consists of 954 acres of which approximately 733 acres is marshland which is leased to the U.S. Government as a national wildlife refuge. A narrow strip of marshland on the southern boundary of the site separates the site from the Toussaint River except for a small segment of the site which extends to the river. The nearest large population center is Toledo, Ohio, located about 20 miles west of the plant. Smaller population centers near the site are Fremont, to the south, and Sandusky, to the southeast. The land area surrounding the site is generally agricultural with no major industry in the vicinity.

The station has a pressurized water reactor nuclear steam supply system furnished by the Babcock & Wilcox Company. The Bechtel Corporation and its affiliate, the Bechtel Company, provided architect-engineering services for the station design, and construction management services for the construction. The licensed core power level is 2817 megawatts-thermal (MWt). The gross electrical output of the plant is 908 megawatts-electric (MWe).

The Updated Safety Analysis Report (USAR) identifies the major structures as the Auxiliary Building, Circulating Water Pump House, Containment Structure, Cooling Tower, Diesel Fuel Tank, Dry Fuel Storage Facility, Fire Water Storage Tank, Flammable Liquids Warehouse, Intake Structure, Low Level Radwaste Storage Facility, Meteorological Tower, Office Building, Personnel Shop Facility, Primary Access Facility, Relay House, Station Blackout Diesel Generator Building, Switchyard, Training Building, Turbine Building, Water Treatment Building, Wet Wash Facility, and 69-kV Substation.

Descriptions of the majority of the Davis-Besse systems and structures can be found in the USAR. Additional descriptive information about the Davis-Besse systems and structures is provided in Section 2 of this application.

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1.3 GENERAL REFERENCES

1.3-1 10 CFR 50, *Domestic Licensing of Production and Utilization Facilities*.

1.3-2 10 CFR 51, *Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions*.

1.3-3 10 CFR 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*.

1.3-4 NUREG-1800, *Standard Review Plan for Review for License Renewal Applications for Nuclear Power Plants*, U.S. Nuclear Regulatory Commission, Revision 1.

1.3-5 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report, Volumes 1 and 2*, U.S. Nuclear Regulatory Commission, Revision 1.

1.3-6 Regulatory Guide 1.188, *Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses*, U.S. Nuclear Regulatory Commission, Revision 1.

1.3-7 NEI 95-10, *Industry Guidelines for Implementing the Requirements of 10 CFR 54 – The License Renewal Rule*, Nuclear Energy Institute, Revision 6.

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2.0 SCOPING AND SCREENING METHODOLOGY FOR IDENTIFYING STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW AND IMPLEMENTATION RESULTS

This section describes the process for identification of structures and components subject to aging management review in the Davis-Besse integrated plant assessment. For those systems, structures, and components (SSCs) within the scope of license renewal, 10 CFR 54.21(a)(1) requires the license renewal applicant to identify and list structures and components subject to aging management review. Furthermore, 10 CFR 54.21(a)(2) requires that methods used to identify these structures and components be described and justified. Technical information in this section serves to satisfy these requirements.

The scoping and screening methodology is described in Section 2.1. This methodology is implemented in accordance with NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule," Revision 6. The results of the assessment to identify systems and structures within the scope of license renewal (plant-level scoping) are provided in Section 2.2. The results of the identification of the structures and components subject to aging management review (screening) are contained in the following sections:

- Section 2.3 for mechanical systems
- Section 2.4 for structures
- Section 2.5 for electrical and instrumentation and control systems

Table 2.0-1 provides the expanded definitions of the intended functions used for structures and components in this application. The pertinent tables in the application may refer to either the intended function name or the corresponding abbreviation defined in Table 2.0-1.

Table 2.0-1
Intended Functions: Abbreviations and Definitions

Intended Function	Abbreviation	Definition
Absorb Neutrons	ABN	Provide neutron absorption
Conduct Electricity	not abbreviated	Provide electrical connection to specified sections of an electrical circuit to deliver voltage, current, or signals
Direct Flow	DF	Provide spray shield or curbs for directing flow
Expansion or Separation	EXP	Provide for thermal expansion or seismic separation
Filtration	not abbreviated	Provide filtration to remove undesired contamination
Fire Barrier	FB	Provide rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant
Flood Barrier	FLB	Provide flood protection barrier (internal or external flooding event)
Flow Control	not abbreviated	Control or distribute flow as designed for balance or to promote mixing
Gaseous Release Path	RP	Provide path for release of filtered and unfiltered gaseous discharge
Heat Sink	HS	Provide heat sink during station blackout or design basis accidents (includes source of cooling water for plant shutdown)
Heat Transfer	not abbreviated	Provide heat transfer capability
HELB Shielding	HELB	Provide shielding against high energy line breaks (HELB)
Insulation (and Support)	not abbreviated	Insulate and support an electrical conductor
Missile Barrier	MB	Provide missile barrier (internally or externally generated)
Pipe Whip Restraint	PW	Provide pipe whip restraint

Table 2.0-1
Intended Functions: Abbreviations and Definitions (continued)

Intended Function	Abbreviation	Definition
Pressure Boundary	not abbreviated	Provide pressure retaining boundary so that sufficient flow at adequate pressure is delivered, or provide fission product barrier for containment pressure boundary, or provide containment isolation for fission product retention (*mechanical definition*)
Pressure Relief	PR	Provide over-pressure protection (*structural definition*)
Shelter or Protection	EN	Provide shelter or protection to safety-related equipment
Shielding	SHD	Provide shielding against radiation
Spray	not abbreviated	Introduce air, gas, or steam into a liquid (e.g., quencher, sparger), or liquid into air, gas, or steam (e.g., spray head or array, sprinkler), providing a defined flow pattern or flow distribution
Structural Integrity	not abbreviated	Maintain structural and pressure boundary integrity to prevent adverse physical interaction with safety-related SSCs such that the safety-related SSCs might fail to perform their intended functions
Structural Pressure Barrier	SPB	Provide pressure boundary or essentially leak tight barrier to protect public health and safety in the event of postulated design basis events (*structural definition*)
Support	not abbreviated	Provide structural integrity (e.g., reactor vessel support or internal subcomponents that do not have a pressure boundary function)
Support for Criterion (a)(1) Equipment	SSR	Provide structural or functional support to safety-related equipment
Support for Criterion (a)(2) Equipment	SNS	Provide structural or functional support to nonsafety-related equipment whose failure could prevent satisfactory accomplishment of required safety functions (includes Seismic II over I considerations)
Support for Criterion (a)(3) Equipment	SRE	Provide structural or functional support required to meet the Commission's regulations for the regulated events in 10 CFR 54.4(a)(3)
Throttling	not abbreviated	Provide flow restriction for measuring flow or for control to limit or balance flow

Table 2.0-1
Intended Functions: Abbreviations and Definitions (continued)

Intended Function	Abbreviation	Definition
Water Removal	not abbreviated	Remove water from an air, gas, or ventilation environment to protect or improve the performance of downstream components

2.1 SCOPING AND SCREENING METHODOLOGY

The following sections describe the methodology used for the license renewal scoping (Section 2.1.1) and screening (Section 2.1.2) processes. A discussion of NRC Interim Staff Guidance (ISG) as it applies to the Davis-Besse license renewal process is contained in Section 2.1.3. Section 2.1.4 contains a review of NRC Generic Safety Issues related to the Davis-Besse license renewal process. Conclusions related to the scoping and screening methodology are provided in Section 2.1.5 and related references are listed in Section 2.1.6.

2.1.1 SCOPING METHODOLOGY

The License Renewal Rule (10 CFR Part 54) defines the scope of license renewal using three criteria. 10 CFR 54.4(a) requires systems, structures, and components (SSCs) to be included in the license renewal process if they are:

(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions—

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable.

(2) All nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (a)(1)(i), (ii), or (iii) of this section.

(3) All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).

In addition, 10 CFR 54.4(b) states:

The intended functions that these systems, structures, and components must be shown to fulfill in § 54.21 are those functions that are the bases for including them within the scope of license renewal as specified in paragraphs (a)(1) – (3) of this section.

NEI 95-10 (Reference 2.1-1) provides industry guidance for determining which plant SSCs are in the scope of license renewal. The process to determine the SSCs in the scope of license renewal for Davis-Besse followed the recommendations of NEI 95-10.

The NRC endorsed NEI 95-10 in Section C.2 of Regulatory Guide 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses" (Reference 2.1-2):

> *Revision 6 of NEI 95-10, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 — The License Renewal Rule," dated June 2005, provides methods that the NRC staff considers acceptable for complying with the requirements of 10 CFR Part 54 for preparing a license renewal application.*

Consistent with NEI 95-10, the Davis-Besse license renewal project scoping process established a listing of plant systems and structures, determined the functions they perform, and then determined which functions meet one or more of the three criteria of 10 CFR 54.4(a). Functions that meet one or more of the criteria are intended functions for license renewal. The systems or structures that perform those functions are included in the scope of license renewal.

The Davis-Besse scoping process included a review of current licensing basis and design basis information sources. The following types of controlled plant documents were consulted to support inclusion of systems and structures in the scope of license renewal and for documenting the system and structure descriptions and functions:

- Davis-Besse Updated Safety Analysis Report (USAR),
- Davis-Besse Safety Evaluation Reports,
- Davis-Besse docketed information sources,
- Design Criteria Manual,
- Maintenance Rule Program Manual (MRPM),
- System description documents,
- Plant Engineering Drawings – site plan drawings, plant general arrangement drawings, piping and instrument diagrams, controlled vendor drawings, isometric drawings, civil drawings, electrical drawings, etc.,
- Piping calculations,
- Plant Procedures,
- Other controlled information sources.

Design basis event information was also reviewed during the scoping process. Design basis events are defined in 10 CFR 50.49(b)(1)(ii) as conditions of normal operation, including anticipated operational occurrences, design basis accidents, external events, and natural phenomena for which the plant must be designed. The Davis-Besse USAR identifies the design basis events for the station, including normal operational transients and anticipated operational occurrences; design basis accidents; and, design external events and natural phenomena, such as earthquakes, floods, and tornadoes. The USAR review identified the design basis events and confirmed that the Davis-Besse license renewal scoping process had evaluated the associated plant systems and structures consistent with the criteria of 10 CFR 54.4(a)(1).

The listing of Davis-Besse mechanical and electrical systems was developed from

- the MRPM,
- the USAR, and
- system description documents.

The listing of Davis-Besse structures was developed from

- the MRPM,
- the USAR, and
- architectural arrangement and civil drawings.

The information contained in the MRPM was a key input for the identification of system and structure functions because of the similarities in scoping requirements between the Maintenance Rule (10 CFR 50.65) and the License Renewal Rule (10 CFR 54.4).

The scoping process employed a combination of the following information sources to determine the system and structure license renewal intended functions:

- MRPM information,
- USAR information,
- system description documents,
- piping and instrument diagrams,
- electrical drawings,
- docketed correspondence, and
- other pertinent controlled references.

Each Davis-Besse system and structure was evaluated against the criteria in 10 CFR 54.4(a) as described in the following sections. Additionally, since structural scoping was performed independent of mechanical and electrical scoping, a review of mechanical and electrical scoping was performed to provide added assurance that structures that support or shelter in-scope mechanical and electrical components are included within the scope of license renewal.

- Section 2.1.1.1 describes the evaluation of the safety-related scoping criteria, 10 CFR 54.4(a)(1).
- Section 2.1.1.2 describes the evaluation of the nonsafety-affecting-safety scoping criteria, 10 CFR 54.4(a)(2).
- Section 2.1.1.3 describes the evaluation of the regulated events scoping criteria, 10 CFR 54.4(a)(3).

The results of the scoping evaluations for plant systems and structures are presented in Section 2.2.

2.1.1.1 Safety-Related Scoping Criteria

In accordance with 10 CFR 54.4(a)(1), SSCs relied upon to remain functional during and following design basis events were evaluated as safety-related and are included within the scope of license renewal.

The Davis-Besse definition of safety-related reads as follows:

A classification of any structure, system, or component that is necessary to ensure:

a) The integrity of the reactor coolant pressure boundary,

b) The capability to shut down the reactor and maintain it in a safe shutdown condition or

c) The capability to prevent or mitigate the consequences of the plant conditions that could result in potential off-site exposures that are comparable to the guideline exposures of the Code of Federal Regulations, Title 10, “Energy”, Part 100, “Reactor Site Criteria”.

Comparison of the Davis-Besse safety-related definition to the scoping criteria of the License Renewal Rule demonstrates that it fully encompasses the systems and equipment that meet the criteria of 10 CFR 54.4(a)(1).

The Davis-Besse definition of safety-related differs in item c) from the definition in 10 CFR 50.49 (b)(1), as referenced in 10 CFR Part 54. Neither 10 CFR 50.34(a)(1) nor 10 CFR 50.67(b)(2) are applicable to Davis-Besse, since 10 CFR 50.34(a)(1) pertains to preliminary safety analysis reports associated with construction permits, and 10 CFR 50.67(b)(2) pertains to the use of an alternate source term, which Davis-Besse has not credited for any analysis.

Nuclear safety-related SSCs are relied upon to remain functional during design basis events. For Davis-Besse, SSCs that are determined to be nuclear safety-related are designated as quality class “Q.” In accordance with Davis-Besse component quality classification, the terms “nuclear safety-related” and “Q” are synonymous with safety-related.

Davis-Besse quality group classifications comply with Regulatory Guide 1.26, “Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants” (see USAR Section 3.2.2). USAR Table 3.2-2 provides a listing of major components and identifies the quality group classification for each component of those fluid systems that are required to prevent or mitigate the consequences of accidents or malfunctions within the reactor coolant pressure boundary, or to permit safe shutdown of the reactor and maintenance of safe shutdown conditions.

The Quality Classification List is a master controlling document that identifies SSCs that have been classified as safety-related (“Q”) or augmented quality. Augmented quality is defined as a classification assigned to any item which is not safety-related, but performs one or more functions that meets mandates for the application of quality assurance in the Code of Federal Regulations or in Davis-Besse commitments to regulatory authorities. The Quality Classification List is comprised of two sections: Section I identifies structures, systems, and generic components that have been classified as safety-related or augmented quality; Section II is a component-level listing that is maintained and generated by the Davis-Besse configuration control database (i.e., SAP), and identifies, by component identification number (labeled as ‘functional locations’ in SAP), the quality classifications assigned to each component.

The piping and instrument diagrams for mechanical systems delineate, with the symbol "Q," the boundaries of safety-related components, i.e., components that meet the scoping criteria of 10 CFR 54.4(a)(1).

The USAR, Quality Classification List, and piping and instrument diagrams were reviewed to ensure that all systems that contain safety-related components were included in the scope of license renewal.

SSCs that perform intended functions that meet the safety-related criteria of 10 CFR 54.4(a)(1) are identified in Sections 2.3, 2.4, and 2.5.

2.1.1.2 Nonsafety-Affecting-Safety Scoping Criteria

In accordance with 10 CFR 54.4(a)(2), nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of a safety function as defined in 10 CFR 54.4(a)(1), referred to as nonsafety-affecting-safety (NSAS), are within the scope of license renewal. It is necessary to consider the impact of failures of nonsafety-related SSCs as either functional or spatial to provide reasonable assurance that all such systems are identified. Appendix F of NEI 95-10 contains guidance on scoping for NSAS. As explained below, the Davis-Besse methodology is consistent with the NEI 95-10 guidance.

For license renewal considerations, a functional NSAS failure is the failure of a nonsafety-related SSC to perform its normal function, which adversely affects the successful accomplishment of a safety function.

A spatial NSAS failure is the loss of structural or pressure boundary integrity of a nonsafety-related SSC that is connected to or located near (in physical proximity to) a safety-related SSC, which adversely affects the successful accomplishment of a safety function of the safety-related SSC.

The evaluation of functional failures and spatial failures with respect to license renewal is described further in the respective sections below.

2.1.1.2.1 Functional Failures of Nonsafety-Related SSCs

Where nonsafety-related equipment is required, as documented in the current licensing basis, to remain functional in support of a safety function, the supporting systems satisfy the NSAS license renewal scoping criterion of 10 CFR 54.4(a)(2).

Engineering and licensing documents were reviewed to determine the appropriate systems and structures in this category. The applicable sections of the USAR, MRPM, and system description documents provided the system and structure functional information to address these considerations.

The SSCs that perform intended functions credited in the current licensing basis that meet the NSAS criteria of 10 CFR 54.4(a)(2) were included within the scope of license renewal and are identified in Sections 2.3, 2.4, and 2.5.

2.1.1.2.2 Spatial Failures of Nonsafety-Related SSCs

Nonsafety-related systems and nonsafety-related portions of safety-related systems also satisfy the NSAS scoping criterion if there is a potential for spatial interactions with safety-related SSCs. That is, the degradation and failure of a nonsafety-related component that is directly connected (attached) to or located in the same space (i.e., same building or area) as that of safety-related systems and components creates the potential for interaction between the SSCs due to physical impact (including pipe whip and jet impingement), harsh environment, flooding, spray, or leakage that could adversely impact the safety-related functions of a safety-related SSC.

Certain mitigative features, such as missile barriers, flood barriers, and spray shields, are credited in the current licensing basis for the protection of safety-related SSCs from spatial interaction. These protective features were included in the scope of license renewal in accordance with Section 2.1.1.2.1 and were evaluated as structural components. In addition, the preventive option described in Appendix F of NEI 95-10 was used to determine the scope of license renewal with respect to the protection of safety-related SSCs from spatial interactions that are not addressed in the current licensing basis. The identification of nonsafety-related systems and portions of systems that are in the scope of license renewal under 10 CFR 54.4(a)(2) due to a potential for spatial interactions with safety-related equipment required an evaluation based on equipment location and the consequences of a nonsafety-related component failure in that location, rather than on equipment function itself. A “spaces” approach was used that focused on an entire structure (e.g., Auxiliary Building) rather than being limited to specific areas inside a structure. In this manner, all fluid-containing components (e.g., liquid or steam) and components associated with safety-related to nonsafety-related interfaces were evaluated for potential spatial interactions, with no rooms, areas or area-to-area transitions overlooked. The only exception to the use of the “spaces” approach was for the nonsafety-related top level of the safety-related Intake Structure, a room that contains no safety-related components.

Nonsafety-related structural components (such as hangers, supports, conduit, cable trays, barriers, and other protective features) were included in the scope of license renewal if they are located in, or are a part of, a plant structure that contains systems or components that satisfied the license renewal scoping criteria (and distinction between safety-related and nonsafety-related structural components was not necessary). Nonsafety-related mechanical systems and components were included in the scope of license renewal, due to the potential for spatial failures, if they are attached to or located in the same building or area as safety-related systems and components, unless justification was provided to assure that failures would not impact a safety function. Consistent with the related discussions in NEI 95-10 Appendix F, failure of non-attached nonsafety-related mechanical components that do not contain a fluid (e.g., liquid or steam) will not result in spatial interaction as there is no fluid to leak, spray, or impinge on safety-related SSCs and system pressure is such that there is no jet force that could cause significant movement of the failed component. This conclusion was confirmed by review of Davis-Besse and industry operating experience.

USAR Section 3.2.1.1 addresses compliance with Regulatory Guide 1.29, “Seismic Design Classification.” With respect to nonsafety-related piping that is attached to safety-related piping, the boundaries of Seismic Class I design requirements may extend to the first seismic restraint beyond the safety-related boundary. These seismic restraints are considered “equivalent anchors”, and are depicted on the piping and instrument diagrams by the symbol “S/I”. If an “S/I” boundary is not shown on the piping and instrument diagram for a particular safety-nonsafety interface, then the safety-related (Q) boundary is the seismic boundary, and the piping beyond the safety-related (Q) boundary (attached nonsafety-related piping) is not within the scope of license renewal.

FirstEnergy Nuclear Operating Company did not exclude components from the scope of license renewal based on duration of exposure to conditions resulting from the failure of a nonsafety-related mechanical component (such as leakage or spray). Fluid-filled nonsafety-related mechanical components that satisfy the NSAS criteria for spatial considerations were determined by a review of system description documents; piping and instrument diagrams; and component data contained in the Davis-Besse configuration control database that identifies component classification and location.

SSCs that perform intended functions for spatial considerations that meet the NSAS criteria of 10 CFR 54.4(a)(2) are identified in Sections 2.3 and 2.4.

2.1.1.3 Regulated Events Scoping Criteria

In accordance with 10 CFR 54.4(a)(3), SSCs that are relied upon (credited) in safety analyses or plant evaluations to perform a function that demonstrates compliance with NRC regulations for the following events are within the scope of license renewal:

- fire protection (10 CFR 50.48),
- environmental qualification (10 CFR 50.49),
- pressurized thermal shock (10 CFR 50.61),
- anticipated transients without scram (10 CFR 50.62), and
- station blackout (10 CFR 50.63).

Engineering and current licensing basis documents provide the technical basis for the SSCs that are required for compliance with the above regulated events. SSCs required for compliance with these NRC regulated events were identified through a combined review of the pertinent current licensing basis documents and engineering documents, including the USAR, Fire Hazards Analysis Report, the station blackout NRC Safety Evaluation Report, and other applicable docketed correspondence between FirstEnergy Nuclear Operating Company (and its predecessors, including Toledo Edison) and the NRC.

However, as a starting point for license renewal regulated event scoping, FirstEnergy Nuclear Operating Company reviewed the augmented quality classification in the Davis-Besse configuration control database. The augmented quality classification is used for components that require quality augmentation either as a result of NRC requirements or as committed to by FirstEnergy Nuclear Operating Company, but otherwise have no safety-related function. Augmented quality components include components required for fire protection, environmental qualification, anticipated transients without scram, and station blackout. There is no augmented quality designation for pressurized thermal shock.

The evaluation methodology for each regulated event is described further below.

SSCs that perform intended functions that meet the regulated event criteria of 10 CFR 54.4(a)(3) are identified in Sections 2.3, 2.4, and 2.5.

2.1.1.3.1 Fire Protection (10 CFR 50.48)

The current licensing basis for the Davis-Besse Fire Protection program is described in the Fire Hazards Analysis Report.

Davis-Besse was licensed before January 1, 1979; therefore, in accordance with 10 CFR 50.48(b), the requirements of 10 CFR Part 50 Appendix R apply. However, because Davis-Besse is in compliance with Branch Technical Position APCSB 9.5-1, the plant is exempt from the provisions of Appendix R, except for Sections III.G/L, III.J, and III.O.

The Fire Hazards Analysis Report describes the fire protection features which ensure the capability to achieve and maintain the cold safe shutdown of the plant and demonstrates compliance with the requirements of Appendix A to Branch Technical Position (BTP) APCSB 9.5-1; 10 CFR 50 Appendix R Sections III.G/L, III.J, and III.O; 10 CFR 50.48 (Fire Protection); and General Design Criterion 3 of Appendix A to 10 CFR Part 50. The Fire Hazards Analysis Report includes a description of post-fire safe shutdown (to demonstrate compliance with Appendix R), a description of fire protection systems (including requirements for compliance), and a fire hazards analysis (demonstrates that a single postulated fire will not affect the ability of the unit to be brought to and maintained in a cold shutdown condition).

In addition, the Davis-Besse system description document for fire protection addresses the design and licensing basis considerations for the Fire Protection System.

The Davis-Besse current licensing basis for fire protection was reviewed to identify those SSCs required for compliance with 10 CFR 50.48 and the corresponding intended functions. This review identified the features required for fire protection of safety-related equipment, and system functions that are included in, or provide necessary support for, the safe shutdown paths credited for compliance with Appendix R. The SSCs that perform an intended function for fire protection were included in the scope of license renewal.

2.1.1.3.2 Environmental Qualification (10 CFR 50.49)

Electrical components relied upon in safety analyses or in plant evaluations to remain functional when exposed to harsh environments, in accordance with 10 CFR 50.49, “Environmental Qualification of Electrical Equipment Important to Safety,” are within the scope of license renewal in accordance with 10 CFR 54.4(a)(3). The components in the environmental qualification program include both safety-related and nonsafety-related electrical components required for accident mitigation, post-accident monitoring, and safe shutdown.

Environmental qualification applies to electrical components which are installed in mechanical systems, such as instruments or valve operators in a fluid system, as well as to electrical components installed in electrical and instrumentation and control systems. Because the license renewal evaluation is being conducted on a discipline basis, environmental qualification is addressed by each discipline separately, as necessary. For the structural review, environmental qualification does not apply because the structures themselves have no electrical application.

The primary function of environmental qualification is to ensure that electrical systems and components located in a harsh environment are qualified to operate in that environment to perform the safety functions of accident mitigation, post-accident monitoring, and safe shutdown. Based on a review of the Davis-Besse current licensing basis for environmental qualification, the intended functions for each system supporting the 10 CFR 50.49 requirements were determined, and the SSCs that perform an intended function for environmental qualification were included in the scope of license renewal.

2.1.1.3.3 Pressurized Thermal Shock (10 CFR 50.61)

Systems relied on in safety analyses or plant evaluation to perform a function that demonstrates compliance with 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," are within the scope of license renewal per 10 CFR 54.4(a)(3). 10 CFR 50.61 contains requirements for utilities to minimize the effects of pressurized thermal shock to the reactor vessel. This concern exists during periods in which cold water may be injected into the reactor vessel at relatively high system pressures (e.g., safety system injection after an accident). The NRC definition of pressurized thermal shock from 10 CFR 50.61 is:

> *"Pressurized Thermal Shock Event" means an event or transient in pressurized water reactors (PWRs) causing severe overcooling (thermal shock) concurrent with or followed by significant pressure in the reactor vessel.*

The requirements in 10 CFR 50.61 identify specific operational limits pertaining to the belt-line region of the reactor vessel which must not be exceeded for pressurized thermal shock. As pertains to the reactor vessel, plant conditions are managed to ensure that the reference temperature for nil-ductility transition remains within the operational limits.

The identification of mechanical systems, other than the Reactor Pressure Vessel, that are relied upon to demonstrate compliance with 10 CFR 50.61 requires a review of docketed licensing correspondence and related technical reports. USAR Section 5 discusses compliance with 10 CFR 50.61 for Davis-Besse.

Review of docketed licensing correspondence and related technical reports did not identify any systems or structures, other than the Reactor Pressure Vessel, that are credited with mitigation of pressurized thermal shock.

Therefore, the Reactor Coolant System is the only system, and the reactor vessel is the only component, within the scope of license renewal for pressurized thermal shock. Pressurized thermal shock is evaluated as a time-limited aging analysis in Section 4.

2.1.1.3.4 Anticipated Transients Without Scram (10 CFR 50.62)

Anticipated transients without scram (ATWS) are not design basis events, but are anticipated operational occurrences accompanied by a failure of the reactor trip portion of the Reactor Protection System to shut down the reactor. The ATWS Rule, 10 CFR 50.62, requires specific improvements in the design and operation of commercial nuclear power facilities to reduce the probability of failure to shut down the reactor following anticipated transients and to mitigate the consequences of ATWS events. The ATWS transients of concern for Babcock & Wilcox plants are a complete loss of main feedwater and a loss of offsite power leading to a loss of main feedwater.

In February 1989 and in June 1989, Toledo Edison (previous owner/operator of Davis-Besse) submitted proposed plant-specific designs to comply with the requirements of the ATWS Rule for Davis-Besse. In September 1989, the NRC issued its Safety Evaluation Report (Reference 2.1-3), and concluded that the proposed designs were in compliance with the ATWS Rule and, therefore, acceptable.

The plant-specific designs for Davis-Besse consist of two elements: (1) the Steam and Feedwater Rupture Control System, and (2) the Diverse Scram System. The Steam and Feedwater Rupture Control System actuates the Auxiliary Feedwater System and initiates a turbine trip on low steam generator level (indicative of a loss of main feedwater) or a loss of four reactor coolant pumps (indicative of a loss of offsite power). The Diverse Scram System, a subsystem of the Reactor Protection/Trip System, provides a diverse means of removing power from the electronic trip circuits to drop the control rods into the reactor core. Both of these ATWS mitigation systems are electrical and instrumentation and control systems that do not include mechanical components. The Steam and Feedwater Rupture Control System and the Diverse Scram System were included in the scope of license renewal as electrical and instrumentation and control systems.

2.1.1.3.5 Station Blackout (10 CFR 50.63)

In accordance with 10 CFR 50.63, "Loss of All Alternating Current Power", each light-water-cooled nuclear power plant is required to be able to withstand and recover from a station blackout (SBO). An SBO is defined as the loss of offsite and onsite alternating current (AC) electric power to the essential and non-essential switchgear buses. It does not include the loss of AC power fed from inverters powered by station batteries. Nuclear power plants are required to be capable of withstanding an SBO event and maintaining adequate reactor core cooling and appropriate containment integrity for an established coping period.

The NRC review and acceptance of the Davis-Besse SBO coping assessment submittal is documented in a Safety Evaluation Report (Reference 2.1-4), with the conclusion that, with the addition of an alternate AC power source consisting of the SBO diesel generator, Davis-Besse conforms with the SBO Rule.

Plant equipment (i.e., systems and instrumentation) necessary to cope with SBO, recover from SBO, and ensure containment integrity and core cooling was identified and investigated to assure that items necessary for the equipment to function would be available for at least four hours; this is the equipment relied upon for compliance with 10 CFR 50.63.

An additional consideration for license renewal, based on NRC guidance, was that the systems and structures relied upon to restore offsite AC power (including the plant system portion of the offsite power system) and onsite AC power for an SBO event would be included within the license renewal scope. This guidance is provided in NUREG-1800 (Reference 2.1-5) and NRC Interim Staff Guidance (ISG) letter LR-ISG-02 (Reference 2.1-6), which was later incorporated into Section 2.5.2.1.1 of NUREG-1800, Revision 1.

SSCs required for compliance with 10 CFR 50.63, as well as the corresponding intended functions, were determined through a review of the current licensing bases, with consideration of the requirements of the License Renewal Rule and the guidance provided in NUREG-1800 and LR-ISG-02, and included in the scope of license renewal. The Davis-Besse evaluation boundary for SBO is addressed in Section 2.5.6.2.

2.1.1.4 Scoping Boundary Determination

For each system and structure within the scope of license renewal, identification of components subject to aging management review begins by determining the system and structure evaluation boundaries. The evaluation boundaries identify the components that are in the scope of license renewal and define those portions of the system or structure that are necessary to ensure that the intended functions of the system are performed. Components needed to support each of the system or structure intended functions identified in the scoping process are included within the evaluation boundaries. Components that do not support a system or structure intended function are outside the evaluation boundaries and need not be considered further. However, all safety-related components are considered to be in the scope of license renewal in accordance with 10 CFR 54.4(a)(1), and are included within the evaluation boundaries, even if they do not directly support a system or structure intended function. Components within the evaluation boundaries may be determined to be not subject to aging management review, as described in Section 2.1.2 below.

Components were primarily evaluated within their plant-assigned (i.e., parent) system. Some mechanical system components were scoped for license renewal within a system other than their parent system where necessary for clarity or to make the aging management review process more efficient. For example, Class 1 portions of engineered safety features systems were moved into the Reactor Coolant System to ensure that reactor coolant pressure boundary components were addressed consistently. Another example is the auxiliary feedwater pump turbines, which were moved into the main steam system to make the aging management review process more efficient. System assignments are clearly depicted on the drawings by the use of flags with system identifications. Components were not transferred to another system to prevent the original system from being in-scope.

2.1.1.4.1 Mechanical Systems

For mechanical systems, the evaluation boundaries are illustrated on piping and instrument diagrams by highlighting the flow paths that are required for the system to perform the intended functions that satisfy the license renewal scoping criteria described in Sections 2.1.1.1, 2.1.1.2, and 2.1.1.3 above. Light blue highlighting indicates portions of systems that are Safety Class 1 and in-scope based on the criteria of 10 CFR 54.4(a)(1). Light green highlighting indicates portions of systems that are non-Class 1 and in-scope based on the criteria of 10 CFR 54.4(a)(1), the functional considerations of 10 CFR 54.4(a)(2), or required compliance with a regulated event under 10 CFR 54.4(a)(3). Magenta highlighting indicates portions of systems that are in-scope based on the spatial considerations of 10 CFR 54.4(a)(2).

2.1.1.4.2 Structures

The evaluation boundary of an in-scope structure is the structure itself and the structural commodities within that structure, unless noted otherwise.

2.1.1.4.3 Electrical and Instrumentation and Control Systems

The philosophy of scoping for electrical systems is that all plant electrical and instrumentation and control systems are included within the scope of license renewal unless they are specifically scoped out.

Mechanical systems for which the only license renewal function involves electrical and instrumentation and control components are included within the electrical evaluation boundary.

The scoping of electrical and instrumentation and control systems includes electrical components within mechanical systems that are required for a complete evaluation of the mechanical system.

Evaluation boundaries are not illustrated for electrical and instrumentation and control systems based on the scoping philosophy. Evaluation boundaries are depicted, however, relative to the electrical and instrumentation and control systems and components required to establish the station blackout scoping boundary (see Section 2.5.6.2).

2.1.2 SCREENING METHODOLOGY

Screening is the process for determining the structures and components that are subject to aging management review (AMR). The requirement for screening is found in 10 CFR 54.21(a), which states:

(1) For those systems, structures, and components within the scope of this part, as delineated in § 54.4, identify and list those structures and components subject to an aging management review. Structures and components subject to an aging management review shall encompass those structures and components—

(i) That perform an intended function, as described in § 54.4, without moving parts or without a change in configuration or properties. These structures and components include, but are not limited to, the reactor vessel, the reactor coolant system pressure boundary, steam generators, the pressurizer, piping, pump casings, valve bodies, the core shroud, component supports, pressure retaining boundaries, heat exchangers, ventilation ducts, the containment, the containment liner, electrical and mechanical penetrations, equipment hatches, seismic Category I structures, electrical cables and connections, cable trays, and electrical cabinets, excluding, but not limited to, pumps (except casing), valves (except body), motors, diesel generators, air compressors, snubbers, the control rod drive, ventilation dampers, pressure transmitters, pressure indicators, water level indicators, switchgears, cooling fans, transistors, batteries, breakers, relays, switches, power inverters, circuit boards, battery chargers, and power supplies; and

(ii) That are not subject to replacement based on a qualified life or specified time period.

(2) Describe and justify the methods used in paragraph (a)(1) of this section.

(3) For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

NUREG-1800 and NEI 95-10, Appendix B were used as the basis for the identification of passive structures and components. Most passive structures and components are long-lived. Although the requirements for the integrated plant assessment are the same for systems and structures, in practice the screening process differed for each of the mechanical, structural, and electrical disciplines. The screening processes for each discipline met the requirements of 10 CFR 54.21(a), and are described below.

2.1.2.1 Screening of Mechanical Systems

For each mechanical system within the scope of license renewal, the screening process identified those components that are subject to AMR. Section 2.3 presents the results of the screening process for mechanical systems.

2.1.2.1.1 Identifying Mechanical Components Subject to Aging Management Review

Within the evaluation boundaries, passive, long-lived components that perform or support a system intended function are subject to AMR.

In making the determination that a component is passive (i.e., the component intended function is performed without moving parts or a change in configuration or properties), it was not necessary to consider the piece-parts of the component, with the exception of certain Class 1 components. For example, in the case of pumps, valves, fans and dampers, the pump casings, valve bodies, and fan and damper housings may perform the component intended function of maintaining system pressure boundary integrity and therefore, were subject to AMR, whereas the pump impeller, valve discs and stems, and fan and damper blades are moving parts and were not subject to AMR. A list of typical passive components is contained in NEI 95-10, Appendix B (Reference 2.1-1).

A determination was made as to whether a component was long-lived or short-lived (i.e., subject to replacement based on a qualified life or specified time period). Long-lived components are subject to AMR. Components that were determined to be short-lived and subject to replacement programs are not subject to AMR. Replacement programs may be based on vendor recommendations, plant experience, or other means that establish a specific service life, qualified life, or replacement frequency under a controlled program, such as preventive maintenance activities. The specific replacement program for a component was identified to justify excluding the component from AMR. Components subject to refurbishment or replacement solely on the basis of condition (e.g., the component is replaced only if significant degradation is observed during a periodic inspection), were considered long-lived and required an AMR. The associated condition monitoring program was considered an aging management program to be credited for license renewal.

Consumables were also considered in the process for determining components subject to AMR. Consumables are, by definition, not long-lived components, and include such things as packing, gaskets, component seals, o-rings, oil, grease, component filters (media), system filters (media), fire extinguishers, fire hoses, and air packs. Table 4.1-2 of NEI 95-10 provides a method to disposition consumables (refer to Section 2.1.2.4).

<u>Grouping of Mechanical Components into Component Types</u>

Most of the components that are subject to AMR were grouped into component types with similar characteristics to streamline the AMR process. For example, it was not necessary to perform an AMR on each and every valve within the system evaluation boundaries. Rather, the valves were grouped together according to their materials of fabrication or construction and the environment to which they are exposed. In this way, the AMR was conducted once for carbon steel valve bodies exposed to raw water, for example, and the results were applied to all carbon steel valve bodies within the system evaluation boundaries that were determined to be exposed to raw water.

Components and component types within the system evaluation boundaries were reviewed against the list contained in NEI 95-10, Appendix B, and those that were both passive and long-lived were identified as subject to AMR. Major plant components such as pumps, tanks, and heat exchangers that have unique design features or functions were identified separately, and may have included a component identification number (functional location); whereas others, such as piping, valves, instrumentation, etc., were grouped by component type. The component types listed in Chapter IX of NUREG-1801 were also considered (Reference 2.1-7).

2.1.2.1.2 Mechanical Component Intended Functions

The component intended function was considered to be the specific simple function, such as “maintain pressure boundary integrity,” that supported the broader system intended function, such as “provide core cooling flow.” Passive, long-lived components and component types subject to AMR were determined to perform a limited number of component intended functions. The primary component intended function identified for mechanical components was to maintain pressure boundary integrity. For heat exchanger tubes, the function of heat transfer may also have been assigned. A limited number of components have unique functions identified, such as filtration, flow control, or throttling.

Table 2.0-1 provides definitions of intended functions identified in this application, including those used for mechanical components.

2.1.2.2 Screening of Structures

For each structure or building within the scope of license renewal, the screening process identified those structural components and commodities that are subject to AMR. Section 2.4 presents the results of the screening process for structures.

2.1.2.2.1 Identifying Structural Components Subject to Aging Management Review

In accordance with the License Renewal Rule, an in-scope structure (e.g., the Auxiliary Building) contains inherently passive long-lived structural components and commodities. Those structural components and commodities that were determined to perform an intended function were identified as subject to AMR.

The screening process for structural components and commodities involved a review of design and licensing basis documents (e.g., USAR, Design Criteria Manual, drawings) to identify specific structural components and commodities that made up the structure. In most cases, structural components and commodities have no unique identifiers like those given to mechanical components. Therefore, grouping structural components and commodities based on materials of construction first, then subdividing them based on component design and functions, provided a practical means of categorizing them for AMR.

Once the structural component and commodity groups were identified within an in-scope structure (e.g., steel, concrete, fire barriers, elastomers), subdividing the groups into discrete structural component types based on design (e.g., walls, floors and ceilings, fire doors, flood curbs, equipment supports, penetrations, foundations, personnel airlocks) was useful because some component types may have performed different intended functions.

Evaluation Boundaries for Structural Component and Commodity Groups

Structural components and commodities that are attached to a structure or reside within a structure were categorized as: (1) component supports, or (2) other structural members.

The evaluation boundaries for mechanical component supports were established in accordance with rules governing inspection of component supports (i.e., ASME Section XI, Subsection IWF). Component support examination boundaries for integral and non-integral (i.e., mechanically attached) supports are defined in article IWF-1300, Figure IWF-1300-1. In general, the support boundary extends to the surface of the building structure, but does not include the building structure. Furthermore, the support boundary extends to include non-integral attachments to piping and equipment but excludes integral attachments to the same. Component support examination boundaries for non-ASME in-scope components included the structural component and the associated attachment to the building structure (e.g., structural component supports for heating, ventilation, and air-conditioning ducts include duct support members, baseplate, and anchorage).

Supports for electrical components include cable trays, conduit, cable tray and conduit supports, electrical panels, racks, cabinets, and other enclosures. The evaluation boundary for these items includes supporting elements, including mechanical or integral attachments to the building structure.

Evaluation boundaries for other structural members whose function is to carry dynamic loads caused by postulated design basis events were determined consistent with the method for establishing boundaries for supports specified above. That is, the boundary was evaluated including the structural component and the associated attachment to the building structure. The portion of the attachment embedded in the building structure was considered as part of the structure.

2.1.2.2.2 Structural Commodity Intended Functions

Structural component and commodity groups were evaluated to determine their intended functions. Unlike mechanical equipment for which both system-level and component-level intended functions were defined, the intended functions for structures were based on a simple set of functions that were applied to both the structure and to its components. The FirstEnergy Nuclear Operating Company process for determining the intended functions of structures, structural components, and structural commodities for license renewal followed the NEI 95-10 guidelines.

Table 2.0-1 provides definitions of intended functions identified in this application, including those used for structural commodities.

2.1.2.3 Screening of Electrical and Instrumentation and Control Systems

For each electrical and instrumentation and control system within the scope of license renewal, the screening process identified those electrical components and commodities that are subject to AMR. Electrical components in mechanical systems that were determined to be within the scope of license renewal were addressed under the electrical screening process. Section 2.5 presents the results of the screening process for electrical and instrumentation and control systems.

2.1.2.3.1 Identifying Electrical Commodities Subject to Aging Management Review

The philosophy of the electrical component screening process was that electrical components were included in the review unless they were scoped out at the system level or screened out by commodity group at the component level. The screening of electrical components was performed on a commodity basis. The electrical components were grouped by component type and evaluated in their respective commodity groups. The evaluation determined the materials of construction and service conditions (operating environment) of the equipment.

The grouping by commodity was performed because it would have been unworkable and unnecessary to list each and every electrical component separately (every cable, light bulb, insulator, etc.). The commodity grouping allowed for further subdivision based upon materials of construction, so that components with the same materials were evaluated together. The list of electrical component commodity groups generated was descriptive enough for the identification of the components within the group, and provided useful classification to support the electrical component AMR.

The electrical screening process was based on application of the listing in NEI 95-10, Appendix B, of component commodity groups that were identified as active and those which were listed as passive. Active components were excluded from AMR. The electrical screening process also set aside the components that are addressed by the environmental qualification program, which are evaluated as time-limited aging analysis in Section 4.4. The remaining electrical components (i.e., commodity groups) are subject to AMR.

2.1.2.3.2 Electrical Commodity Intended Functions

Electrical commodities were evaluated to determine their intended functions. The intended functions for electrical commodities were identified based on guidance provided in NEI 95-10.

Table 2.0-1 provides definitions of intended functions identified in this application, including those used for electrical commodities.

2.1.2.4 Treatment of Consumables

Consumables, as defined in Section 4.1 of NEI 95-10 and addressed in NUREG-1800 Table 2.1-3, comprise the following four categories: (a) packing, gaskets, component seals, and o-rings; (b) structural sealants; (c) oil, grease, and component filters; and (d) system filters, fire extinguishers, fire hoses, and air packs. Each category, as it applies to Davis-Besse license renewal, is discussed below. The discussion of structural sealants also addresses mechanical sealants, based on similarities in function and application. The discussion of system filters, fire extinguishers, fire hoses, and air packs also addresses compressed gas cylinders, based on a similar justification to that used for fire extinguishers.

2.1.2.4.1 Packing, Gaskets, Component Seals, and O-Rings

Packing, gaskets, component seals, and o-rings are treated as sub-components of pressure-retaining components (e.g., valves) and were evaluated based on guidelines described in Table 2.1-3 of NUREG-1800. These sub-components are not relied upon by ANSI B31.1 or ASME Section III for maintaining system pressure boundary. The sub-components provide leak-proof seals when components are mechanically joined together, but are not required to support the intended function of the parent component. Furthermore, these subcomponents are typically replaced as condition (e.g., leakage) warrants as a standard practice. As such, packing, gaskets, component seals, and o-rings are classified as consumables and are not subject to AMR.

2.1.2.4.2 Structural Sealants

Structural sealants perform an intended function without moving parts or change in configuration and are not typically replaced. Therefore, structural sealants were determined to be subject to AMR based on their application, and are evaluated as bulk commodities.

Mechanical sealants used in heating, ventilation, and air-conditioning systems or other systems that circulate or process ambient air similarly perform an intended function and are not typically replaced. Therefore, mechanical sealants in heating, ventilation, and air-conditioning and other air circulation systems were determined to be subject to AMR based on their application, and are evaluated within their respective systems.

2.1.2.4.3 Oil, Grease, and Component Filters

Oil, grease, and component filter media are sub-components of in-scope equipment and are, by definition, short-lived because either: (1) a program for periodic replacement exists, or (2) a monitoring program (e.g., predictive analysis activities, condition monitoring) exists that replaces these consumables, based on established performance criteria, when their condition begins to degrade, but before there is a loss of intended function. Examples of component filter media are fuel oil and lubricating oil filters. Therefore, oil, grease, and component filters are classified as consumables and are not subject to AMR.

2.1.2.4.4 System Filters, Fire Extinguishers, Fire Hoses, and Air Packs

System filter media, fire extinguishers, fire hoses, air packs, and compressed gas cylinders are consumables, and are routinely tested, periodically inspected and replaced when necessary, and are not subject to AMR. System filters are monitored during testing and operation, and are either replaced periodically or on condition. Fire hoses and fire extinguishers are inspected and hydrostatically tested periodically and must be replaced if they do not pass the test or inspection. Breathing air apparatus and air cylinders are inspected and tested periodically and must be replaced if they do not pass the test or inspection. Fire protection procedures specify the replacement criterion of these components that are routinely checked by tests or inspections to assure operability. Criteria for inspection and replacement are based on accepted industry standards (e.g., Branch Technical Position BTP-APCSB 9.5-1, National Fire Protection Association (NFPA) NFPA-10 for fire extinguishers, NFPA-1962 for fire hoses, and the Code of Federal Regulations 29 CFR 1910.134, Section 6.2.1 for air packs). Therefore, while these consumables are within the scope of license renewal, they are short-lived, and are not subject to AMR.

2.1.2.5 Treatment of Stored Equipment

Equipment that is stored on-site for installation in response to a design basis event was evaluated as within the scope of license renewal. The USAR, the Fire Hazards Analysis Report, site procedures, and system description documents were reviewed to identify stored equipment by performing keyword searches. Keyword searches of abnormal operating procedures were specifically performed to determine whether there is stored or staged equipment that is relied upon (credited) in response to design basis events. Identified equipment was evaluated and determined to be short-lived based on periodic testing and inspections.

There is no stored or staged long-lived equipment that is relied upon (credited) for design basis event mitigation. Therefore, there is no stored equipment subject to AMR.

2.1.2.6 Treatment of Insulation

Insulation is addressed in license renewal guidance documents, including NEI 95-10 (Reference 2.1-1), NUREG-1800 (Reference 2.1-5), and NUREG-1801 (Reference 2.1-7), almost exclusively in relation to electrical components (in terms of insulation for electrical cables, electrical connections, and electrical bus bar).

For electrical components, the insulation serves a specific function of preventing unwanted loss of electrical current and conductivity. The thermal considerations of the insulation for electrical components, if any, are secondary.

Insulation for mechanical and structural components is concerned with thermal characteristics and is associated with piping and other components that contain high or low temperature liquids or steam, and with items like the insulation around the reactor vessel (to protect adjacent concrete from temperature affects).

Insulating materials for mechanical components are nonsafety-related and typically are not required for the intended function of the systems and components to which they are affixed (Reference 2.1-5, Table 2.3-1). Thermal insulation may be: a) credited with a specific function (such as in room heat-up analyses and for structural fire barriers), or b) affixed to mechanical components and have the potential to fall on, block, or obstruct safety-related components. As such, insulating materials that function to limit heat transfer, perform a fire barrier function, or that must maintain their integrity to prevent interactions with safety-related components are within the scope of license renewal.

Because insulating materials affixed to mechanical and structural components share material and environment properties and were common to multiple SSCs rather than being associated with a specific system, they were addressed as bulk commodities in the structural evaluations.

Insulation for electrical components, and for mechanical and structural applications, was determined to be passive and long-lived. Therefore, insulating materials that serve an intended function are subject to AMR.

2.1.3 INTERIM STAFF GUIDANCE ASSOCIATED WITH LICENSE RENEWAL

Interim Staff Guidance (LR-ISG) documents for license renewal serve as a means for the NRC staff to issue changes and clarifications to license renewal guidance documents issued by the NRC between formal revisions, and to address emergent issues. Changes are generally made with input from license renewal stakeholders. License renewal guidance documents issued by the NRC include NUREG-1800, NUREG-1801, and Regulatory Guide 1.188. LR-ISGs may exist in either a draft or approved status. LR-ISGs typically address technical issues, but may address process issues as well.

There are two types of LR-ISGs: clarification ISGs and compliance ISGs. Clarification ISGs provide additional guidance intended to reduce unnecessary requests for additional information (RAIs) and inform applicants when more information is needed on an issue already addressed in NRC guidance documents for license renewal. Clarification ISGs do not create new staff positions not already addressed by previous applicants. Compliance ISGs involve compliance with previously issued NRC regulations.

As recommended by NEI 95-10, Section 1.4, LR-ISGs that remain open and have not been incorporated into license renewal guidance documents should be considered by applicants for license renewal. The current status of LR-ISGs, as well as a description of the process, is available on the NRC Reactor License Renewal Guidance Document web page. As described in an NRC letter dated February 6, 2007 (Reference 2.1-8), ISGs through 2005 have either been incorporated into NRC guidance documents for license renewal, have been otherwise closed, or remain open.

The LR-ISGs that remain open as of June 2010 are discussed below.

<u>LR-ISG-19B – Cracking of Nickel-Alloy Components in the Reactor Coolant Pressure Boundary</u>

The NRC staff has prepared a draft aging management program, XI.M11-B, "Cracking of Nickel-Alloy Components in the Reactor Coolant Pressure Boundary." This ISG has been deferred, and the program will be included in the update of NUREG-1801 and will not become a final LR-ISG.

FirstEnergy Nuclear Operating Company has committed to a plant-specific aging management program for Davis-Besse, the “Nickel-Alloy Management Program,” to address this issue (see Appendix B).

LR-ISG-2006-01 – Plant-Specific Aging Management Program for Inaccessible Areas of Boiling Water Reactor Mark 1 Steel Containment Drywell Shell

Plants with a boiling water reactor (BWR) Mark I steel containment are to provide a plant-specific aging management program that addresses the potential loss of material due to corrosion in the inaccessible areas of their Mark I steel containment drywell shell for the period of extended operation.

This LR-ISG is not applicable to Davis-Besse, which is a pressurized water reactor (PWR).

LR-ISG-2006-03 – Staff Guidance for Preparing Severe Accident Mitigation Alternatives Analyses

This LR-ISG endorses the use of industry guidance document NEI 05-01 (Revision A), issued in November 2005, when preparing severe accident mitigation alternatives (SAMA) analyses for license renewal. The LR-ISG clarifies the staff’s expectation with respect to SAMA information submitted with the LRA.

NEI 05-01 was used as guidance in the development of SAMA analyses submitted as part of the Davis-Besse License Renewal Application (see Appendix E).

LR-ISG-2007-01 – License Renewal Interim Staff Guidance Process, Revision 1

This LR-ISG issued a revised process for guiding the development and implementation of LR-ISGs. The revised process superseded the previous process entitled, “Process for Interim Staff Guidance,” which the NRC staff issued on December 12, 2003.

The LR-ISG process communicates interim changes to NRC license renewal guidance documents. Revision 1 of this LR-ISG (issued August 7, 2009) extended the LR-ISG process to certain environmental review guidance documents, added a new backfitting discussion section to LR-ISGs, and updated references to NRC license renewal guidance documents. The process has since been superseded by the "License Renewal Interim Staff Guidance Process," Revision 2, issued June 14, 2010.

This LR-ISG does not affect the development of the Davis-Besse License Renewal Application.

LR-ISG-2007-02 – Changes to Generic Aging Lessons Learned (GALL) Report Aging Management Program (AMP) XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”

This LR-ISG addresses acceptable approaches for managing the effects of aging for certain electrical cable connections within the scope of license renewal. The methodology allows for a one-time inspection of a representative sample of electrical cable connections (to be performed prior to the period of extended operation). If a resistance measurement (via thermography or contact resistance testing, for example) cannot be practically performed (or cannot be done for safety reasons), then a visual inspection may be utilized. However, a visual inspection cannot be a one-time inspection and a periodic program is needed.

FirstEnergy Nuclear Operating Company has committed to a one-time inspection, consistent with LR-ISG-2007-02, for Davis-Besse, the "Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection," to address this issue (see Appendix B).

LR-ISG-2009-01 – Aging Management of Spent Fuel Pool Neutron-Absorbing Materials other than Boraflex

This LR-ISG details an acceptable approach for managing the effects of aging during the period of extended operation for neutron-absorbing material in spent fuel pools within the scope of license renewal. NUREG-1801 Section XI.M22 describes adequate aging management program characteristics for Boraflex monitoring, and this material is excluded from this LR-ISG. Other materials, such as Boral, Metamic, boron steel, and Carborundum are addressed.

The staff has determined that each applicant needs to demonstrate that, for each type of neutron-absorber material used in the spent fuel pool, degradation has not occurred in a manner that could adversely impact the material's intended function. A plant-specific aging management program should be submitted that addresses the aging effects relative to reduction in neutron-absorbing capacity, change in dimensions, and loss of material, due to the effects of the spent fuel pool environment.

FirstEnergy Nuclear Operating Company has committed to a plant-specific aging management program, consistent with LR-ISG-2009-01, for Davis-Besse, the "Boral® Monitoring Program," to address this issue (see Appendix B).

2.1.4 GENERIC SAFETY ISSUES

Generic resolution of a generic safety issue (GSI) or unresolved safety issue (USI) is not necessary for the issuance of a renewed license. GSIs and USIs that do not contain issues related to the license renewal aging management review or time-limited aging evaluation need not be reviewed. Unresolved safety issues, and high and medium priority issues described in Appendix B of NUREG-0933, "Resolution of Generic Safety Issues" (Reference 2.1-9), that involve aging effects for structures and components subject to aging management review or time-limited aging analyses are specifically addressed. Per NEI 95-10 (Section 1.5), the version of NUREG-0933 that is current on the date six (6) months before the submittal date of the license renewal application is used to identify such issues. Branch Technical Position RLSB-2, Generic Safety Issues Related to Aging, contained in Appendix A.3 of NUREG-1800, provides additional guidance on treatment of GSIs.

Review of NUREG-0933 Appendix B identified no outstanding USIs. There are no GSIs identified as medium-priority. The following GSIs are identified as high-priority:

- GSI-163, Multiple Steam Generator Tube Leakage

  GSI-163 involves the potential for multiple steam generator tube leaks during a main steam line break that cannot be isolated. This GSI is event-driven (i.e., initiated by a main steam line break) and is not related to aging. However, steam generator tubes are part of the reactor coolant pressure boundary and are the subject of an aging management review and time-limited aging analysis evaluation as documented in Section 3.1.2.1.4 and Section 4.3.2. Aging management of steam generator tubes is addressed within the current licensing basis of the plant and will continue to be addressed during the period of extended operation by the Steam Generator Tube Integrity Program discussed in Section B.2.38.

- GSI-191, Assessment of Debris Accumulation on PWR Sump Performance (Revision 1)

  GSI-191 involves the potential for blockage of containment sump strainers that filter debris from cooling water supplied to the safety injection and containment spray pumps following a postulated LOCA. The issue is based on containment strainer design and on the identification of new potential sources of debris that may block the sump strainers. The issues identified in GSI-191 and related NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors," are not aging-related issues, and, therefore, are not a license renewal concern for Davis-Besse. Also, the issues are not related to the 40-year term of the current operating license, and, therefore, are not time-limited aging analyses. At Davis-Besse, a new emergency sump strainer was designed and installed in the

Cycle 13 refueling outage (February 30, 2002 to March 2004). FirstEnergy Nuclear Operating Company evaluated the containment emergency sump and strainer for license renewal in the Containment structure evaluation in Section 2.4.1.

These GSIs are applicable to Davis-Besse, a pressurized water reactor (PWR). However, these GSIs do not involve either aging effects for structures or components subject to aging management review or time-limited aging analyses. Therefore, these GSIs need no further evaluation for license renewal.

There are no GSIs that require further evaluation in this License Renewal Application.

2.1.5 CONCLUSION

The methodology described in Sections 2.1.1 and 2.1.2 was used to identify the SSCs that are within the scope of license renewal and to identify those structures and components that are subject to aging management review. The methods are consistent with, and satisfy the requirements of, 10 CFR 54.4 and 10 CFR 54.21(a)(1).

2.1.6 REFERENCES FOR SECTION 2.1

2.1-1 NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule*, Nuclear Energy Institute, Revision 6.

2.1-2 Regulatory Guide 1.188, *Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses*, U. S. Nuclear Regulatory Commission, Revision 1.

2.1-3 EXT-89-07488 (Log No. 3077), Thomas V. Wambach (NRC) to Donald C. Shelton (Toledo Edison), *Evaluation of the Davis-Besse Nuclear Power Station Compliance with 10 CFR 50.62 Requirements for Reduction of Risk from Anticipated Transients without SCRAM (ATWS) (TAC 59086)*, September 29, 1989.

2.1-4 EXT-91-01364 (Log No. 3421), Dominic C. Dilanni (NRC) to Donald C. Shelton (Toledo Edison, Davis-Besse), *Safety Evaluation of the Davis-Besse Nuclear Power Station, Unit No. 1, Station Blackout Rule 10 CFR 50.63 (TAC No. 68536)*, March 7, 1991.

2.1-5 NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,* U. S. Nuclear Regulatory Commission, Revision 1.

2.1-6 NRC LR-ISG-02, *Staff Guidance on Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout (SBO) Rule (10 CFR 50.63) for License Renewal (10 CFR 54(a)(3))*, April 1, 2002 [historical].

2.1-7 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, U. S. Nuclear Regulatory Commission, Revision 1.

2.1-8 NRC letter, P.T. Kuo, Director, Division of License Renewal, Office of Nuclear Regulatory Research, to A. Marion, NEI, *Summary of the 2001-2005 Interim Staff Guidance for License Renewal*, February 6, 2007.

2.1-9 NUREG-0933, Supplement 32, *Resolution of Generic Safety Issues*, U. S. Nuclear Regulatory Commission, July 2008.

2.2 PLANT-LEVEL SCOPING RESULTS

The Davis-Besse license renewal review methodology consisted of three distinct processes: scoping, screening, and aging management review. This section provides the results of the scoping process described in Section 2.1.1.

Table 2.2-1, Table 2.2-2, and Table 2.2-3 provide the results of applying the license renewal scoping criteria to the mechanical systems, electrical and instrumentation and control (I&C) systems, and structures, respectively. If a system or structure, in whole or in part, met one or more of the license renewal scoping criteria, the system or structure was evaluated as within the scope of license renewal for Davis-Besse. The tables include a reference to the section of the application that discusses the screening results for each system and structure determined to be within the scope of license renewal.

Table 2.2-1
License Renewal Scoping Results for Mechanical Systems

System Name	In-Scope	Screening Results Section
Auxiliary Building HVAC Systems	Yes	2.3.3.1
Auxiliary Building Chilled Water System	Yes	2.3.3.2
Auxiliary Feedwater System	Yes	2.3.4.1
Auxiliary Steam and Station Heating System	Yes	2.3.3.3
Boron Recovery System	Yes	2.3.3.4
Chemical Addition System	Yes	2.3.3.5
Chlorination System	No	
Circulating Water System	Yes	2.3.3.6
Component Cooling Water System	Yes	2.3.3.7
Condensate System	No	
Condensate Storage System	Yes	2.3.4.2
Condenser Vacuum System	No	
Containment Air Cooling and Recirculation System	Yes	2.3.2.1
Containment Hydrogen Control System	Yes	2.3.3.8
Containment Purge System	Yes	2.3.3.9
Containment Spray System	Yes	2.3.2.2
Containment Vacuum Relief System	Yes	2.3.3.10
Control Rod Drive System	No	
Core Flooding System	Yes	2.3.2.3
Demineralized Water Storage System	Yes	2.3.3.11
Demineralizer System	No	
Decay Heat Removal and Low Pressure Injection System	Yes	2.3.2.4
Electro-Hydraulic Control System	No	
Emergency Diesel Generators System	Yes	2.3.3.12
Emergency Ventilation System	Yes	2.3.3.13

Table 2.2-1
License Renewal Scoping Results for Mechanical Systems (continued)

System Name	In-Scope	Screening Results Section
Extraction Steam System	No	
Fire Protection System	Yes	2.3.3.14
Fuel Oil System	Yes	2.3.3.15
Gaseous Radwaste System	Yes	2.3.3.16
High Pressure Injection System	Yes	2.3.2.5
Instrument Air System	Yes	2.3.3.17
Main Feedwater System	Yes	2.3.4.3
Main Generator and Auxiliaries System	No	
Main Steam System	Yes	2.3.4.4
Main Turbine and Auxiliaries System	No	
Makeup and Purification System	Yes	2.3.3.18
Makeup Water Treatment System	Yes	2.3.3.19
Miscellaneous Building HVAC System	Yes	2.3.3.20
Miscellaneous Liquid Radwaste System	Yes	2.3.3.21
Miscellaneous Mechanical System	No	
Nitrogen Gas System	Yes	2.3.3.22
Primary Hydrogen Makeup System	No	
Process and Area Radiation Monitoring System	Yes	2.3.3.23
Reactor Coolant Vent and Drain System	Yes	2.3.3.24
Reactor Coolant System	Yes	2.3.1.3
Reactor Pressure Vessel	Yes	2.3.1.1
Reactor Vessel Internals	Yes	2.3.1.2
Sampling System	Yes	2.3.3.25
Service Water System	Yes	2.3.3.26
Spent Fuel Pool Cooling and Cleanup System	Yes	2.3.3.27
Spent Resin Transfer System	Yes	2.3.3.28
Station Air System	Yes	2.3.3.29
Station Blackout Diesel Generator System	Yes	2.3.3.30

Table 2.2-1
License Renewal Scoping Results for Mechanical Systems (continued)

System Name	In-Scope	Screening Results Section
Station Plumbing, Drains, and Sumps System	Yes	2.3.3.31
Steam Generators	Yes	2.3.1.4
Turbine Building HVAC System	No	
Turbine Plant Cooling Water System	Yes	2.3.3.32

Table 2.2-2
License Renewal Scoping Results for Electrical and I&C Systems

System Name	In-Scope	Screening Results Section
Administration - Power Structure Maintenance System	No	
Annunciators and Miscellaneous Power System	No	
Batteries and DC Power Supplies (125/250 VDC) System	Yes	2.5
Instrument AC System (including 240/120 VAC Essential System)	Yes	2.5
480 VAC System (including 480 VAC substations and 480 VAC motor control centers)	Yes	2.5
4160 VAC System	Yes	2.5
345-kV Switchyard System	Yes	2.5
Startup Transformers / 13.8-kV Buses System	Yes	2.5
Central Welding System	No	
Communications System	Yes	2.5
Containment System (electrical penetrations)	Yes	2.5
Containment Leak Detection System	No	
Control Rod Drive System (power supplies)	Yes	2.5
Environmental Equipment System	No	
Fire Protection System (fire detection)	Yes	2.5
Incore Monitoring System	Yes	2.5
Integrated Control System	No	
Main Generator and Auxiliaries System	No	
Main Turbine and Auxiliaries System (see Table 2.2-1 for the Electro-Hydraulic Control System)	No	
Main and Auxiliary Transformers System	No	
Miscellaneous Electrical Systems	No	
Miscellaneous Subsystems	No	
Nuclear Instrumentation System	Yes	2.5
Non-Nuclear Instrumentation System	Yes	2.5

Table 2.2-2
License Renewal Scoping Results for Electrical and I&C Systems (continued)

System Name	In-Scope	Screening Results Section
Piping Protection (cathodic and freeze protection) System	Yes	2.5
Plant Computer and Monitoring System	No	
Personnel Processing Facility [also known as Primary Access Facility] (electrical systems)	No	
Process and Area Radiation Monitoring System	Yes	2.5
Protective Relays System	No	
Reactor Coolant Pump Maintenance Tools System	No	
Reactor Protection/Trip System	Yes	2.5
Safety Features Actuation System	Yes	2.5
Station AC/DC Lighting System	Yes	2.5
Steam and Feedwater Rupture Control System	Yes	2.5

Table 2.2-3
License Renewal Scoping Results for Structures

Structure Name	In-Scope	Screening Results / Section
1,000-kVA Transformer Foundation	No	Provides support to the 1,000-kVA Transformer
69-kV Substation Foundation	No	Provides support to the 69-kV Substation which feeds loads that are not in the scope of license renewal
Acid Supply Pump House	No	Also known as the Acid Supply System (Cooling Tower); abandoned in place
Auxiliary Building (including control room, diesel generator rooms, and spent fuel storage area)	Yes	2.4.2
Beach House	No	Utilized to comply with environmental regulations
Beach House Transformer Vault	No	Houses the Beach House transformer which supplies power to the Beach House and other nonsafety-related loads
Borated Water Storage Tank Foundation (including trench)	Yes	2.4.12
Bridge (over Cooling Tower Return Canal)	No	Used as a roadway for crossing over the Cooling Tower Return Canal
Borated Water Storage Tank Level Transmitter Building	Yes	2.4.4
Carbon Dioxide Storage Tank Pad	No	Provides support to the carbon dioxide gas storage unit
Chlorination Pipe Trench	No	Concrete trench routed outside between the Intake Structure and the Circulating Water Screen Structure and covered with gratings and checkered plates
Chlorine Detector Building	No	Also known as the Chlorine Detector Enclosure; abandoned in place
Chlorine Unloading Facility	No	Abandoned in place

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In-Scope	Screening Results / Section
Circulating Water Pump House	No	Also known as the Circ Water System Pump House; houses a 30-ton traveling bridge crane, four circulating water pumps and piping that supply water to the turbine steam condensers
Circulating Water Screen Structure	No	Also known as the Screen Structure; houses screens to prohibit any large debris from entering the Circulating Water System
Collection Box	No	Reinforced concrete vault with manway access utilized to comply with environmental regulations
Containment (including Containment Vessel, Shield Building, and Containment internal structures)	Yes	2.4.1
Cooling Tower	No	Hyperbolically shaped concrete shell supported on a concrete foundation; located such that complete collapse in the most unfavorable direction would not endanger critical station structures
Cooling Tower Return Canal	No	Also known as the Open Channel; carries circulating water from the Cooling Tower basin to the Circulating Water Screen Structure
Davis-Besse Administration Building (DBAB) and Annex	No	Also known as the Administration Office Building or the DBAB; houses the Technical Support Center, Emergency Operation Facility, radiation testing lab, site emergency operation center, records management, and administrative offices
Davis-Besse Administration Building Power Structure	No	Also known as the Emergency Control Center or Emergency Planning Facility Power Structure; provides backup power to support the emergency response facilities
Demineralized Water Storage Tank Foundation	No	Supports the Demineralized Water Storage Tank, which is not in-scope for license renewal

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In-Scope	Screening Results / Section
Diesel Oil Pump House	Yes	2.4.12
Diesel Oil Storage Tank Foundation	Yes	2.4.12
Dry Fuel Storage Facility	No	Provides temporary on-site spent fuel dry storage; licensed and operated in accordance with 10 CFR Part 72
Emergency Diesel Generator Fuel Oil Storage Tanks Foundation	Yes	2.4.12
Fire Hydrant Hose Houses and Foundations	Yes	2.4.12
Fire Walls between Bus-Tie Transformers, between Bus-Tie and Startup Transformer 01, and between Auxiliary and Main Transformers	Yes	2.4.12
Fire Water Storage Tank Foundation	Yes	2.4.12
Fire Water Storage Tank Pump House	No	Also known as the Construction Water Treatment Building or Service Building No. 5; used to fill the Fire Water Storage Tank with treated water by means of the station water treatment system. Provides a water filling function which sets up the initial condition for the Fire Water Storage Tank.
Flammable Liquids Warehouse	No	Also known as the Flammable Liquids Building; provides storage for flammable liquids
Flow Test Box	No	Concrete valve vault with manway access that contains valves associated with discharge piping
Forebay (including retaining walls)	Yes	2.4.3

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In-Scope	Screening Results / Section
Fuel Storage Tanks Foundations	No	Support the fuel storage tanks; the 1,000 gallon diesel fuel storage tank and 2,000 gallon gasoline storage tank are located in a concrete retaining structure. designed to contain the total volume of both tanks
Gate House	No	Utilized for site security purposes
Hydrogen Trailer Area	No	Concrete slab that supports the hydrogen supply which is permanently piped into the Turbine Building
Intake Canal	No	Dredged at the lake end and terminated with a diked closure at the original shoreline. The collapse of the intake pipe or complete closure of the canal was analyzed. The stored water in the forebay is adequate for safe shutdown.
Intake Crib	No	Submerged structure located approximately 3,100 feet offshore in Lake Erie which conveys water to the shore by an intake pipe. The intake crib air bubbler is abandoned in place.
Intake Crib Air Piping Manhole	No	Abandoned in place
Intake Structure	Yes	2.4.3
Low Level Radwaste Storage Facility	No	Also known as the Low Level Radwaste Building; provides temporary storage of low level radwaste
Lube Oil Delivery Fill Box	No	Concrete below-grade valve box with a cast iron cover providing shelter and support to the lube oil fill and disposal piping
Main and Auxiliary Transformer Foundations	No	Provide support for the main and auxiliary transformer which are not in-scope for license renewal

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In-Scope	Screening Results / Section
Meteorological Tower	No	A 100-meter tall free-standing tower with backup meteorological systems installed on the tower and associated equipment housed in a climate controlled shelter
Microwave Tower	No	A 10-meter tall free-standing tower with backup meteorological systems installed on the tower and associated equipment housed in a climate controlled shelter
Miscellaneous Diesel Generator Building	Yes	2.4.5
Nitrogen Storage Building	Yes	2.4.12
Nonsafety-related Utility Manholes, Sumps, Oil Interceptors, Catch Basins and Oil Collection Tanks, Lift Stations, Cleanouts, Connection Boxes, and Holding Tanks	No	Associated with environmental consideration of waste oil treatment and retention; located throughout the yard
Office Building (Condensate Storage Tanks)	Yes	2.4.6
Operations Support Center	No	Located inside the Personnel Shop Facility
Primary Access Facility	No	Also known as the Personnel Processing Facility; utilized for site security purposes
Personnel Shop Facility	No	Houses offices and shop facilities
Personnel Shop Facility Passageway (Missile Shield Area)	Yes	2.4.7
Ponds (including Ponds A through D, Dewatering Pond, Grout Waste Hole, and ponds west of Cooling Tower)	No	Located on the Davis-Besse site; ponds are borrow pits used to provide fill material during site construction. Dewatering Pond was used for the dewatering of groundwater during construction. Grout Waste Hole is a waste dump area for unused grout.

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In-Scope	Screening Results / Section
Primary Water Storage Tank Foundation	No	Abandoned in place
Propane Tanks Foundations	No	Provide physical support to the propane tanks
Pump House (construction water)	No	Abandoned in place
Pump House (near State Highway 2)	No	Protects a marsh pump used to control water level in the marsh near the Cooling Tower
Resource and Recovery Act (RCRA) (Hazardous Waste) Storage Area and Building	No	Provides storage of hazardous waste and waste oil drums
Red Barn	No	Abandoned in place
Salt Barn	No	Provides storage for de-icing salt
Satellite Tower	No	Free-standing tower that is part of the Communications System
Screen Wash Catch Basin	No	Utilized to comply with environmental regulations
Seismograph Detector Housing	No	Houses the seismograph detector; reinforced cube-like structure installed below grade with a steel cover plate
Service Buildings 2, 3, 4, and 6	No	Houses site personnel, offices, and warehouse parts
Service Building 4 Substation Foundation	No	Provides support for the Service Building 4 Substation
Service Water Discharge Structure	Yes	2.4.3
Service Water Pipe Tunnel and Valve Rooms	Yes	2.4.8
Settling Basins 1, 2, and 3	No	Utilized to comply with environmental regulations

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In-Scope	Screening Results / Section
Sewage Treatment Plant No. 1	No	Abandoned in place (located west of the Settling Basins)
Sewage Treatment Plant No. 2	No	Processes waste water (located east of Pond "B")
Spare Transformer Foundation	No	Provides support to the spare start-up transformer
Staging Warehouse	No	Located on the first two floors of the eastern half of the Office Building; facilitates maintenance and operations
Station Blackout Component Foundations and Structures in the Yard and Switchyard (Startup Transformers 01 and 02, Bus-Tie Transformers, 345-kV Switchyard circuit breakers ACB34560, ACB34561, ACB34562, ACB34563, ACB34564, air break switch ABS34625, Relay House, and "J" and "K" Buses)	Yes	2.4.12
Station Blackout Diesel Generator Building (including Transformer X-3051 and radiator skid foundations)	Yes	2.4.9
Station Service Transformer Foundations	No	Provide support to the Station Service Transformers
Storage Tank Area	No	Houses the caustic, acid, neutralizing water, and sodium hypochlorite storage tanks
Storm Sewer Monitoring Building	No	Utilized to comply with environmental regulations
Substation 1, Substation 2, and Substation LM3 Foundations	No	Also known as the Outage Support Substation (Substation 1) and Service Building Transformer DF6 (Substation 2); support the substations
Technical Support Center	No	Located inside the Davis-Besse Administration Building

Table 2.2-3
License Renewal Scoping Results for Structures (continued)

Structure Name	In-Scope	Screening Results / Section
Training Building	No	Also known as the Training Center or Construction Office Building; houses the simulator room, administrative facilities, training facilities, and laboratories
Training Weld Shop	No	Also known as the Recharge System Water Treatment Building; houses training facilities for welders
Transformer Oil Collection Tank Vault	No	Below grade concrete structure with manhole access that provides for oil collection
Turbine Building	Yes	2.4.10
Warehouse No. 2	No	Provides storage of spare parts
Water Treatment Building	Yes	2.4.11
Wave Protection Dikes	Yes	2.4.12
Welcome Center	No	Utilized as a welcome center for the site
Wet Wash Facility	No	Contains decontamination equipment

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

The determination of mechanical systems within the scope of license renewal is made through the application of the process described in Section 2.1. The results of the mechanical systems plant-level scoping review are presented in Section 2.2.

Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements of 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section.

The screening results for mechanical systems consist of lists of components and component types that require aging management review (AMR). Brief descriptions of mechanical systems within the scope of license renewal are provided as background information. Mechanical system intended functions are described for in-scope systems.

The screening results are provided below in four sections:

- Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators (Section 2.3.1),
- Engineered Safety Features Systems (Section 2.3.2),
- Auxiliary Systems (Section 2.3.3), and
- Steam and Power Conversion Systems (Section 2.3.4).

Supports for all in-scope piping are evaluated as structural commodities in Section 2.4.13.

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2.3.1 REACTOR VESSEL, INTERNALS, REACTOR COOLANT SYSTEM AND REACTOR COOLANT PRESSURE BOUNDARY, AND STEAM GENERATORS

The following systems are addressed in this section:

- Reactor Pressure Vessel (Section 2.3.1.1)
- Reactor Vessel Internals (Section 2.3.1.2)
- Reactor Coolant System and Reactor Coolant Pressure Boundary (Section 2.3.1.3)
- Steam Generators (Section 2.3.1.4)

2.3.1.1 Reactor Pressure Vessel

System Description

The reactor pressure vessel was fabricated by Babcock & Wilcox. The reactor pressure vessel is a vertical, cylindrical pressure vessel of welded construction. The vessel was designed, fabricated, tested, and inspected as a Class A vessel in accordance with ASME Code, Section III, "Nuclear Vessels," 1968 Edition with Addenda through Summer 1968. Design of the reactor pressure vessel and its support system meets Seismic Category I equipment requirements.

The main subcomponents of the reactor pressure vessel are listed, and then discussed in order, below.

- Vessel Shell and Heads
- Nozzles and Safe Ends
- Control Rod Drive (CRD) Nozzles
- Incore Instrument Nozzles
- Reactor Vessel Internal Attachments
- Reactor Vessel Supports
- Reactor Vessel External Attachments
- Reactor Vessel Insulation
- Pressure Boundary Bolting

Vessel Shell and Heads

The reactor pressure vessel is made of a cylindrical shell, bottom head, and top head. The upper head and the upper shell each have a forged flange welded to them for vessel closure.

The reactor pressure vessel closure head (flange) is fastened to the reactor pressure vessel shell flange by threaded studs and nuts. The lower end of each stud is installed in a threaded hole in the vessel shell flange. A nut and washer are installed on the upper end of each stud. The vessel flanges are sealed with two concentric gaskets.

The upper shell assembly forms the top third of the reactor pressure vessel. It consists of the upper shell flange, which provides the seating surface for the vessel closure head, and a cylindrical section that contains the inlet, outlet, and core flood nozzles.

The upper shell flange is a clad low-alloy steel ring forging. The top horizontal flange surface contains a stainless steel clad mating surface with two concentric grooves for the two O-ring gaskets used to seal the closure head to the vessel. In addition, there are 60 threaded holes for the closure studs. At two locations a small leakage path was machined to come down from between the two concentric O-rings and exit the outer side of the flange. One location is a blind flange and the other location is used as the leakage monitoring path. This drain arrangement permits testing and monitoring for leakage past the inner O-ring seal. The inner surface of the flange contains a shelf from which the reactor pressure vessel internals are suspended. This shelf supports the weight of the reactor pressure vessel internals and the core. A seal ledge ring, which is used to support the seal plate, is welded on the outside of the vessel flange.

The shell assembly consists of the upper and lower shells, which are joined with a circumferential weld. The interior surface of the shell assembly is clad with austenitic stainless steel weld deposit. The core guide lugs are welded to the cladding along the bottom of the inner surface of the lower shell assembly. These lugs provide a passive restraint to prevent core drop.

The lower vessel head is of a semi-hemispherical shape; i.e., its radius of curvature is larger than the vessel radius. The lower vessel head is made from two pieces:

- the transition forging, a ring forging for the upper portion; and
- the bottom head, a formed plate for the center concave region.

A full penetration circumferential weld seam joins the two sections. The interior surface of the lower vessel head is clad with austenitic stainless steel weld deposit. The bottom head is a concave disc that is penetrated by the 52 incore instrument nozzles attached from the inside with partial penetration welds.

The closure head assembly consists of a clad low-alloy steel upper dome (similar to the bottom head) and a forged flange. The closure head flange is machined to accept 60 closure head studs, which are used to fasten the closure head to the reactor pressure vessel. The closure head contains 69 penetrations for the CRD nozzles (housings).

The lower horizontal flange surface has two concentric grooves to accommodate the O-rings and their fastening hardware. Three lifting lugs and the lower control rod drive mechanism (CRDM) service support skirt are welded to the top of the closure head.

<u>Nozzles and Safe Ends</u>

The reactor pressure vessel has eight nozzles: four inlet nozzles, two outlet nozzles, and two core flooding nozzles. Reactor coolant flows through the two outlet nozzles to the steam generators, and re-enters the reactor pressure vessel through the four inlet nozzles. Two smaller core flooding nozzles between the reactor coolant nozzles serve as inlets for decay heat cooling and emergency cooling water injection (core flooding and low-pressure injection engineered safety functions).

CRD Nozzles

The closure head contains 69 penetrations for the CRDM nozzles. The CRDMs are aligned and supported by the CRD nozzles. CRDMs are attached to 61 of these nozzles. One of the remaining nozzles is used for a continuous vent line back to the inlet plenum of Steam Generator 2 and the remaining seven unused nozzles have blind flanges attached. Of those seven, four have small vent orifices and bellows (vent) valves attached.

The CRDM service structure provides an air flow cooling path for the CRDMs, supports accessory equipment required for the CRDMs and limits horizontal motion of the CRDMs. The service structure is permanently attached to the closure head. The upper platform of the service structure provides a work area for servicing the CRDMs and supports the electrical cables and component cooling water piping required by the CRDMs. The service structure is seismic Category I to the extent required to support the Control Rod Drive Mechanisms. The purpose of this requirement is to ensure the CRDM housings are sufficiently restrained in the lateral direction so that trip of the control rods is possible after an earthquake.

Incore Instrument Nozzles

The bottom head of the vessel is penetrated by 52 incore instrument nozzles. The incore instrument nozzles are joined by field-welds to pipes that terminate in bolted sealing flanges located in a shielded area at a higher elevation in the containment vessel.

Reactor Vessel Internal Attachments

The only reactor pressure vessel interior attachments at Davis-Besse are the core guide lugs. Twelve core guide lugs are welded at equal distances around the bottom inside surface of the lower shell course. The guide lugs provide a secondary core support by limiting the downward displacement of the core and core support structure in the event of failure of a core support component.

Reactor Vessel Supports

The reactor pressure vessel is supported by four pads which are integrally forged on the reactor coolant inlet nozzles. Each support pad bears on a support shoe which rests on the vessel support structure. The support shoe is a structural member that transmits the support loads to the supporting structure, the primary shield. The supports restrain seismic and dead weight lateral, vertical and rotational movement of the reactor pressure vessel and still allow thermal growth by permitting radial sliding at each support.

Reactor Vessel External Attachments

There are multiple external attachments to the reactor pressure vessel, including the top head lifting lugs, insulation support pads, vessel handling lugs, and the CRDM support skirt.

Reactor Vessel Insulation

Metal reflective insulation is used on the exterior of the reactor pressure vessel from the closure flange down to and including the exterior of the bottom head dome. Removable metal reflective insulation panels enclose the top head closure flange and studs. Metal reflective insulation is used on the closure head dome.

Pressure Boundary Bolting

The bolting materials and bolted closures within the scope of this report include the closure stud assemblies that secure the closure head to the vessel flange and the CRD nozzle nut ring assemblies used with CRD flange bolts to secure the CRDMs, continuous vent header, or vented and un-vented blanking flanges to the CRD nozzles.

Reason for Scope Determination

The reactor pressure vessel performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Forms a barrier against the release of reactor coolant and radioactive material to the environment (maintains reactor coolant pressure boundary integrity)
- Provides support for the core and attached reactor coolant system piping, and maintain core in coolable configuration under all operating conditions
- Provides shielding to attenuate radiation generated in the core
- Controls primary coolant distribution to the core as required for design heat removal capability
- Provides support and alignment for control rod drive mechanisms, control rods, and incore detectors

There are no nonsafety-related (NSR) components within the reactor pressure vessel. Therefore, the reactor pressure vessel does not satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The reactor pressure vessel contains components relied upon in safety analyses or plant evaluations to form a barrier against the release of reactor coolant and radioactive material to the environment (reactor pressure vessel beltline materials only), which satisfies the scoping criteria of pressurized thermal shock (10 CFR 50.61), as specified in 10 CFR 54.4(a)(3).

USAR References

Updated Final Safety Analysis Report (USAR) Section 5.4.2 describes the reactor pressure vessel.

License Renewal Drawings

There are no license renewal drawings that depict the evaluation boundaries for the reactor pressure vessel components within the scope of license renewal. As the reactor pressure vessel is a single component, there is no piping and instrumentation diagram (P&ID) that displays the subcomponents in sufficient detail to highlight them for scoping boundaries.

Components Subject to AMR

Table 2.3.1-1 lists the component types that are subject to AMR and their intended functions.

Table 3.1.2-1, Aging Management Review Results – Reactor Pressure Vessel, provides the results of the AMR.

The reactor pressure vessel insulation, CRDM service structure, and vessel support assembly are not required for reactor pressure vessel functions and are evaluated as structural components in Section 2.4.1.

The reactor pressure vessel flange leak detection piping is evaluated in Section 2.3.1.3.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components of the reactor pressure vessel are in the scope of license renewal, but are not subject to AMR:

- O-rings and gaskets
- Top Head Lifting Lugs
- Vessel Insulation Support Pads
- Vessel Handling Lugs

The internal attachments provide support to their respective components and all of the internal attachments are subject to AMR. External attachments are subject to AMR if they are load bearing attachments connected to pressure retaining portions of the vessel. The lifting lugs, insulation support pads, and vessel handling lugs do not bear significant weight during power operation and are not subject to AMR. In addition, o-rings and gaskets are not designed for the life of the plant and are periodically replaced.

Table 2.3.1-1
Reactor Pressure Vessel
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bottom Head	Pressure boundary
Closure Studs, Nuts, and Washers	Pressure boundary
Core Flooding Nozzle Safe Ends	Pressure boundary
Core Flooding Nozzles	Pressure boundary
Core Guide Lugs	Support
CRD Bolts	Pressure boundary
CRD Flanges	Pressure boundary
CRD Nut Rings	Pressure boundary
CRD Nozzles	Pressure boundary
Incore Instrument Nozzles	Pressure boundary
Inlet Nozzles	Pressure boundary
Outlet Nozzles	Pressure boundary
Shell (Beltline Plates)	Pressure boundary
Shell (Beltline Welds)	Pressure boundary
Shell (Closure Flange)	Pressure boundary
Shell (Shell Rings)	Pressure boundary
Upper Head (Closure Flange)	Pressure boundary
Upper Head (Dome)	Pressure boundary

2.3.1.2 Reactor Vessel Internals

System Description

Reactor internal components include the core support assembly and the plenum assembly. The core support assembly includes the core barrel assembly, core support shield assembly, flow distributor assembly, incore instrument guide tube assemblies, thermal shield assembly, lower grid assembly, surveillance specimen holder tubes, and vent valve assemblies. The plenum assembly includes the control rod guide tube assemblies, the plenum cover assembly, the plenum cylinder assembly, and the upper grid assembly. A general assembly drawing of the important reactor internal components is shown in USAR Figure 4.2-4.

The reactor internals are designed to support the core, to maintain fuel assembly alignment, to limit fuel assembly movement, and to maintain control rod assembly guide tube alignment between fuel assemblies and control rod drives. They also direct the flow of reactor coolant, provide gamma and neutron shielding, provide guides for incore instrumentation between the reactor pressure vessel lower head and the fuel assemblies, support the surveillance specimen assemblies in the annulus between the thermal shield and the reactor pressure vessel wall, and support the internal vent valves. These vent valves provide an emergency steam release path from the upper plenum region above the core to the upper downcomer region in the event of a cold leg break. All reactor internal components can be removed from the reactor pressure vessel to allow inspection of the internals and the reactor pressure vessel internal surface.

Reason for Scope Determination

The reactor vessel internals perform the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide support for the core and maintain core in coolable configuration under all operating conditions
- Provide shielding to attenuate radiation generated in the core
- Control primary coolant distribution to the core as required for design heat removal capability
- Provide support and alignment for control rod drive mechanisms, control rods, and incore detectors

There are no NSR components within the Reactor Vessel Internals. Therefore, the Reactor Vessel Internals do not satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The reactor vessel internals are not relied upon to demonstrate compliance with, nor satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated event.

USAR References

USAR Section 4.2.2 describes the reactor vessel internals.

License Renewal Drawings

There are no license renewal drawings that depict the evaluation boundaries for the reactor vessel internals components within the scope of license renewal because there is no piping and instrumentation diagram (P&ID) that displays the subcomponents in sufficient detail to highlight them for scoping boundaries.

Components Subject to AMR

Table 2.3.1-2 lists the component types that are subject to AMR and their intended functions.

Table 3.1.2-2, Aging Management Review Results – Reactor Vessel Internals, provides the results of the AMR.

The surveillance specimen holder tube assemblies do not provide any safety function. Consequently this component does not perform an intended function and is not subject to AMR.

The fuel assemblies and control rod assemblies, and incore neutron detectors are not subject to AMR as they are short-lived components whose lifetime will not be affected by the period of extended operation.

Table 2.3.1-2
Reactor Vessel Internals
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Core Support Assembly	
Core Support Shield Assembly	Support
Core Barrel Assembly	Support
Lower Grid Assembly	Support
Flow Distributor Assembly	Flow control Support
Thermal Shield Assembly	Shielding Support
Incore Guide Tube Assembly	Support
Vent Valve Assembly	Support
Plenum Assembly	
Cover Assembly	Support
Control Rod Guide Tube Assembly	Support
Cylinder Assembly	Support
Upper Grid Assembly	Support

2.3.1.3 Reactor Coolant System and Reactor Coolant Pressure Boundary

System Description

The Reactor Coolant System (RCS) consists of the reactor pressure vessel, two vertical once-through steam generators, four shaft-sealed reactor coolant pumps, an electrically heated pressurizer, and interconnecting piping. The system, located entirely within the Containment Vessel (with the exception of the pressurizer sampling line, which extends into the Auxiliary Building), is arranged in two heat transport loops, each with two reactor coolant pumps and one steam generator. Reactor coolant is transported through piping connecting the reactor pressure vessel to the steam generators and flows downward through the steam generator tubes transferring heat to the steam and water on the shell side of the steam generator. In each loop the reactor coolant is returned to the reactor through two lines, each containing a reactor coolant (RC) pump. In addition to serving as a heat transport medium, the coolant also serves as a neutron moderator and reflector and as a solvent for the soluble poison (boron in the form of boric acid) utilized in chemical shim reactivity control. The reactor pressure vessel is discussed in detail in Section 2.3.1.1. The reactor pressure vessel internals are discussed in detail in Section 2.3.1.2.

In addition to the RCS, the Reactor Coolant Pressure Boundary (RCPB) includes the class 1 (Code Group A) portions of the Core Flooding System, Decay Heat Removal and Low Pressure Injection System, High Pressure Injection (HPI) System, Makeup and Purification (MU) System, Nitrogen (NN) System, and Sampling System. Also included are the reactor pressure vessel flange leak detection piping and the Incore Monitoring System piping. The non-Class 1 in-scope portions of the listed systems are discussed in Sections 2.3.2 and 2.3.3.

Reason for Scope Determination

The RCS performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Transfer heat from the reactor core to the steam generators during steady-state operation and for any design transient without exceeding core thermal limits
- Transfer heat from the reactor core to containment during a loss of steam generator cooling with high system pressure utilizing makeup/high pressure injection core cooling
- Remove decay heat from the core via redundant components and features using controls from inside or outside the control room
- Provide containment isolation
- Form a barrier against the release of reactor coolant and radioactive material to the environment (maintains RCPB integrity) – includes portions of other systems

- Provide natural circulation cooldown from normal operating temperature and pressure to conditions that permit operation of the Decay Heat Removal and Low Pressure Injection System

The RCS does not contain any NSR components that are identified in the current licensing basis (CLB) as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The RCS does, however, contain NSR components that are attached to or located near safety-related systems, structures and components (SSCs), whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the RCS satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The RCS is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49) and Station Blackout (10 CFR 50.63) regulated events.

USAR References

USAR Section 5.1 describes the RCS and the RCPB.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M030A, LR-M030B, LR-M031A, LR-M033A, LR-M033B, LR-M040A, LR-M040D, LR-M042C

Components Subject to AMR

Table 2.3.1-3 lists the component types that are subject to AMR and their intended functions.

Table 3.1.2-3, Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The pressurizer immersion heaters accomplish their intended function through a change of configuration and therefore are considered active components that are not subject to AMR.

- Pump seals, bearings and motors – The seals, bearings and motors for the RC pumps include the mechanical seals and bearings in the flow-path of the cooling and seal water. These seals and bearings, and the motors, perform their function with moving parts and are, therefore, also excluded in 10 CFR 54.21(a)(1)(i). As such, the pump seals, bearings, and motors (including the lubricating oil subcomponents and the motor enclosure air cooler) are not subject to AMR.

Table 2.3.1-3
Reactor Coolant System and Reactor Coolant Pressure Boundary Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
CRDM Motor Tube Assembly	Pressure boundary
Drain Pan	Pressure boundary
Flexible Connection	Pressure boundary
Flow Element	Pressure boundary Throttling
Orifice < 4 inches	Pressure boundary Throttling
Piping	Pressure boundary
Piping – Cold Leg and Hot Leg	Pressure boundary
Piping – Dissimilar Metal Weld (DMW)	Pressure boundary
Piping < 4 inches	Pressure boundary Structural integrity
Piping < 4 inches – RV flange leakage	Pressure boundary
Piping < 4 inches – Incore Monitoring	Pressure boundary
Piping >= 4 inches	Pressure boundary
Pressurizer Heater Belt Forgings	Pressure boundary
Pressurizer Heater Bundle Assembly	Pressure boundary
Pressurizer Heater Bundle Cover Plate	Pressure boundary
Pressurizer Manway Cover	Pressure boundary
Pressurizer Manway Forging	Pressure boundary
Pressurizer Manway Insert	Pressure boundary
Pressurizer Relief Nozzle Safe End	Pressure boundary
Pressurizer Relief, Spray, and Surge Nozzle	Pressure boundary
Pressurizer Relief, Spray, and Surge Nozzle Weld	Pressure boundary
Pressurizer Shell and Heads	Pressure boundary
Pressurizer Spray Nozzle Safe End	Pressure boundary

**Table 2.3.1-3 (Continued)
Reactor Coolant System and Reactor Coolant Pressure Boundary
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Pressurizer Spray Nozzle Weld	Pressure boundary
Pressurizer Support Plate Assembly	Support
Pressurizer Surge and Spray Nozzle Thermal Sleeve	Pressure boundary
Pressurizer Surge Nozzle Safe End	Pressure boundary
Pressurizer Surge Nozzle Weld	Pressure boundary
Pressurizer Vent, Sampling, Level Sensing, and Thermowell Nozzle and Weld	Pressure boundary
RC Pump Case and Cover	Pressure boundary
RC Pump Driver Mount	Pressure boundary
RC Pump Seal Cooling Heat Exchanger Tube (Inner)	Heat transfer Pressure boundary
RC Pump Seal Cooling Heat Exchanger Tube (Outer)	Heat transfer Pressure boundary
Tank (DB-T156-1 and DB-T156-2)	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary
Valve Body < 4 inches	Pressure boundary Structural integrity
Valve Body >= 4 inches	Pressure boundary

2.3.1.4 Steam Generators

System Description

The steam generator is a vertical, straight-tube-and-shell heat exchanger that produces superheated steam at approximately a constant pressure over the power range. Reactor coolant water enters the steam generator at the upper primary head, flows down the Inconel tubes while transferring heat to the secondary shell-side fluid, and leaves through the lower primary head. Steam is generated on the shell side.

The high-pressure parts of the unit are the hemispherical heads, the tubesheets, and the straight Inconel tubes between the tubesheets. The reactor coolant side has access ports (manways and inspection openings), and a drain nozzle for the bottom head. The reactor coolant side of the unit is vented by a vent connection on the reactor coolant inlet pipe to each unit.

The shell, the outside of the tubes, and the tubesheets form the boundaries of the steam-producing section of the vessel. Within the shell, the tube bundle is surrounded by a baffle (shroud) which separates the feedwater inlet (lower annulus between the shell and the baffle) and steam outlet (upper annulus between the shell and the baffle) from the boiling (tube) region. Tube supports hold the tubes in a uniform pattern along their length. Vents, drains, instrumentation nozzles, and access ports (manways, handholes, and inspection openings) are provided on the shell side of the unit.

Reactor coolant enters the steam generator through a nozzle in the upper head, flows down inside the tubes, and exits through two outlet nozzles in the lower head and flows to the reactor coolant pumps and back to the reactor. The main feedwater (MFW) enters each steam generator through a divided circular header and 32 feedwater nozzles. The feedwater nozzles spray the water down into an annulus between the shell and the baffle (shroud). During upset or emergency conditions, feedwater may be added through auxiliary feedwater (AFW) nozzles which are located high in the steam generator and discharge directly into the tube bundle.

The unit is supported by a skirt attached to the bottom head which rests on a sliding support and provides the required freedom of movement to accommodate thermal expansion of the RCS.

There are several external attachments to the shell. The external attachments include shell thermocouples, grounding plates, and main feedwater header support plates and gussets.

Tube repair hardware includes multiple types of plugs, sleeves, and stabilizers.

Reason for Scope Determination

The steam generators perform the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide a pressure boundary between the reactor coolant and the secondary side fluid to confine fission products and activation products within the RCS
- Provide normal and auxiliary feedwater flow paths and heat transfer capability for both normal and emergency cooldown
- Provide containment integrity by maintaining the steam generator tube and tubesheet integrity whenever containment integrity is required in all modes

The steam generators do not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The steam generators do, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the steam generators satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The steam generators are relied upon to demonstrate compliance with, and satisfy the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 5.5.2 describes the steam generators.

License Renewal Drawings

There are no license renewal drawings that depict the evaluation boundaries for the steam generator components within the scope of license renewal. There is no piping and instrumentation diagram (P&ID) that displays the subcomponents in sufficient detail to highlight them for scoping boundaries.

Components Subject to AMR

Table 2.3.1-4 lists the component types that are subject to AMR and their intended functions.

Table 3.1.2-4, Aging Management Review Results – Steam Generators, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- Orifice plate – controls the differential pressure between the feedwater and the boiling region, adjusting the “level” in the once through steam generator (OTSG) during operation.
- Baffle (shroud) inspection opening cover assemblies – these prevent steam/feedwater bypass during operation but perform no license renewal function.
- External attachments – The shell thermocouples and grounding plates do not support the OTSG intended functions. Therefore, they are not subject to AMR.
- Stabilizers – Tube stabilizers are not part of the primary pressure boundary and do not support the OTSG intended functions. Therefore, they are not subject to AMR.

Table 2.3.1-4
Steam Generators
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary
Primary Side; Drain Nozzle	Pressure boundary
Primary Side; Manway and Inspection Opening Cover and Backing Plate	Pressure boundary
Primary Side; Nozzle Dam Retaining Ring	Support
Primary Side; Tube and Sleeve	Heat transfer Pressure boundary
Primary Side; Tube Plug	Pressure boundary
Primary Side; Upper and Lower Head, Inlet and Outlet Nozzle	Pressure boundary
Primary Side; Upper and Lower Tubesheet	Pressure boundary
Secondary Side; AFW Header, Riser, Weldneck, and Blind Flange	Pressure boundary
Secondary Side; AFW Thermal Sleeve, AFW Header Transition Section	Pressure boundary
Secondary Side; Baffle (Shroud), Closure Ring, Support Ring, and Base Ring	Support
Secondary Side; Manway and Handhole Cover	Pressure boundary
Secondary Side; MFW Header Support Plate and Gusset	Support
Secondary Side; MFW Header	Pressure boundary
Secondary Side; MFW Spray Head	Pressure boundary
Secondary Side; Nozzle	Pressure boundary
Secondary Side; Pipe Cap	Pressure boundary
Secondary Side; Shell	Pressure boundary
Secondary Side; Tube Support Plate	Support
Secondary Side; Tube Support Rod and Spacer	Support
Support Skirt	Support

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2.3.2 ENGINEERED SAFETY FEATURES SYSTEMS

The following systems are addressed in this section.

- Containment Air Cooling and Recirculation System (Section 2.3.2.1)
- Containment Spray System (Section 2.3.2.2)
- Core Flooding System (Section 2.3.2.3)
- Decay Heat Removal and Low Pressure Injection System (Section 2.3.2.4)
- High Pressure Injection System (Section 2.3.2.5)

2.3.2.1 Containment Air Cooling and Recirculation System

System Description

The Containment Air Cooling and Recirculation System is composed of the Containment Air Cooling System and the Containment Recirculation System.

The Containment Air Cooling System is composed of three air coolers units located within the Containment Vessel. Two of the three units are used for both normal and emergency cooling. The system is designed to control the Containment Vessel ambient air temperature to a maximum of 120°F with two of the three units operating.

The Containment Air Cooling System is composed of three parallel trains, each with an air cooler unit, ductwork, and backdraft dampers, discharging to a common distribution system. The system is used for both normal and emergency cooling. Each air cooler unit consists of a finned tube cooling coil and a direct drive two speed fan. The Containment Air Cooling System provides cooling by recirculation of the Containment Vessel air across air-to-water heat exchangers. The containment air cooler fans pull the air through the cooling coils where heat is transferred from the air to the cooling water (supplied by the Service Water System) in the tubes.

The Containment Recirculation System consists of two trains, each with a direct drive, vane axial fan, ductwork, and dampers. The fans circulate the air in the Containment Dome to the vicinity of the Containment Air Cooling System inlets. This action helps prevent temperature stratification in Containment.

Reason for Scope Determination

The Containment Air Cooling and Recirculation System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Maintain post-accident containment temperature and pressure within the design limits
- Remove heat from the containment atmosphere to reduce pressure (post-LOCA (loss-of-coolant accident) and following main steam line break in containment)
- Mix the post-LOCA containment atmosphere to prevent the formation of hydrogen pockets

The Containment Air Cooling and Recirculation System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Containment Air Cooling and Recirculation System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the

Containment Air Cooling and Recirculation System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Containment Air Cooling and Recirculation System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49) regulated events.

USAR References

USAR Section 6.2.2.2.1 describes the Containment Air Cooling and Recirculation System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M029E

Components Subject to AMR

Table 2.3.2-1 lists the component types that are subject to AMR and their intended functions.

Table 3.2.2-1, Aging Management Review Results – Containment Air Cooling and Recirculation System, provides the results of the AMR.

Table 2.3.2-1
Containment Air Cooling and Recirculation System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary
Damper Housing	Pressure boundary
Drain Pan	Structural integrity
Duct	Pressure boundary
Fan Housing – Containment air cooler fans (DB-C1-1, -2 & -3)	Pressure boundary
Flexible Connection	Pressure boundary
Heat Exchanger (cooling coil casing) – Containment air cooling coils (DB-E37-1, -2 & -3)	Pressure boundary
Heat Exchanger (cooling coil fins) – Containment air cooling coils (DB-E37-1, -2, & -3)	Heat transfer
Heat Exchanger (cooling coil tubes) – Containment air cooling coils (DB-E37-1, 2, & 3)	Heat transfer Pressure boundary
Piping	Pressure boundary
Register	Pressure boundary
Valve Body	Pressure boundary

2.3.2.2 Containment Spray System

System Description

The Containment Spray System is an engineered safety feature which has the dual function of removing heat and fission product iodine from the post-accident containment atmosphere.

The system consists of two redundant, independent trains. Each train consists of a containment spray pump, a containment isolation valve that also serves as a throttle valve, piping, instrumentation, and a containment spray ring header with 90 spray nozzles. Each containment spray pump is provided with two suction paths, one from the borated water storage tank (BWST) and the other from the containment emergency sump. One train of containment spray, operating in conjunction with one containment air cooler, is designed to remove the total post- LOCA heat release to the containment.

High containment vessel pressure or low reactor coolant pressure will actuate a Level 2 trip to open the spray isolation valves. High-high containment pressure will actuate a Level 4 trip to start the two containment spray pumps. The pumps take suction initially from the BWST. The Containment Spray System shares the BWST and the suction lines from the tank with the High Pressure Injection System and the Low Pressure Injection System. After the water in the BWST reaches a low level, the suction for the spray pumps is transferred to the containment vessel emergency sump. Baskets of Na_3PO_4 are available in containment so that when sump flooding occurs, neutralization of the sump water will result.

Reason for Scope Determination

The Containment Spray System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Cool and condense the post-LOCA containment atmosphere to reduce the pressure and, as a result, minimize the leakage of airborne and gaseous radioactivity from the containment
- Mix the containment atmosphere to prevent the stratification of hydrogen, which could produce areas of high local concentration
- Maintain containment design temperature and pressure limits following a LOCA
- Reduce elemental and particulate fission product iodine in the containment atmosphere such that offsite radiation exposures post-LOCA are within the guidelines of 10 CFR 100
- Provide containment isolation

The Containment Spray System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Containment Spray System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Containment Spray System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Containment Spray System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 6.2.2.2.2 describes the Containment Spray System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M034

Components Subject to AMR

Table 2.3.2-2 lists the component types that are subject to AMR and their intended functions.

Table 3.2.2-2, Aging Management Review Results – Containment Spray System, provides the results of the AMR.

Table 2.3.2-2
Containment Spray System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Orifice	Pressure boundary Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – Containment spray pumps (DB-P56-1 & 2)	Pressure boundary
Separator	Pressure boundary
Spray Nozzle	Spray
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.2.3 Core Flooding System

System Description

The Core Flooding System is a fluid system designed to store borated water for pressure injection into the reactor pressure vessel in the event of an accident which lowers the RCS below the pressure maintained in the two core flooding tanks. The Core Flooding System is divided into two injection trains. Each train has a separate core flooding tank which discharges to separate reactor core flooding nozzles. This allows one core flooding tank to inject into the reactor pressure vessel during a core flooding tank discharge line break. Each train is self-contained and self-actuated. This allows the system to perform its emergency core cooling system (ECCS) function without relying on any auxiliary system or electrical power sources.

Reason for Scope Determination

The Core Flooding System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Supply water to the reactor when RCS pressure falls below core flood tank pressure following a LOCA
- Provide containment isolation
- Maintain RCS pressure boundary integrity
- Isolate core flood tanks when cooling down before going below 700 psig

The Core Flooding System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Core Flooding System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Core Flooding System satisfies the scoping criteria 10 CFR 54.4(a)(2).

The Core Flooding System is also relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49) regulated events.

USAR References

USAR Section 6.3.1 describes the Core Flooding System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M033A, LR-M033B, LR-M034, LR-M040A, LR-M042C

Components Subject to AMR

Table 2.3.2-3 lists the component types that are subject to AMR and their intended functions.

Table 3.2.2-3, Aging Management Review Results – Core Flooding System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- Air operators and associated components – Core flood tank fill and pressurization isolation valves (DB-CF1541 and DB-CF1544), pneumatic vent to waste gas isolation (DB-CF1542), and core flood tank bleed line isolation valve (DB-CF1545) are air-operated valves. As shown on LR-M034, these valves are normally closed and fail closed. Therefore, these valves are fail-safe on loss of the control air supply. Additionally, the solenoid valves that supply the control air to the operators, which are themselves active components, fail open to vent the control air lines. As such, a pressure boundary failure of any component within the control air supply will result in the isolation valves going to their safe positions, and the system will perform its intended function. Therefore, the air operators and associated components are not subject to AMR.

Table 2.3.2-3
Core Flooding System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure boundary Structural integrity
Nozzle – Core flood tanks (DB-T9-1 & 2)	Pressure boundary
Orifice	Structural integrity
Piping	Pressure boundary Structural integrity
Tank – Core flood tanks (DB-T9-1 & 2)	Pressure boundary
Tubing	Pressure boundary
Valve Body	Pressure boundary Structural integrity

2.3.2.4 Decay Heat Removal and Low Pressure Injection System

System Description

The Decay Heat Removal and Low Pressure Injection (DHR) System provides both normal operating and emergency operating functions. The system, operating in the decay heat removal mode, removes decay heat from the core and sensible heat from the RCS during the later stages of cooldown. The system also provides auxiliary spray to the pressurizer for complete depressurization, maintains the reactor coolant temperature during refueling, and provides a means for filling and partial draining of the refueling canal. In the event of a LOCA, the system injects borated water into the reactor pressure vessel for long-term emergency cooling.

During the injection phase following a LOCA, the Decay Heat Removal and Low Pressure Injection System, operating in the low-pressure injection mode, in conjunction with the High Pressure Injection System, will operate to provide full protection over the entire spectrum of break sizes. As the postulated break size is increased, the RCS pressure will tend to decrease to lower levels because the break can pass all of' the steam that is generated in the core. At the lower RCS pressures, the Decay Heat Removal and Low Pressure Injection System, along with the Core Flooding System and the High Pressure Injection System, will inject borated water into the core to ensure adequate core cooling.

During the recirculation phase, the Decay Heat Removal and Low Pressure Injection System, operating in the low-pressure injection mode, will recirculate the spilled reactor coolant and injection water from the containment emergency sump to the reactor pressure vessel through the core flooding lines or the high pressure injection line, if required, to maintain long-term core cooling and through the DHR drop line or auxiliary pressurizer spray line via the high pressure injection pump for post-LOCA boron precipitation management.

For small breaks, the RCS pressure may be higher than the maximum DHR pump head at the time of containment emergency sump recirculation. Under these circumstances a crossover connection permits alignment of the high pressure injection pumps to take suction from the outlet of the DHR coolers to provide for recirculation to the reactor core.

Reason for Scope Determination

The Decay Heat Removal and Low Pressure Injection System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide controlled cooldown of the reactor vessel and core during the latter stages of plant cooldown, and maintain coolant temperature during shutdown and refueling operations

- Provide post-LOCA emergency core cooling: low pressure injection from the BWST (during injection phase) or from the containment emergency sump (during recirculation phase)
- Provide containment isolation
- Provide a pressurized water supply from the containment emergency sump to the suction of the high pressure injection pumps during piggyback mode of operation
- Provide containment heat removal by cooling the water in the containment emergency sump used for containment spray
- Provide an alternate minimum flow path for high pressure injection after isolating the BWST prior to establishing recirculation from the containment emergency sump during a small-break LOCA
- Control reactivity and boron concentration in the RCS and prevent post-LOCA boron precipitation
- Provide low-temperature over-pressure protection of the RCS
- Provide means to sample the containment emergency sump fluid during the sump mode of ECCS operation
- Provide RCS pressure boundary integrity

The Decay Heat Removal and Low Pressure Injection System also recirculates back into the RCS any coolant that may have entered the refueling canal following a LOCA. This system-intended function is performed by NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Decay Heat Removal and Low Pressure Injection System also contains NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Decay Heat Removal and Low Pressure Injection System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Decay Heat Removal and Low Pressure Injection System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49) regulated events.

USAR References

USAR Section 9.3.5 describes the Decay Heat Removal and Low Pressure Injection System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M033A, LR-M033B, LR-M033C, LR-M034, LR-M035, LR-M036B, LR-M042C

Components Subject to AMR

Table 2.3.2-4 lists the component types that are subject to AMR and their intended functions.

Table 3.2.2-4, Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but are not subject to AMR:

- Air operators and associated components – DHR cooler outlet and bypass flow control valves (DH14A/B and DH13A/B, respectively) are air-operated valves. As shown on LR-M033B and LR-M033C, the outlet flow control valves are locked open and fail open, and the bypass flow control valves are normally closed and fail closed. Therefore, these valves are fail-safe on loss of the control air supply.

  Additionally, the solenoid valves that supply the control air to the air operators, which are themselves active components, fail open to vent the control air lines. As such, a pressure boundary failure of any component within the control air supply will result in the flow control valves going to their safe positions, and the system will perform its intended function. Therefore, the air operators and associated control air supply components are not subject to AMR.

Table 2.3.2-4
Decay Heat Removal and Low Pressure Injection System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Heat Exchanger (channel, shell) – BWST heater (DB-E34)	Structural integrity
Heat Exchanger (channel, shell, tubesheet) – DHR cooler (DB-E27-1 & 2)	Pressure boundary
Heat Exchanger (housing) – DHR pump bearing oil cooler (DB-P42-1 & 2)	Heat transfer Pressure boundary
Heat Exchanger (tube) – DHR cooler (DB-E27-1 & 2)	Heat transfer Pressure boundary
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – Borated water recirculation pump (DB-P57_BW)	Structural integrity
Pump Casing – DHR pump (DB-P42-1 & 2)	Pressure boundary
Pump Casing – Refueling canal drain pump (DB-P204)	Pressure boundary
Separator	Pressure boundary
Tank – BWST (DB-T10)	Pressure boundary
Tank – Incore instrument tank (DB-T92)	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.2.5 High Pressure Injection System

System Description

The High Pressure Injection System provides an emergency function as a part of the ECCS. The ECCS provides core cooling following a break or transient in the RCS or secondary system of sufficient magnitude to result in a Safety Features Actuation System (SFAS) signal which actuates the ECCS. The SFAS will actuate the High Pressure Injection System upon detection of low RCS pressure or high containment pressure. The High Pressure Injection System uses high pressure injection pumps to pump borated water from the BWST into the RCS cold leg piping near the reactor inlet nozzles. The high pressure injection pumps are capable of injecting BWST water into the RCS over the RCS pressure range of approximately 1600 psig to 0 psig with an injection rate of 900 gallons per minute for one high pressure injection pump at 0 psig RCS pressure.

Reason for Scope Determination

The High Pressure Injection System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide emergency core cooling for small-break LOCA
- Provide borated water for reactor coolant makeup and to decrease reactivity
- Provide makeup for reactor coolant contraction due to excessive cooling of the RCS
- Provide containment isolation
- Maintain RCS pressure boundary integrity
- Maintain boric acid concentration below its solubility limit during post-accident cooling by supplying water for dilution flow to the pressurizer auxiliary spray line (piggyback operation).

The High Pressure Injection System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The High Pressure Injection System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the High Pressure Injection System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The High Pressure Injection System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49) regulated events.

USAR References

USAR Section 6.3.1 describes the High Pressure Injection System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M031C, LR-M033A, LR-M033B, LR-M036B

Components Subject to AMR

Table 2.3.2-5 lists the component types that are subject to AMR and their intended functions.

Table 3.2.2-5, Aging Management Review Results – High Pressure Injection System, provides the results of the AMR.

The ASME Class 1 portions of the High Pressure Injection System are addressed with the other RCPB systems and system portions in Section 2.3.1.3.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- High pressure injection pump lubrication oil system filter media are replaced periodically as the media becomes fouled (or the oil is changed). High pressure injection pump lubrication oil system filter media are therefore short-lived components and not subject to AMR.

Table 2.3.2-5
High Pressure Injection System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Filter Housing	Pressure boundary
Flow Element	Pressure boundary
Heat Exchanger (bonnet, shell, tubesheet) – HPI pump lube oil heat exchangers (DB-E198-1 & 2)	Pressure boundary
Heat Exchanger (tube) – HPI pump lube oil heat exchangers (DB-E198-1 & 2)	Heat transfer Pressure boundary
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – HPI pumps (DB-P58-1 & DB-P58-2)	Pressure boundary
Pump Casing – HPI pump AC lube oil pumps (DB-P197-1 & DB-P198-1)	Pressure boundary
Pump Casing – HPI pump DC lube oil pumps (DB-P197-2 & DB-P198-2)	Pressure boundary
Separator	Pressure boundary
Tank – HPI pump lube oil head tanks (DB-T198-1 & DB-T198-2)	Pressure boundary
Tank – HPI pump lube oil reservoirs (DB-T199-1 & DB-T199-2)	Pressure boundary
Thrust Bearing Housing	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

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2.3.3 AUXILIARY SYSTEMS

The following systems are addressed in this section:

- Auxiliary Building Heating, Ventilation, and Air Conditioning (HVAC) Systems (Section 2.3.3.1)
- Auxiliary Building Chilled Water System (Section 2.3.3.2)
- Auxiliary Steam and Station Heating System (Section 2.3.3.3)
- Boron Recovery System (Section 2.3.3.4)
- Chemical Addition System (Section 2.3.3.5)
- Circulating Water System (Section 2.3.3.6)
- Component Cooling Water System (Section 2.3.3.7)
- Containment Hydrogen Control System (Section 2.3.3.8)
- Containment Purge System (Section 2.3.3.9)
- Containment Vacuum Relief System (Section 2.3.3.10)
- Demineralized Water Storage System (Section 2.3.3.11)
- Emergency Diesel Generators System (Section 2.3.3.12)
- Emergency Ventilation System (Section 2.3.3.13)
- Fire Protection System (Section 2.3.3.14)
- Fuel Oil System (Section 2.3.3.15)
- Gaseous Radwaste System (Section 2.3.3.16)
- Instrument Air System (Section 2.3.3.17)
- Makeup and Purification System (Section 2.3.3.18)
- Makeup Water Treatment System (Section 2.3.3.19)
- Miscellaneous Building HVAC System (Section 2.3.3.20)
- Miscellaneous Liquid Radwaste System (Section 2.3.3.21)
- Nitrogen Gas System (Section 2.3.3.22)
- Process and Area Radiation Monitoring System (Section 2.3.3.23)
- Reactor Coolant Vent and Drain System (Section 2.3.3.24)
- Sampling System (Section 2.3.3.25)
- Service Water System (Section 2.3.3.26)

- Spent Fuel Pool Cooling and Cleanup System (Section 2.3.3.27)
- Spent Resin Transfer System (Section 2.3.3.28)
- Station Air System (Section 2.3.3.29)
- Station Blackout Diesel Generator System (Section 2.3.3.30)
- Station Plumbing, Drains, and Sumps System (Section 2.3.3.31)
- Turbine Plant Cooling Water System (Section 2.3.3.32)

2.3.3.1 Auxiliary Building HVAC Systems

System Description

The Auxiliary Building HVAC Systems consist of the Control Room HVAC, Fuel-handling Area Heating and Ventilation (H&V) (Fuel-handling Area Ventilation), Non-radioactive Areas H&V (Nonradwaste Area Ventilation, Turbine Building Ventilation – for Rooms 237, 238), and Radioactive Areas H&V (Radwaste Area Ventilation). Each of the subsystems is discussed below.

Control Room HVAC – The heating, ventilating, and air conditioning systems for the control room are designed to provide a suitable environment for equipment and station operator comfort and safety.

The Control Room Normal Ventilation System consists of redundant air-handling units with heating and cooling coils. Each air-handling unit has a prefilter, final filter, hot water preheat coil, and a cooling coil. One unit will be operating with the other unit available for manual actuation in the event of failure of the operating unit.

The Control Room Emergency Ventilation System (CREVS), which also includes the Control Room Emergency Air Temperature Control System, consists of two 100% capacity redundant fan-filter assemblies. Each filter system includes a roughing filter, high-efficiency particulate air (HEPA) filter, and charcoal adsorber. A cooling coil and water-cooled condensing unit are provided for each system to provide suitable temperature conditions in the control room for operating personnel and safety-related control equipment. Two 100% capacity redundant air-cooled condensing units are provided as backup to the water-cooled condensing units. On high refrigerant head pressure, the Service Water System valve closes and the refrigerant solenoid valves align the air-cooled condensing unit automatically.

During normal operation, the CREVS is held on standby. Under normal operating conditions, the control room will be free of airborne radioactivity. In the event of a LOCA, the Control Room Normal Ventilation System is automatically shutdown by a SFAS signal. The control room normal air conditioning system is also shutdown by a high radiation signal from the station vent radiation monitors. The CREVS fans are manually activated from the control room.

During emergency isolation of the control room, the normal supply and return fans are shutdown automatically and all control room isolation dampers are closed to preclude the admission of airborne contaminants to the control room. The control room operator has manual controls for initiating the control room emergency ventilation system to ensure satisfactory control room conditions following an accident. The CREVS can either be operated in the recirculation mode or outside air intake mode. However, to minimize the unfiltered in-leakage into the control room, the CREVS is operated in the outside air intake mode following a LOCA.

Fuel-handling Area H&V – The ventilation system for the fuel-handling area is independent of that used in any other areas and is designed on a once-through basis to control and direct all potentially contaminated air to the station vent stack via roughing and HEPA filters. Exhaust air from the fuel-handling area is monitored before it is discharged from the station through the vent stack.

The fuel-handling area ventilation system consists of a supply-air unit and redundant exhaust fans. The supply-air unit provides 100% outside air without a recirculation mode. The fuel-handling area filter consists of prefilters and HEPA filters. During normal operation, the exhaust from the fuel-handling area is passed through the fuel-handling area exhaust filter and discharged through the station vent stack.

In the event of a fuel-handling accident, the fuel-handling area is connected to the Emergency Ventilation System filters by means of ductwork bypasses and dampers. The fuel-handling area supply and exhaust ducting is isolated and the Emergency Ventilation System fans are started automatically to pull a negative pressure in the fuel-handling area.

Non-radioactive Areas H&V – The heating and ventilating systems for the non-radioactive areas are designed to provide a suitable environment for equipment and personnel. The heating and ventilating systems in the following non-radioactive areas perform license renewal intended functions: auxiliary feedwater pump rooms, battery rooms, component cooling water (CCW) pump rooms, emergency diesel generator (EDG) rooms, and low voltage switchgear rooms.

The auxiliary feedwater pump room ventilation system consists of one 100% capacity, safety-related exhaust fan and a temperature switch in each room. Each exhaust fan is started automatically by its pump room temperature switch at a predetermined temperature setpoint and is sized to maintain its pump room between 60°F and 120°F during all modes of operation including post accident, utilizing supply air from the Turbine Building at ≤ 110°F.

Each battery room receives ventilation air from its respective low voltage switchgear room through a transfer grill and is continuously exhausted through duct work by roof mounted nonsafety-related battery room exhaust fans. Fans are energized from hand indicating switches and are designed to run continuously to maintain room temperatures and to purge the hydrogen gas in the room generated by the battery charging. One safety-related battery room ventilation fan is provided in each battery room to exhaust the room following a loss of off-site power, a postulated accident, or failure of the normal, nonsafety-related exhaust fans.

The CCW pump room ventilation system consists of safety-related and nonsafety-related systems. The safety-related system provides two 100% capacity CCW pump room ventilation fans, and electro-hydraulic actuator operated exhaust and recirculation dampers. Safety-related cooling and ventilation is ensured by one of these two 100%

capacity safety-related CCW pump room ventilation fans. The nonsafety-related system consists of the elevator room exhaust fan, which is kept normally shutdown with its damper closed. This restriction is administratively applied to prevent drawing steam laden air into the CCW pump room in the event of a high energy line break in the Turbine Building. The supply air for this fan is drawn from the Turbine Building through a transfer grill located in the north elevator machinery room wall and exhausted into the CCW pump room.

The EDG room ventilation system consists of two safety-related, 50% capacity supply air fans in each EDG room. The fans are started automatically when the respective diesel engine is started. Each ventilation system includes safety-related modulating supply, return, and exhaust air dampers which are interlocked through room temperature controllers. The dampers modulate to maintain the room temperature between 60°F and 125°F for all operating conditions. The supply and exhaust air dampers fail closed, and the return air damper fails open, to prevent freezing temperatures in the EDG room.

The low voltage switchgear ventilation system consists of the non-radioactive area supply and return fans, two safety-related low voltage switchgear room ventilation fans, three safety-related motor operated outside air dampers, two safety-related exhaust dampers and associated controls and duct work. The normal ventilation system consisting of non-radioactive fans operates continuously through temperature controllers which modulate supply, return, and exhaust dampers to maintain the average temperature in the non-radioactive areas between 60°F and 104°F for all normal modes of operation. The safety-related 100% capacity low voltage switchgear room ventilation fans are provided to ensure adequate cooling of the low voltage switchgear room following a loss of off-site power, postulated accident, or failure of the normal ventilation system. Each safety-related ventilation fan is started automatically by a temperature switch at a predetermined temperature setpoint which simultaneously opens outside air supply louvers and exhaust air dampers. Each safety-related ventilation train is designed to maintain its low voltage switchgear average room temperature between 60°F and 104°F year-round during all modes of operation, including post-accident.

Radioactive Areas H&V – The ventilation system for the radioactive areas is independent of that used in other areas and is designed on a once-through basis to control and direct all potentially contaminated air to the vent stack via roughing and HEPA filters. Exhaust air from the radioactive areas HVAC is monitored before it is discharged from the station through the vent stack. The system is required for building ventilation during station operation and during shutdown operation. It consists of a supply-air unit and redundant exhaust fans. The supply-air unit distributes fresh outside air to the potentially contaminated areas at all levels of the Auxiliary Building. The unit provides 100% outside air without a recirculation mode.

During normal operation, the exhaust from the Radwaste HVAC is passed through prefilters and HEPA filters and discharged through the station vent stack. In the event that radioactivity levels exceed acceptable limits, the supply and exhaust fans are stopped and the ducting from the radioactive areas to the Emergency Ventilation System is opened automatically. The cross connect is normally closed.

The ECCS rooms contain pumps that are required to bring the plant to a safe shutdown or mitigate the effects of an accident. The cooling units for the ECCS rooms maintain a suitable environment for the electric motor drivers of the high-pressure injection pumps, decay heat pumps, and containment spray pumps. Each cooling unit consists of a fan and a cooling coil. Room air is circulated over the water-cooling coils by the fans and discharged back into the room. The cooling units are automatically energized by an increase in the room temperature. The Radioactive Areas H&V passive exhaust ductwork that passes through the ECCS rooms has valve and damper sets comprised of a motor-operated valve and a pneumatic isolation damper. In the event of a SFAS signal, these valves and dampers close automatically to isolate the ECCS rooms. The basis for isolating radioactive exhaust ductwork through the ECCS rooms is to ensure that all Engineered Safety Features (ESF) leakage passes through the Emergency Ventilation System after an accident and thus preclude any possibility of the spread of contamination to other areas in case of a breach of the integrity of the subject ductwork.

Reason for Scope Determination

The Auxiliary Building HVAC Systems perform the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Maintain a suitable temperature for safety-related equipment in the following rooms: battery rooms, low-voltage switchgear rooms, emergency diesel generator rooms, auxiliary feedwater rooms, component cooling water pump rooms, and ECCS pump rooms (high-pressure injection, decay heat removal, and containment spray)
- Maintain a suitable environment for safety-related equipment, and a comfortable environment for operators, in the control room and cabinet room

- Provide recirculated filtered air (following a LOCA) or filtered outside air (when required) to the Control Room
- Maintain positive pressure in the Control Room
- Isolate the Auxiliary Building Radioactive Areas H&V System passive exhaust ductwork passing through the ECCS rooms in the event of a LOCA

The Auxiliary Building HVAC Systems contain NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Auxiliary Building HVAC Systems satisfy the NSAS scoping criterion of 10 CFR 54.4(a)(2), and performs the following system intended function:

- Provide a path from the fuel handling area to the Emergency Ventilation System following a fuel handling accident

The Auxiliary Building HVAC Systems also contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Auxiliary Building HVAC Systems satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The Auxiliary Building HVAC System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), and Station Blackout (10 CFR 50.63) regulated events.

<u>USAR References</u>

USAR Sections 9.4.1, 9.4.2, and 9.4.3 describe the Auxiliary Building HVAC Systems.

<u>License Renewal Drawings</u>

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M026A, LR-M027A, LR-M027B, LR-M028B, LR-M028C, LR-M028D, LR-M029E

<u>Components Subject to AMR</u>

Table 2.3.3-1 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-1, Aging Management Review Results – Auxiliary Building HVAC Systems, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, dampers (except housings), and fans (except housings), the following components are within the scope of license renewal, but are not subject to AMR:

- Component filter media are evaluated as short-lived components (consumables), not subject to an AMR. Note that the filter housings do have a pressure boundary function and are subject to AMR.
- The system filter media for CREVS filter units DB-F22-1 & 2, including the roughing filters, HEPA filters, and charcoal adsorbers, are evaluated as short-lived components (consumables). The media are replaced on condition in accordance with the applicable standards of Regulatory Guide 1.52 Revision 2, ANSI/ASME N510-1980, and ASTM D3803-1989.
- The system filter media for Fuel Handling area exhaust filter housing DB-F24 including the roughing filters, and HEPA filters, are evaluated as short-lived components (consumables). The media are replaced on condition in accordance with ANSI/ASME N510-1980.
- Electric coil heater DB-E110 and DB-E111 are electrical components that are fully enclosed within the duct and do not have a separate pressure boundary function. The heaters, therefore, are not subject to AMR.
- The humidifier disposable plastic cylinder is evaluated as a short-lived component and is not subject to AMR. The cylinder is replaced on condition between 500 – 2000 operating hours of use.
- Solenoid valves in the air supplies to the damper actuators are not subject to AMR because their function is to vent the air lines (they all fail open), so if they lose their pressure boundary, they still perform their function.

Table 2.3.3-1
Auxiliary Building HVAC Systems
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Compressor housing – CREVS air conditioning unit compressor (DB-MS3311 & DB-MS3321)	Pressure boundary
Condenser Unit Housing – CREVS air-cooled condensing unit (DB-S61-1 & 2)	Pressure boundary
Damper Housing	Pressure boundary Structural integrity
Drain Pan	Structural integrity
Duct	Pressure boundary Structural integrity
Fan Housing – Auxiliary Feedwater Pump Room ventilation fans (DB-C73-1 & 2), Battery Room ventilation fans (DB-C78-1 & 2), component cooling water ventilation fans (DB-C75-1 & 2), CREVS fans (DB-C21-1 & 2), Emergency Diesel Generator Room ventilation fans (DB-C25-1, 2, 3, & 4), ECCS room cooler fans (DB-C31-1, 2, 3, 4, & 5), and Low Voltage Switchgear Room ventilation fans (DB-C71-1 & DB-C133)	Pressure boundary
Filter Housing – CREVS filters (DB-F22-1 & 2) CREVS water-cooled condenser skid (DB-S33-1 & 2) and Fuel Handling Building area exhaust filter (DB-F24)	Pressure boundary
Flexible Connection	Pressure boundary
Heat Exchanger (channel) – CREVS water-cooled condensing units (DB-S33-1 & 2)	Pressure boundary
Heat Exchanger (cooling coil casing) – CREVS air-cooled condensing unit (DB-S61-1 & 2) cooling coils, CREVS cooling coils (DB-E106-1 & 2), and ECCS room cooler coils (DB-E42-1, 2, 3, 4, & 5)	Pressure boundary

**Table 2.3.3-1 (Continued)
Auxiliary Building HVAC Systems
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Heat Exchanger (cooling coil fins) – CREVS air-cooled condensing unit (DB-S61-1&2) cooling coils, CREVS cooling coils (DB-E106-1 & 2), and ECCS room cooler coils (DB-E42-1, 2, 3, 4, & 5)	Heat transfer
Heat Exchanger (cooling coil tubes) – CREVS air-cooled condensing units (DB-S61-1 & 2) CREVS cooling coils (DB-E106-1 & 2), and ECCS room cooler coils (DB-E42-1, 2, 3, 4, & 5)	Heat transfer Pressure boundary
Heat Exchanger (shell) – CREVS water-cooled condensing units (DB-S33-1 & 2)	Pressure boundary
Heat Exchanger (tubes) – CREVS water-cooled condensing units (DB-S33-1 & 2)	Heat transfer Pressure boundary
Heat Exchanger (tubesheet) – CREVS water-cooled condensing units (DB-S33-1 & 2)	Pressure boundary
Humidifier (tubing) – Control Room HVAC humidifiers (DB-S19-1 & 2)	Structural integrity
Mechanical Sealant	Pressure boundary
Piping	Pressure boundary Structural integrity
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.2 Auxiliary Building Chilled Water System

System Description

The Auxiliary Building Chilled Water System consists of two chilled water pumps (in parallel) discharging to a common header. During normal operation, one chilled water pump is on to ensure chilled water is continuously supplied to the computer room air conditioning unit DB-S77 while the other pump is off. The chilled water pump DB-P92-1 (DB-P92-2) discharge flows through the two water chiller evaporators (in parallel) and circulates to the control room air handling unit (AHU) cooling coil DB-E44 (DB-E45) and the computer room air conditioning unit DB-S77, as well as to the access control area duct cooling coil DB-E47 and the electric penetration room cooling coil DB-E78. After providing cooling to the coils, the heated water is returned to the pump suction via an air separator and chilled water system expansion tank DB-T88, which is provided to alleviate any surges and thermal expansion in the closed loop chilled water system. The expansion tank also provides suction pressure for the chilled water pumps.

Reason for Scope Determination

The Auxiliary Building Chilled Water System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Auxiliary Building Chilled Water System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Auxiliary Building Chilled Water System does, however, contain NSR components that are located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Auxiliary Building Chilled Water System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Auxiliary Building Chilled Water System is not relied upon to demonstrate compliance with, and does not satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated events.

USAR References

USAR Section 9.4.3.2 describes the Auxiliary Building Chilled Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M027A, LR-M028C, LR-M043

Components Subject to AMR

Table 2.3.3-2 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-2, Aging Management Review Results – Auxiliary Building Chilled Water System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The internals (tubes and tubesheets) for the Control Room water chiller evaporators (DB-S12-1 and 2) are not subject to AMR because these heat exchangers are in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.

Table 2.3.3-2
Auxiliary Building Chilled Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural integrity
Flexible Connection	Structural integrity
Heat Exchanger (shell) – Control Room water chiller evaporator (DB-S12-1 & 2)	Structural integrity
Heat Exchanger (tubes) – Access Control Area duct cooling coil (DB-E47)	Structural integrity
Heat Exchanger (tubes) – Computer Room A/C unit (DB-S77)	Structural integrity
Heat Exchanger (tubes) – Control Room air handling cooling coil (DB-E44 & 45)	Structural integrity
Heat Exchanger (tubes) – Electric Penetration Room 402 cooling coil (DB-E78)	Structural integrity
Orifice	Structural integrity
Piping	Structural integrity
Pump Casing – Chilled water pump (DB-P92-1 & 2)	Structural integrity
Strainer (body)	Structural integrity
Tank – Air separator	Structural integrity
Tank – Chemical pot feeder (DB-T154)	Structural integrity
Tank – Expansion tank (DB-T88)	Structural integrity
Tubing	Structural integrity
Valve Body	Structural integrity

2.3.3.3 Auxiliary Steam and Station Heating System

System Description

During normal plant operation, the Auxiliary Steam System is supplied with steam from the Main Steam System. Superheated steam at a pressure of approximately 875 psig is drawn from the main steam header downstream of the main steam isolation valves and is passed through a pressure reducing valve which reduces the steam pressure to 235 psig prior to introducing the steam to the Auxiliary Steam System header. The 235 psig header supplies steam to components either directly or via other steam headers at reduced pressures.

The Station Heating System uses a closed loop, circulating hot water system. The water is heated by the station heating heat exchangers using auxiliary steam as a heat source. Hot water is circulated through a primary loop that feeds various secondary loops. The primary loop provides a constant supply of hot water for conveying heat to the secondary loops while the secondary loops serve the terminal heat transfer units.

Reason for Scope Determination

The Auxiliary Steam and Station Heating System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Auxiliary Steam and Station Heating System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Auxiliary Steam and Station Heating System does, however, contain NSR components that are located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Auxiliary Steam and Station Heating System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Auxiliary Steam and Station Heating System is not relied upon to demonstrate compliance with, and does not satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated events.

USAR References

USAR Sections 3.6.2.7.1.9 and 3.6.2.7.1.13 describe the Auxiliary Steam and Station Heating System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M010D, LR-M020A, LR-M020B, LR-M020D, LR-M021, LR-M026B, LR-M027A, LR-M027B, LR-M028C, LR-M028D, LR-M029E

Components Subject to AMR

Table 2.3.3-3 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-3, Aging Management Review Results – Auxiliary Steam and Station Heating System, provides the results of the AMR.

Table 2.3.3-3
Auxiliary Steam and Station Heating System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural integrity
Heat Exchanger (tubes) – Containment purge air supply heating coil (DB-E38)	Structural integrity
Heat Exchanger (tubes) – Control Room heating coil (DB-E46-1 & 2)	Structural integrity
Heat Exchanger (tubes) – Fuel handling supply heating coil (DB-E40)	Structural integrity
Heat Exchanger (tubes) – Intake structure unit heater (DB-E50-1)	Structural integrity
Heat Exchanger (tubes) – Main steam line area unit heater (DB-E87-1, 2, & 3)	Structural integrity
Heat Exchanger (tubes) – Radwaste supply heating coil (DB-E39)	Structural integrity
Orifice	Structural integrity
Piping	Structural integrity
Pump Casing – 10 psig condensate pump (DB-P118-1 & 2)	Structural integrity

**Table 2.3.3-3 (Continued)
Auxiliary Steam and Station Heating System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Pump Casing – Degasifier package drain pump (DB-P178-1 & 2)	Structural integrity
Pump Casing – Evaporator package condensate drain pump (DB-P275-1 & 2)	Structural integrity
Pump Casing – Secondary hot water control room AHU pump (DB-P97 & 98)	Structural integrity
Pump Casing – Secondary hot water fuel handling pump (DB-P95)	Structural integrity
Pump Casing – Secondary hot water purge supply pump (DB-P93)	Structural integrity
Pump Casing – Secondary hot water radwaste supply pump (DB-P94)	Structural integrity
Strainer (body)	Structural integrity
Tank – 10 psig condensate tank (DB-T95)	Structural integrity
Tank – Degasifier package drain pump reservoir	Structural integrity
Trap Body	Structural integrity
Tubing	Structural integrity
Valve Body	Structural integrity

2.3.3.4 Boron Recovery System

System Description

The Boron Recovery System performs several functions important to normal operation. The first function is to collect, store, process, and reuse or dispose of radioactive reactor grade liquid from various sources, including liquid from the reactor coolant drain tank (DB-T14) and letdown from the Makeup and Purification System. Another function is to remove boron from reactor coolant letdown to maintain proper boron coolant chemistry. The last function is to collect, store, process, and reuse or dispose of recovered boron.

Liquid from the reactor coolant drain tank (DB-T14) and letdown from the Makeup and Purification System is pumped through one of the primary demineralizer filters (DB-F5-1 and 2), associated primary demineralizers (DB-T19-1 and 2), and into one of the clean waste receiver tanks (DB-T15-1 and 2). The liquid is then pumped by transfer pumps (DB-P49-1 and 2) to one of the boric acid evaporators (DB-S1-1 and 2) where it is separated into demineralized water (distillate) and boric acid.

The demineralized water is pumped through one of the clean waste polishing demineralizers (DB-T21-1 and 2), one of the clean waste monitor tank filters (DB-F6-1 and 2), and into one of the clean waste monitor tanks (DB-T23-1 and 2). From the clean waste monitor tanks (DB-T23-1 and 2), the demineralized water is pumped by transfer pumps (DB-P50-1 and 2) directly into the RCS via the Makeup and Purification System or discharged to the collection box.

The boric acid is pumped from the boric acid evaporators (DB-S1-1 and 2) through the concentrates demineralizer (DB-T55) and into the concentrates storage tank (DB-T16). The boric acid is then pumped by the concentrates transfer pump (DB-P47-2), from the concentrates storage tank (DB-T16) to the boric acid addition tanks (DB-T7-1 and 2) for reuse or to the Miscellaneous Waste System if the acid does not meet chemistry specifications.

The deborating demineralizers (DB-T20-1 and 2) are used in lieu of the boric acid evaporators (DB-S1-1 and 2), near the end of core life when the boron concentration is relatively low in order to remove boron from the liquid. The sodium hydroxide tank (DB-T90) and pump (DB-P113) were designed to inject sodium hydroxide into the boric acid evaporators (DB-S1-1 and 2) for pH control and for regeneration of the deborating demineralizers (DB-T20-1 and 2).

Reason for Scope Determination

The Boron Recovery System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Boron Recovery System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Boron Recovery System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Boron Recovery System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Boron Recovery System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) regulated event.

USAR References

USAR Section 11.2.2 describes the Boron Recovery System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M010D, LR-M031A, LR-M033B, LR-M033C, LR-M036C, LR-M037C, LR-M037D, LR-M037E, LR-M037F, LR-M037G, LR-M037H, LR-M038B, LR-M046

Components Subject to AMR

Table 2.3.3-4 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-4, Aging Management Review Results – Boron Recovery System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The internals (tubes) for the boric acid concentrators (DB-T200-1 and 2) are not subject to AMR because these tanks are in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.
- The internals (tubes and tubesheets) for the seal water coolers (DB-E199-1 and 2) and distillate coolers (DB-E200-1 and 2) are not subject to AMR because these heat exchangers are in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.
- The internals for the air-water separators (DB-S403-1 and 2) are not subject to AMR because these components are in scope only for potential leakage and

spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.

- Component filter media are evaluated as short lived components (consumables), not subject to AMR. Note that the housings for the primary demineralizer filters (DB-F5-1 and 2), clean waste monitor tank filters (DB-F6-1 and 2), clean waste receiver tank recirculation filter (DB-F90), and concentrates storage tank particulate filter (DB-F155), serve a structural integrity function and are subject to AMR.
- The internals (screens) for the deborating demineralizer outlet strainers (DB-S347 and S348), primary demineralizer outlet strainers (DB-S345 and 346), clean waste polishing demineralizer outlet strainers (DB-S374 and S375), and concentrates demineralizer outlet strainer (DB-S376) are not subject to AMR because these strainers are in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.

Table 2.3.3-4
Boron Recovery System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Filter Housing	Structural integrity
Flexible Connection	Structural integrity
Heat Exchanger (channel, shell) – Distillate coolers (DB-E200-1 & 2)	Structural integrity
Heat Exchanger (channel, shell) – Seal water coolers (DB-E199-1 & 2)	Structural integrity
Orifice	Pressure boundary Structural integrity
Piping	Pressure boundary Structural integrity
Pump Casing – Bottoms circulation pumps (DB-P271-1, 2, 3, & 4)	Structural integrity
Pump Casing – Clean waste booster pumps (DB-P179-1 & 2)	Structural integrity
Pump Casing – Clean waste monitor tank transfer pumps (DB-P50-1 & 2)	Structural integrity
Pump Casing – Clean waste receiver tank transfer pumps (DB-P49-1 & 2)	Structural integrity
Pump Casing – Concentrates pumps (DB-P272-1 & 3)	Structural integrity
Pump Casing – Concentrates transfer pump (DB-P47-2)	Structural integrity
Pump Casing – Concentrator vacuum pumps (DB-270-1, 2, 3, & 4)	Structural integrity

Table 2.3.3-4 (Continued)
Boron Recovery System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Pump Casing – Distillate pumps (DB-269-1 & 3)	Structural integrity
Rupture Disc	Structural integrity
Separator	Structural integrity
Strainer (body)	Structural integrity
Tank – Boric acid concentrators (DB-T200-1 & 2)	Structural integrity
Tank – Clean waste monitor tanks (DB-T23-1 & 2)	Structural integrity
Tank – Clean waste polishing demineralizers (DB-T21-1 & 2)	Structural integrity
Tank – Clean waste receiver tanks (DB-T15-1 & 2)	Pressure boundary
Tank – Concentrates demineralizer (DB-T55)	Structural integrity
Tank – Concentrates storage tank (DB-T16)	Structural integrity
Tank – Deborating demineralizers (DB-T20-1 & 2)	Structural integrity
Tank – Primary demineralizers (DB-T19-1 & 2)	Structural integrity
Tank – Boric acid concentrators condensate reservoirs	Structural integrity
Tubing	Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.5 Chemical Addition System

The Chemical Addition System consists of the Boric Acid Addition System, Reactor Coolant Chemical Addition System, and Steam Generator Wet Layup Chemical Addition System. The Boric Acid Addition System injects boric acid into the RCS to control reactivity. The Boric Acid Addition System injects boric acid into the Borated Water Storage Tank System and the Spent Fuel Pool Cooling System to control their boron levels.

The Chemical Addition System provides a boric acid solution to the Boric Acid Addition System, and provides lithium hydroxide, hydrazine, ammonia, and other chemical amines to control pH and oxygen in the plant systems fed by the Reactor Coolant Chemical Addition System and Steam Generator Wet Layup Chemical Addition System.

Boric acid is mixed in the boric acid mix tank (DB-T6) and then transferred to the boric acid addition tanks (DB-T7-1 and 2) for storage. The solution is then delivered by the boric acid pumps (DB-P38-1 and 2) to the RCS to control reactivity in the reactor core.

Lithium hydroxide or hydrazine is mixed individually in the lithium hydroxide and hydrazine mix tank (DB-T8) and then transferred by the corresponding lithium hydroxide pump (DB-P39) or hydrazine pump (DB-P40) to the makeup filters (DB-F12-1 and 2) in the Makeup and Purification System. Lithium hydroxide is used in the RCS as a pH control additive during all phases of critical conditions and power operations and during normal subcritical or cold shutdown conditions. Controlling the pH helps to control corrosions of the system materials. Hydrazine is injected into the RCS during subcritical conditions to scavenge dissolved oxygen.

Chemicals are added to either of the steam generator wet layup chemical addition tanks (DB-T139-1 and 2). The solution is then transferred by the steam generator wet layup chemical addition metering pumps (DB-P259-1 and 2) and steam generator wet layup recirculation pumps (DB-P182-1 and 2) to the steam generators via the Auxiliary Feedwater System. Amines and hydrazine are injected during a wet layup condition for pH control and oxygen control respectively to minimize corrosion in the steam generators.

<u>Reason for Scope Determination</u>

The Chemical Addition System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Chemical Addition System contains NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1):

- Provide makeup from the boric acid addition tanks to the RCS in the event of a tornado that causes a loss of offsite power and loss of the borated water storage tank.

The Chemical Addition System also contains NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Chemical Addition System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Chemical Addition System is not relied upon to demonstrate compliance with, and does not satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated events.

USAR References

USAR Section 9.3.6 describes the Chemical Addition System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M035, LR-M037D, LR-M039A, LR-M039B, LR-M045

Components Subject to AMR

Table 2.3.3-5 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-5, Aging Management Review Results – Chemical Addition System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal but are not subject to AMR:

- The internals (screens) for the lithium hydroxide mix tank discharge strainer (DB-S334) and hydrazine pump suction strainer (DB-S335) are not subject to AMR because these strainers are in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.

Table 2.3.3-5
Chemical Addition System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Orifice	Pressure boundary Structural integrity
Piping	Pressure boundary Structural integrity
Pump Casing – Boric acid pumps (DB-P38-1 & 2)	Pressure boundary
Pump Casing – Hydrazine pump (DB-P40)	Structural integrity
Pump Casing – Lithium hydroxide pump (DB-P39)	Structural integrity
Strainer (body)	Pressure boundary Structural integrity
Strainer (screen)	Filtration
Tank – Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary
Tank – Boric acid mix tank (DB-T6)	Structural integrity
Tank – Lithium hydroxide and hydrazine mix tank (DB-T8)	Structural integrity
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.6 Circulating Water System

System Description

The Circulating Water System removes heat from the condenser and then disperses this heat to the atmosphere via the cooling tower. The Circulating Water System also provides a backup supply of water for cooling the turbine plant cooling water (TPCW) heat exchangers, provides dilution flow to the collection box during planned discharge of processed radioactive liquid, and receives the discharge of the Service Water System and the drainage from the condenser hotwell during hotwell cleanup operations.

Reason for Scope Determination

The Circulating Water System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Circulating Water System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Circulating Water System does, however, contain NSR components that are located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Circulating Water System satisfies the scoping criteria of 10 CFR 54.4(a)(2)

The Circulating Water System is not relied upon to demonstrate compliance with, and does not satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated events.

USAR References

USAR Section 10.4.5 describes the Circulating Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M012E, LR-M041A, LR-M041C

Components Subject to AMR

Table 2.3.3-6 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-6, Aging Management Review Results – Circulating Water System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The cooling tower makeup pumps (DB-P116-1 and 2) are within the scope of license renewal. However, the only license renewal function that these pumps serve is as the anchors of safety-nonsafety interfaces and for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function. Only the discharge head portion of these pumps fulfills this function, not the column pipe, top bowl, intermediate bowl or suction bell.

Table 2.3.3-6
Circulating Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural integrity
Flexible Connection	Structural integrity
Piping	Structural integrity
Pump Casing – Cooling tower makeup pump (DB-P116-1 & 2)	Structural integrity
Strainer (body)	Structural integrity
Tubing	Structural integrity
Valve Body	Structural integrity

2.3.3.7 Component Cooling Water System

System Description

The Component Cooling Water System is a closed loop system which provides cooling water to the nuclear and engineered safety features systems. It also acts as an intermediate barrier between radioactive systems and the Service Water System. The system consists of three circulating pumps, three heat exchangers, a surge tank, associated valves, piping, instrumentation, and controls.

The Component Cooling Water System is designed to provide cooling water to reactor auxiliaries and ECCS systems during normal station operation and Design Basis Accident (DBA) conditions. The components of the system are sized on the basis of removing the maximum heat load during normal station operation with 90°F service water temperature, and removing maximum heat loads from ECCS components during DBA conditions with service water at the ultimate heat sink conditions.

During normal operation, one of the loops will supply cooling water to reactor auxiliaries with the other loop in a standby capacity. During DBA conditions, the nonessential portion of the system is automatically isolated from both loops and the standby loop starts.

Three CCW pumps and heat exchangers are provided so that any one of the pump heat exchanger units can be removed from service for maintenance or repair without reducing the capability or redundancy of the system.

During normal station operation one pump is operating and one pump is in standby (in the redundant loop). The third pump is electrically disconnected from the system. Failure of the operating pump initiates an automatic transfer to the standby pump in the redundant loop. Manual valve and electrical alignment is initiated to place the third pump in a standby status in place of the affected pump.

Under DBA conditions, one CCW pump runs in each loop and nonessential components are isolated from the system. No single failure in a loop affects the other loop.

During normal operation, cooling to the makeup pumps is supplied via the nonessential header, which may be isolated during conditions requiring feed-and-bleed operations. During DBA accident conditions, cooling is supplied by the essential flowpath.

The system also contains two control rod drive cooling (CRDC) booster pumps and filters. The three CCW pumps and heat exchangers supply two essential loops and non-essential loads.

Reason for Scope Determination

The Component Cooling Water System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide cooling water to the following safety-related components: high-pressure injection pumps and bearing oil coolers; decay heat removal pump bearing housing coolers; decay heat removal coolers; containment gas analyzer heat exchangers; emergency diesel generator jacket cooling water heat exchangers
- Provide containment isolation

The Component Cooling Water System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Component Cooling Water System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Component Cooling Water System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Component Cooling Water System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), and Station Blackout (10 CFR 50.63) regulated events.

USAR References

USAR Section 9.2.2 describes the Component Cooling Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M036A, LR-M036B, LR-M036C, LR-M040D, LR-M041B, LR-M042C

Components Subject to AMR

Table 2.3.3-7 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-7, Aging Management Review Results – Component Cooling Water System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- Air operators and associated components – Decay heat removal cooler outlet flow control valves (DB-CC1467 and DB-CC1469), Auxiliary Building nonessential header inlet flow control valve (DB-CC1495), component cooling surge tank outlet valve (DB-CC1412), demineralized water crosstie valve (DB-DW2643), and inlet to normal makeup pump header valve (DB-CC1460), are air-operated valves. As shown on LR-M036A and LR-M036B, the supply control valves fail closed, and the outlet flow control valves fail open to ensure a flowpath to remove decay heat under worst case conditions is available to satisfy this requirement. Therefore, these valves are fail-safe on loss of the control air supply. In accordance with NEI 95-10, the nonsafety-related air supply components are not subject to aging management review.

  Additionally, the solenoid valves that supply the control air to the air operators, which are themselves active components, fail open to vent the control air lines. As such, a pressure boundary failure of any component within the control air supply will result in the flow control valves going to their safe positions, and the system will perform its intended function. Therefore, the air operators and associated components are not subject to AMR. In accordance with NEI 95-10, the nonsafety-related air supply components are not subject to AMR.

Table 2.3.3-7
Component Cooling Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Filter Housing	Structural integrity
Heat Exchanger (channel, shell, tubesheet) – Component cooling heat exchangers (DB-E22-1, 2, & 3)	Pressure boundary
Heat Exchanger (tubes) – Component cooling heat exchangers (DB-E22-1, 2, & 3)	Heat transfer Pressure boundary
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – Component cooling pumps (DB-P43-1, 2, & 3)	Pressure boundary
Pump Casing – CRDC booster pumps (DB-P170-1 & 2)	Structural integrity
Tank – Chemical pot feeder (DB-T13)	Structural integrity
Tank – Component cooling surge tank (DB-T12)	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.8 Containment Hydrogen Control System

System Description

The Containment Hydrogen Control System includes the Containment Hydrogen Dilution System and Containment Gas Analyzer System.

The Containment Hydrogen Control System operation is post-accident only. These subsystems are not normally operated under any plant operating conditions, except during testing.

The Containment Hydrogen Dilution System was designed to add air to the containment vessel to effectively maintain hydrogen concentrations within acceptable limits. The Containment Hydrogen Dilution System consists of redundant trains of a 100%-capacity air compressor (blower).

The Containment Gas Analyzer System consists of two redundant operating trains. Each train consists of a heat exchanger, recombiner, moisture removal system, and gas sampling system. Both trains of electronics are typically in operation with the sample pumps in standby mode.

After a LOCA, the Containment Gas Analyzer System monitors the containment atmosphere for hydrogen. When the hydrogen in the Containment reaches 3% by volume, the Containment Hydrogen Dilution System will be manually initiated, to introduce air into the Containment to dilute the hydrogen concentration if the pressure inside Containment is less than 32.4 psia. The Containment Hydrogen Dilution System is used to pressurize the containment vessel to 32 psia, and then the Containment Purge System is lined up to the station exhaust.

Reason for Scope Determination

The Containment Hydrogen Control System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Monitor and indicate the hydrogen concentration of the containment vessel atmosphere
- Provide containment isolation

The Containment Hydrogen Control System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Containment Hydrogen Control System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Containment Hydrogen Control System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Containment Hydrogen Control System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 6.2.5 describes the Containment Hydrogen Control System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M029B, LR-M029C, LR-M029D, LR-M041B, LR-M041C

Components Subject to AMR

Table 2.3.3-8 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-8, Aging Management Review Results – Containment Hydrogen Control System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- Component filter media are evaluated as short-lived components (consumables), not subject to AMR. Note that the housing for DB-F60 serves a pressure boundary function and is subject to AMR.
- The demister pads for DB-S432 are evaluated as short-lived components not subject to AMR.

**Table 2.3.3-8
Containment Hydrogen Control System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Damper Housing	Pressure boundary
Demister (DB-S432)	Pressure boundary Water removal
Duct	Pressure boundary
Fan Housing – Hydrogen dilution system blowers (DB-C62-1 & 2)	Pressure boundary
Filter Housing (DB-F60)	Pressure boundary
Heat Exchanger (shell) – Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Pressure boundary
Heat Exchanger (tubes) – Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Heat transfer Pressure boundary
Moisture Separator (DB-F131 & 132)	Pressure boundary Water removal
Moisture Separator (DB-S404-1 & 2)	Pressure boundary Water removal
Orifice (DB-RO186, DB-RO187, DB-RO5063)	Pressure boundary Throttling
Orifice (DB-RO4813A-D, DB-RO4814A-D)	Pressure boundary
Piping	Pressure boundary Structural integrity
Pump Casing – Containment hydrogen analyzer pumps (DB-P267-1, -2 & DB-P268-1, -2)	Pressure boundary
Silencer (muffler)	Pressure boundary

**Table 2.3.3-8 (Continued)
Containment Hydrogen Control System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Tank – Containment radiation monitor moisture accumulation tank (DB-T216)	Pressure boundary
Trap Body (DB-MT9 & 10)	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.9 Containment Purge System

System Description

The Containment Purge System was designed to be a standby system. However, in order to maintain temperature and control noble gas levels, the system is normally in operation ventilating the mechanical penetration rooms. The Containment Purge System was designed to purge Containment during normal plant operation, but regulatory commitments have been made to keep the containment isolation valves closed in modes 1 through 4.

The Containment Purge System serves as a backup to the Containment Hydrogen Dilution System and is designed to release containment air through a HEPA and a charcoal filter prior to discharge to the station exhaust. The driving force for the Containment Purge System is the difference in pressure between the Containment and the atmosphere.

Reason for Scope Determination

The Containment Purge System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide containment isolation
- Provide mechanical penetration rooms isolation

The Containment Purge System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Containment Purge System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Containment Purge System does not satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The Containment Purge System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 6.2.3 describes the Containment Purge System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M029E

Components Subject to AMR

Table 2.3.3-9 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-9, Aging Management Review Results – Containment Purge System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments (including flow indicators), the following components are within the scope of license renewal, but not subject to AMR:

- Valve actuator housings are evaluated as active components, and as such are not subject to AMR. Additionally, the solenoid valves that supply the control air to the actuators fail open to vent the control air lines. As such, a pressure boundary failure of any component within the control air supply will result in the isolation valves going to their safe, fail-closed, positions, and the system will perform its intended function. Therefore, the solenoid valves and the associated capillary tubing are also not subject to AMR.

Table 2.3.3-9
Containment Purge System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve Body	Pressure boundary

2.3.3.10 Containment Vacuum Relief System

System Description

The Containment Vacuum Relief System consists of ten piping penetrations which penetrate the containment vessel. Each piping penetration is provided with a motor-operated butterfly valve in series with a non-return (swing check) valve. The motor-operated butterfly valve is normally open and can be closed from the Control Room, locally with a control switch, or by a SFAS level 2 signal. The non-return valves are free to open whenever the Containment negative pressure exceeds the valve unseating pressure.

Reason for Scope Determination

The Containment Vacuum Relief System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Maintain the integrity of the containment vessel by permitting an influx of air to the Containment under positive external differential pressure conditions, which may occur in the event of an inadvertent actuation of the Containment Spray System
- Provide containment isolation

The Containment Vacuum Relief System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Containment Vacuum Relief System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Containment Vacuum Relief System does not satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The Containment Vacuum Relief System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 3.8.2.1 describes the Containment Vacuum Relief System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M029B

Components Subject to AMR

Table 2.3.3-10 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-10, Aging Management Review Results – Containment Vacuum Relief System, provides the results of the AMR.

Table 2.3.3-10
Containment Vacuum Relief System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary
Piping	Pressure boundary
Valve Body	Pressure boundary

2.3.3.11 Demineralized Water Storage System

System Description

The Demineralized Water Storage System consists of two tanks, a heat exchanger, and four pumps (three transfer pumps and one recirculation pump). The Demineralized Water Storage System functions to supply demineralized plant water to equipment and systems throughout the plant. The demineralized water supply header is normally kept pressurized by one of the transfer pumps, with the other two in standby.

Reason for Scope Determination

The Demineralized Water Storage System performs the following safety-related system intended function that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Provide containment isolation

The Demineralized Water Storage System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Demineralized Water Storage System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Demineralized Water Storage System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Demineralized Water Storage System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 9.2.3.2 describes the Demineralized Water Storage System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M010C, LR-M010D, LR-M020B, LR-M021, LR-M031A, LR-M035, LR-M036A, LR-M037C, LR-M037D, LR-M037E, LR-M039A, LR-M040A, LR-M045

Components Subject to AMR

Table 2.3.3-11 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-11, Aging Management Review Results – Demineralized Water Storage System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- Air operators and associated components – DB-DW6831A and DB-DW6831B are air-operated valves. As shown on LR-M010C, the valves fail closed upon loss of power or loss of instrument air. In accordance with NEI 95-10, the NSR air supply components are not subject to AMR.

  Additionally, the solenoid valves that supply the control air to the air operators, which are themselves active components, fail open to vent the control air lines. As such, a pressure boundary failure of any component within the control air supply will result in the flow control valves going to their safe positions, and the system will perform its intended function. Therefore, the air operators and associated components are not subject to AMR. In accordance with NEI 95-10, the NSR air supply components are not subject to AMR.

Table 2.3.3-11
Demineralized Water Storage System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure boundary Structural integrity
Piping	Pressure boundary Structural integrity
Tank – Lab. demin. water storage tank (DB-T108)	Structural integrity
Tubing	Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.12 Emergency Diesel Generators System

System Description

Two redundant EDG units, one connected to essential 4.16-kV bus C1 and the other connected to essential 4.16-kV bus D1, are provided as onsite standby power sources to supply their respective essential buses upon loss of the normal and the reserve power sources. Bus load shedding and isolation, bus transfer to the EDG, and pickup of critical loads are automatic.

EDG Air Start – Each of the two EDGs has a complete starting air supply system including starting air compressor, two air reservoirs (each of which has the capacity to provide 5 starts without recharging), and two sets of two starting motors in parallel, one set from each reservoir. The compressor has sufficient capacity to recharge two air reservoirs from minimum to maximum starting air pressure in not more than 30 minutes. Each air compressor will charge one of the two air reservoirs in the starting systems for each of the two emergency diesel engines. A third compressor, which can be manually aligned to act as either of the normally aligned compressors, is available when either of the other two compressors has been isolated.

EDG Lubricating Oil – Each diesel engine has its own independent lube oil system which is an integral part of the engine. The lube oil system consists of the following:

- Lube oil filtering and cooling system – this system draws oil from the engine sump through a cleanable basket strainer by means of an engine-driven scavenge pump. The oil is directed to a full flow filter, and then to an oil cooler. Thermostatically controlled engine jacket water cools and maintains the lube oil temperature automatically at the proper operating condition. The cooled oil returns to an engine-mounted strainer.
- Main lubrication and piston cooling systems – these systems draw oil from the oil cooler through the duplex strainer by the gear-driven pressure pump. The main lubrication oil system supplies oil pressure to all necessary moving parts of the engine. The piston cooling pump discharges oil in continuous sprays on the underside of the piston crowns. All oil from these systems drains into the engine oil sump.
- Turbocharger cooling system – an independent, essentially powered, electric AC motor-driven turbo oil pump draws oil from the sump and delivers it to the turbocharger bearings through a replaceable cartridge filter. This pump is always kept running to provide pre-lubrication of the turbocharger bearings for starting and post-lubrication at stopping. The oil drains from the turbocharger housing into the oil sump. An alarm is actuated if sufficient oil pressure is not provided to the turbocharger bearings. An electric, DC motor-driven pump acts as a back-up to the AC turbo oil pump. The DC motor-driven pump is normally in standby (not

running) but will automatically start when the discharge pressure from the AC motor-driven turbo pump drops off.

- An essentially powered AC motor-driven circulating oil pump draws oil from the engine sump and circulates it through the main lube oil filter, the lube oil cooler, and the main lube oil gallery. This pump is always kept running to provide pre-lubrication of the engine with warm, filtered oil.

EDG Jacket Water Cooling – Each EDG jacket water cooling system includes a heat exchanger, expansion tank, lube oil cooler, automatic cooling water temperature regulating valve, and engine-driven water pumps. Jacket cooling water is circulated in a closed loop through the engine lube oil cooler, the engine cooling water passages, and the shell side of the raw water heat exchanger. The raw water flowing through the tube side is supplied by the Component Cooling Water System.

An electric immersion heater powered from an essential source is provided in the diesel engine jacket water system, and is controlled by a temperature switch. The immersion heater keeps both the jacket water and lube oil systems warm during standby conditions to enhance reliability and fast starting of the EDG set. The heated water is circulated by thermo-siphoning through the lube oil cooler where the circulating oil gets heated up, and is maintained above 85°F. A low jacket water temperature alarm monitors the operation of the immersion heater.

EDG Fuel Oil – The diesel fuel oil system includes sufficient fuel oil storage for seven days of operation for each emergency diesel generator. This system consists of the EDG day tank, bulk storage (week) tank, pumps, and associated piping and valves to the respective diesel generator.

The diesel fuel oil storage and transfer system is comprised of two separate trains. Each train consists of one supply (week) tank, one fuel oil transfer pump, one day tank, and piping between the supply (week) tank and day tank. Each supply (week) tank has a gross capacity of approximately 40,000 gallons. The tanks are installed above grade elevation; with tornado missile protection provided by a truncated pyramid of structural backfill built around the tanks.

The EDG day tanks are filled automatically via separate transfer systems which receive fuel oil from the two emergency diesel fuel oil storage (week) tanks. Each transfer pump is a submersible centrifugal pump suspended from the supply (week) tank manhole. The pumps have a capacity which is greater than the fuel consumption of its associated emergency diesel generator at its maximum rated load. The fuel oil transfer pump discharge lines run directly to the associated diesel day tank.

Each of the two diesel generator day tanks has a capacity of approximately 5,000 gallons, measured from the "start” level for the transfer pump.

The fuel oil filtering system is composed of a number of devices to guarantee fuel oil purity. Before entering the suction of the engine-driven fuel pump, the oil passes through a strainer which protects the pump. The oil discharged from the pump then passes through a duplex cartridge filter. The fuel supplied by the DC motor-driven, redundant fuel pump is filtered in the same manner as that supplied by the engine-driven pump, except that a duplex basket strainer is used on the suction of the pump.

EDG Air Intake and Exhaust – The air intake structure and filtering system for each diesel consists of an intake filter assembly, an intake silencer, and interconnecting piping to the diesel engine-mounted air inlet flexible connector. The filtered air then enters the impeller-end of a turbocharger where its pressure is increased for combustion and exhaust gas removal. The exhaust system consists of an engine-mounted manifold, turbine-end of the turbocharger, and interconnecting piping to an exhaust silencer.

The air intake filter and intake and exhaust silencers are located outside at the roof top of the Auxiliary Building above the diesel rooms. Suitable enclosures are provided to protect the filter and silencers from missiles, tornadoes, snow, rain, etc. Since the air intake is located outside of the diesel building, there is no possibility of fire extinguishing agents being drawn into the air intakes. The physical separation of the intake and exhaust preclude significant recirculation of exhaust gas into the air intake.

Reason for Scope Determination

The Emergency Diesel Generators System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1)

- Provide onsite standby power source for safety-related loads required to mitigate the effects of an accident combined with a loss of offsite power and to safely shut down the plant and maintain safe shutdown
- Provide onsite standby power source for safety-related loads following a loss of offsite power not accompanied by an accident

The Emergency Diesel Generators System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Emergency Diesel Generators System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Emergency Diesel Generators System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Emergency Diesel Generators System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49) regulated events.

USAR References

USAR Sections 8.3.1.1.4 and 9.5.4.2 describe the Emergency Diesel Generators System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M017A, LR-M017B, LR-OS041A1, LR-OS041A2

Components Subject to AMR

Table 2.3.3-12 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-12, Aging Management Review Results – Emergency Diesel Generators System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The EDG engines and generators are active components and not subject to AMR. The diesel engine boundary extends to the interfaces with the jacket water, intake and exhaust, lubricating oil, fuel oil, and starting air subsystems. Components integral to the EDG engine, such as the engine block, intake and exhaust manifolds, gear housings, lube oil pan (crankcase), and the fuel injectors, are included in the diesel engine boundary.

- The EDG main, turbo and aux turbo lubricating oil filter media (DB-F104-1/2, 105-1/2, and 106-1/2) are replaced periodically. Also the air intake oil bath filters (DB-F108-1 and 2) have the oil, which is the filter media, drained and replaced periodically. As such the EDG lubricating oil filter and air filter media are short-lived components and not subject to AMR.

- The EDG fuel oil filter media (DB-F158 through 161) are replaced periodically. As such they are short-lived components and not subject to AMR.

- The EDG circulating (i.e., soakback) oil pumps (DB-P147-1 and 2) are replaced periodically. As such they are short-lived components and not subject to AMR.

- The EDG air line lubricators (DB-S406-1 and 2 and DB-S407-1 and 2) are replaced periodically. As such they are short-lived components and not subject to AMR.

- The EDG AC turbo lube oil pumps (DB-P147-3 and 4) are replaced periodically. As such they are short-lived components and not subject to AMR.

- The EDG immersion heater elements are replaced periodically. As such they are short-lived components and not subject to AMR.

- The EDG jacket water pumps (DB-P148-1A, 1B, 2A, and 2B) are replaced periodically. As such they are short-lived components and not subject to AMR.

- The EDG engine-driven fuel oil pumps and the DC fuel oil pumps are replaced periodically. As such they are short-lived components and not subject to AMR.

- The EDG air start flexible hoses are replaced periodically. As such they are short-lived components and not subject to AMR.

- The EDG air start motors (DB-S207-1 through 4) are replaced periodically. As such they are short-lived components and not subject to AMR.

- The following jacket water flexible connections, of which not all are shown on LR-OS041A1 and LR-OS041A2, are replaced periodically, and are therefore short-lived components and not subject to AMR:

  - Water pump suction line from left bank pump
  - Water pump suction line from right bank pump
  - Jacket water line between engine and thermostatic control valve
  - Jacket water line between lube oil cooler and thermostatic control valve
  - Jacket water vent line between lube oil cooler and jacket water tank
  - Lines (2) off bottom of jacket water tank

Table 2.3.3-12
Emergency Diesel Generators System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Compressor Casing – Turbocharger (DB-C148-1 & 2)	Pressure boundary
Filter Body	Pressure boundary
Flame Arrestor	Pressure boundary
Flexible Connection	Pressure boundary
Heat Exchanger (channel, shell, tubesheet) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary
Heat Exchanger (shell) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Pressure boundary
Heat Exchanger (shell) – EDG immersion heater	Pressure boundary
Heat Exchanger (shell) – Lube oil cooler (DB-E94-1 & 2)	Pressure boundary
Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Heat Transfer Pressure boundary
Heat Exchanger (tubes) – EDG jacket cooling water heat exchangers (DB-E10-1 & 2)	Heat Transfer Pressure boundary
Heat Exchanger (tubes) – Lube oil cooler (DB-E94-1 & 2)	Heat Transfer Pressure boundary
Piping	Pressure boundary Structural integrity
Pump Casing – DC turbo oil pump (DB-P147-5 & 6)	Pressure boundary
Pump Casing – Engine-driven main lube oil pump (DB-P150-1 & 2)	Pressure boundary
Pump Casing – Engine-driven piston cooling pump (DB-P265-1 & 2)	Pressure boundary
Pump Casing – Engine-driven scavenger pump (DB-P264-1 & 2)	Pressure boundary
Pump Casing – Transfer pump (DB-P195-1 & 2)	Pressure boundary

**Table 2.3.3.12 (Continued)
Emergency Diesel Generators System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Silencer (exhaust, intake)	Pressure boundary
Strainer (body)	Pressure boundary Structural integrity
Strainer (screen)	Filtration
Tank – EDG day tank (DB-T46-1 & 2)	Pressure boundary
Tank – EDG fuel oil storage tank (DB-T153-1 & 2)	Pressure boundary
Tank – EDG starting air receiver (DB-T86-1, 2, 3 & 4)	Pressure boundary
Tank – Jacket water expansion tank (DB-T121-1 & 2)	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.13 Emergency Ventilation System

System Description

The function of the Emergency Ventilation System is to collect and process potential leakage from the containment vessel to minimize environmental activity levels resulting from all sources of containment leakage following a LOCA. The Emergency Ventilation System is designed to provide a negative pressure with respect to the atmosphere within the annular space between the Shield Building and the containment vessel and in the penetration rooms following a LOCA and to provide a filtered exhaust path from the shield building annulus, penetration rooms, and pump rooms following a LOCA.

The system has two redundant, independent fan/filter subsystems, each fully capable of the functional requirement. Each of the two redundant subsystems is provided with an exhaust fan, prefilters, HEPA filters to remove airborne particulates, and charcoal adsorbers to remove gaseous activity (principally iodine).

Following the detection of a radioactive release in the spent fuel pool area, the Fuel Handling Area Ventilation System will be automatically shutdown and its exhaust ductwork will be aligned to the Emergency Ventilation System. The automatic initiation of the Emergency Ventilation System will provide the appropriate ventilation and filtration to limit the potential release of radioactive iodine and other radioactive materials. The Emergency Ventilation System also provides a filtered ventilation path with an assigned filter efficiency of 95% for the areas served by the Containment Purge System or the Auxiliary Building Radioactive Area HVAC Systems in the event that high radiation is detected in any of these ventilation systems.

Reason for Scope Determination

The Emergency Ventilation System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Maintain negative pressure in the shield building annulus and penetration rooms (105, 113, 115, 208, 225, 236, 303, and 314) following a LOCA
- Provide a filtered exhaust path from the shield building annulus and penetration rooms to the station vent following a LOCA
- Provide a filtered exhaust path from the fuel handling area to the station vent following a fuel handling accident

The Emergency Ventilation System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Emergency Ventilation System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Emergency Ventilation System does not satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The Emergency Ventilation System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 6.2.3.1 describes the Emergency Ventilation System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M029D

Components Subject to AMR

Table 2.3.3-13 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-13, Aging Management Review Results – Emergency Ventilation System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, dampers (except housings), and fans (except housings), the following components are within the scope of license renewal, but are not subject to AMR:

- Component filter media are evaluated as short-lived components (consumables), not subject to an AMR. Note that the filter housings do have a pressure boundary function and are subject to AMR.
- The system filter media for the Emergency Ventilation System filter units (DB-F19-1 & 2), including the prefilters, HEPA filters, and charcoal adsorbers, are evaluated as short-lived components (consumables). The media are replaced in accordance with the applicable standards of Regulatory Guide 1.52 Revision 2, ANSI/ASME N510-1980, and ASTM D3803-1989.

Table 2.3.3-13
Emergency Ventilation System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary
Damper Housing	Pressure boundary
Duct	Pressure boundary
Fan Housing – Emergency ventilation fans (DB-C30-1 & 2)	Pressure boundary
Filter Housing – Emergency ventilation system filter units (DB-F19-1 & 2)	Pressure boundary
Flexible Connection	Pressure boundary
Mechanical Sealant	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve Body	Pressure boundary

2.3.3.14 Fire Protection System

System Description

The fire suppression system provides water for all in-scope automatic and manual fire suppression systems. Two separate water supplies and fire pumps are utilized to deliver water to the system. The primary supply consists of a fire water storage tank from which an electric motor-driven fire pump receives water, while the secondary water supply is Lake Erie, from which a diesel engine-driven fire pump takes suction.

Each fire pump discharges to the underground fire main through a separate feed. The underground fire main encircles the plant protected area and provides water to internal building headers and fire hydrants. The internal headers supply sprinkler, deluge and water spray systems, and standpipes. Several Turbine Building sprinkler systems are fed directly from the underground fire main. The underground fire main also supplies water to fire suppression systems, standpipes, and fire hydrants installed outside the protected area.

The fire suppression system is maintained within a predetermined pressure range by a continuously running jockey fire pump. The flow of water from the system will result in a lower water pressure in the underground fire main and internal building headers. The electric fire pump will automatically start when the system pressure has decreased to a predetermined point and begin supplying the underground fire main. Should the electric fire pump be unable to meet the demand, and the system pressure decreases further, the diesel fire pump will automatically start and also supply the underground fire main.

Wet Pipe Sprinkler Systems – Wet pipe sprinkler systems consist of automatic sprinklers, distribution piping (which contains water under pressure), an alarm check valve or flow switch (which indicates water flow in the system), and an isolation valve.

Water flow from a wet pipe sprinkler system is initiated by the operation of individual automatic sprinklers. Only sprinklers whose operating elements reach their design operating temperature will fuse and discharge water.

Preaction Sprinkler Systems – Preaction sprinkler systems consist of automatic sprinklers, distribution piping (which contains supervisory air pressure), an air check valve, a deluge valve with alarm trim (which controls water flow into the system and provides for a water flow alarm), and an isolation valve. The preaction sprinkler systems rely on a detection system to actuate the deluge valve and rely on the Station and Instrument Air System for supervisory air. Two preaction sprinkler systems are installed, one in each diesel generator room.

The system deluge valve is actuated either by a signal from a detection system installed in the area the preaction system protects or by manually actuating the deluge valve.

Water entering the preaction system distribution piping will remain in the piping until the individual automatic sprinklers operate. Only sprinklers whose operating elements reach their design operating temperature will fuse, resulting in the discharge of supervisory air and water.

Deluge Sprinkler Systems – Deluge systems consist of open sprinklers (sprinklers from which the operating elements have been removed), distribution piping, a deluge valve with alarm trim (which controls water flow into the system and provides for a water flow alarm), a strainer provided in the supply piping upstream of the deluge valve, and an isolation valve. One deluge system is installed and protects the hydrogen seal oil unit.

The system deluge valve is actuated by one of three methods; from a detection system installed in the room protected by the deluge system, from a manual pull station which sends an electric signal to release the valve or by manually tripping the deluge valve.

Water entering the deluge system distribution piping will be discharged from all sprinklers in the system.

Water Spray Systems – Water spray systems consist of open nozzles, distribution piping, a deluge valve with alarm trim (to control water flow into the system and provide for a water flow alarm), and an isolation valve. A strainer is provided in the supply piping to all water spray systems, with the exception of the system protecting the open penetrations in the walls in room 235.

The deluge valves are actuated by either a detection system installed in the area protected by the water spray system or a manual release station provided at the individual deluge valves, or manually in the Control Room via Simplex System.

Actuation of the deluge valve for a water spray system results in the discharge of water from all system nozzles.

Fire Protection Diesel – The fire pump diesel engine (DB-K6_FP) supplies power to operate the diesel fire pump (DB-P5-2). The fire pump diesel engine starts automatically when the electric fire pump (DB-P5-1) fails to start or the pressure drops below set limits. The fire pump diesel engine will also start automatically if there is a loss of electric power supply or if the fire water storage tank reaches the low water level.

Reason for Scope Determination

The Fire Protection System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Fire Protection System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Fire Protection System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Fire Protection System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Fire Protection System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) regulated event.

USAR References

USAR Section 9.5.1 describes the Fire Protection System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M016A, LR-M016B, LR-M017C, LR-M026B, LR-M269P, LR-M33301

Components Subject to AMR

Table 2.3.3-14 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-14, Aging Management Review Results – Fire Protection System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The jockey fire pump (DB-P6_FP) is replaced periodically. As such it is short-lived and not subject to AMR.
- Fire hoses are within the scope of license renewal. However, they are periodically inspected and replaced. Therefore, the fire hoses are not subject to AMR, as outlined in 10 CFR 54.21(a)(1)(i) and (ii).
- Fire extinguishers, such as those in the Control Room, are periodically inspected and replaced. Therefore the fire extinguishers are short-lived and not subject to AMR, as outlined in 10 CFR 54.21(a)(1)(i) and (ii).
- The fire protection (FP) engine is an active component and not subject to AMR. The FP engine boundary extends to the interfaces with the jacket water, intake and exhaust, fuel oil, and lubricating oil subsystems. The diesel engine boundary includes the engine, intake and exhaust manifolds, lube oil pan (crankcase), and the fuel injectors. This also includes the FP diesel lube oil pump and diesel water pump that are internal to the engine.

- The FP diesel coolant, fuel oil, and lubricating oil filter media are replaced periodically. Also the air intake oil bath filter has the oil, which is the filter media, drained and replaced periodically. As such they are short-lived components and not subject to AMR.
- The FP diesel oil cooler is replaced periodically. As such it is a short-lived component and not subject to AMR.
- The FP diesel fuel oil pump is replaced periodically. As such it is a short-lived component and not subject to AMR.
- The failure due to aging of the piping associated with the diesel engine combustion air supply (see LR-M026B) will not prevent the FP engine from performing its intended function. Therefore, the piping is not subject to AMR.

Table 2.3.3-14
Fire Protection System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Heat Exchanger (channel, shell, and tubesheet) – Fire water storage tank heat exchanger (DB-E52)	Pressure boundary
Heat Exchanger (tubes) – Fire water storage tank heat exchanger (DB-E52)	Heat transfer
Hydrant	Pressure boundary
Orifice	Pressure boundary Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary
Pump Casing – Electric fire pump (DB-P5-1)	Pressure boundary
Pump Casing – Fire water storage tank recirculation pump (DB-P114)	Pressure boundary
Spray Nozzle	Pressure boundary Spray Structural integrity
Strainer (body)	Pressure boundary
Strainer (screen)	Filtration
Tank – Fire water storage tank (DB-T81)	Pressure boundary
Tank – Retard chamber	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

Table 2.3.3.14 (Continued)
Fire Protection System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Fire Protection Diesel	
Bolting	Pressure boundary
Compressor Casing – Turbocharger	Pressure boundary
Filter Body	Pressure boundary
Flexible Connection	Pressure boundary
Gear Housing	Pressure boundary
Heat Exchanger (shell) – Gear housing oil cooler	Pressure boundary
Heat Exchanger (shell) – Radiator	Pressure boundary
Heat Exchanger (tubes) – Gear housing oil cooler	Heat transfer Pressure boundary
Heat Exchanger (tubes) – Radiator	Heat transfer Pressure boundary
Piping	Pressure boundary
Silencer (exhaust)	Pressure boundary
Tubing	Pressure boundary
Valve Body	Pressure boundary

2.3.3.15 Fuel Oil System

System Description

The fire pump diesel day tank (DB-T47) supplies diesel fuel oil to the fire pump diesel engine (DB-K6_FP). The fire pump diesel day tank is refilled through a fill line from the diesel oil storage tank. The tank will contain sufficient fuel to operate the diesel engine at full load for a minimum of 8 hours.

The diesel oil storage tank (DB-T45) can supply fuel oil, via a diesel oil transfer pump (DB-P8-1) and a temporary connection through valve DB-DO118, to the EDG day tanks in the event of a serious fire event coincident with the failure of the EDG fuel oil transfer pump (DB-P195-1).

Reason for Scope Determination

The Fuel Oil System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Fuel Oil System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Fuel Oil System does not contain NSR components that are attached or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Fuel Oil System does not satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The Fuel Oil System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) regulated event.

USAR References

USAR Section 2.2.3.6.2 describes the Fuel Oil System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M017C

Components Subject to AMR

Table 2.3.3-15 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-15, Aging Management Review Results – Fuel Oil System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The temporary connection used to transfer fuel oil from the diesel oil storage tank (DB-T45) to the EDG day tanks during a postulated fire is evaluated as a short-lived component subject to periodic inspection.

Table 2.3.3-15
Fuel Oil System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure boundary
Flexible Connection	Pressure boundary
Piping	Pressure boundary
Pump – Diesel oil transfer pump (DB-P8-1)	Pressure boundary
Strainer (body)	Pressure boundary
Strainer (screen)	Filtration
Tank – Diesel oil storage tank (DB-T45)	Pressure boundary
Tank – Fire pump diesel day tank (DB-T47)	Pressure boundary
Tubing	Pressure boundary
Valve Body	Pressure boundary

2.3.3.16 Gaseous Radwaste System

System Description

The function of the Gaseous Radwaste System is to collect, hold, and reuse or dispose of radioactive gas generated by the station. The system is designed so that estimated releases of gaseous effluents from the station comply with the requirements of 10 CFR 20 and 10 CFR 50.

Hydrogen and fission product gases are vented from the reactor coolant drain tank, makeup tank, and containment vent header, and returned from the Sample System to the waste gas surge tank. From the waste gas surge tank the radioactive gaseous waste is sent to one of two waste gas compressors. The gaseous waste is then transferred to one of three waste gas decay tanks. Once a decay tank is full, the waste gas decays in the tank for at least 30 days. The waste gas then exits the decay tank and either is released in a controlled manner or reused as a cover gas for the clean waste receiver tanks or clean waste monitor tanks. The gas which is released from the waste gas decay tank passes through an absolute filter, charcoal filter, and two radiation detectors at a predetermined rate prior to being released.

The other waste gas compressor takes its suction from a header containing displaced cover gas from the Clean Liquid Radwaste System and vent gases from the boric acid evaporators. This gas is kept separate from the waste gas surge tank gas and is processed in much the same manner as described above.

To preclude forming an explosive hydrogen-oxygen mixture, in-leakage of oxygen is prevented through the use of a nitrogen blanketing system.

Reason for Scope Determination

The Gaseous Radwaste System performs the following safety-related system intended function that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Maintain system pressure boundary integrity.

The Gaseous Radwaste System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Gaseous Radwaste System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Gaseous Radwaste System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Gaseous Radwaste System is not relied upon to demonstrate compliance with, nor satisfies the 10 CFR 54.4(a)(3) scoping criteria for, any regulated event.

USAR References

USAR Section 11.3 describes the Gaseous Radwaste System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M037D, LR-M038A, LR-M038B, LR-M038C, LR-M040A

Components Subject to AMR

Table 2.3.3-16 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-16, Aging Management Review Results – Gaseous Radwaste System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but are not subject to AMR:

- Air operators and associated components – Gaseous Radwaste waste gas surge tank and waste gas decay tanks isolation control valves (DB-WG2853, 2854, 1803, 1810, 1823 through 1828, and 1835 through 1840) are air-operated valves. As shown on LR-M038B and LR-M038C, the isolation control valves to the waste gas surge tank are normally open and fail closed, and the control valves upstream of the waste gas decay tanks and downstream of the waste gas surge tank and waste gas decay tanks are normally closed and fail closed. Therefore, these valves are fail-safe on loss of the control air supply.

  Additionally, the solenoid valves that supply the control air to the air operators, which are themselves active components, fail open to vent the control air lines. As such, a pressure boundary failure of any component within the control air supply will result in the flow control valves going to their safe positions, and the system will perform its intended function. Therefore, the air operators and associated components are not subject to AMR.

- The sample racks DB-R2714 and DB-R2715 are located in room 244 of the Auxiliary Building. The components within the sample racks are all NSR, and do not meet the NSAS criteria and are not subject to AMR. The sample racks DB-R2714 and DB-R2715 provide anchors for safety-nonsafety interfaces and are evaluated as structural bulk commodities (see Section 2.4.13).

Table 2.3.3-16
Gaseous Radwaste System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Compressor Casing – Waste gas compressor (DB-C10-1 & 2)	Structural integrity
Filter Housing – Waste gas absolute filter (DB-F8)	Structural integrity
Heat Exchanger (shell) – Aftercooler (DB-C10-1 & 2)	Structural integrity
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – Waste gas surge tank transfer pump (DB-P168)	Structural integrity
Tank – Waste gas decay tank (DB-T25-1, 2, & 3)	Pressure boundary
Tank – Waste gas surge tank (DB-T24)	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.17 Instrument Air System

System Description

The Instrument Air System is designed to provide a reliable continuous supply of dry, oil-free compressed air for pneumatic instrument operation and for control of pneumatic valves. The Instrument Air System consists of a 100% capacity emergency instrument air compressor provided to supply instrument air during a malfunction of the station air compressors, with prefilters, two sets of heatless air dryers and after-filters. The Station Air System supplies air to the Instrument Air System upstream of the dryer prefilters. The air is filtered and some moisture is removed by a coalescing type prefilter. From the prefilter, the air is further dried by one of the air dryers. The dry air then passes through an after-filter to remove any particulates generated by the dryer bed. Normally one set of dryers is in service with the other in standby.

Reason for Scope Determination

The Instrument Air System performs the following safety-related system intended function that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Provide containment isolation

The Instrument Air System does not contain any NSR components that are identified in the CLB as having the potential to prevent satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Instrument Air System does, however, contain NSR components that are attached to safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Instrument Air System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Instrument Air System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 9.3.1 describes the Instrument Air System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M015A, LR-M029C

Components Subject to AMR

Table 2.3.3-17 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-17, Aging Management Review Results – Instrument Air System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- Air operators and associated components – The Instrument Air System containment isolation valve, DB-IA2011, is an air-operated valve. This valve is normally open and fails closed. Therefore, this valve is fail-safe on loss of the control air supply. Additionally, the solenoid valve that supplies the control air to the operator fails open to vent the control air line. As such, a pressure boundary failure of any component within the control air supply will result in the isolation valve going to its safe position, and the system will perform its intended function. Therefore, the air operator and associated components are not subject to AMR.

Table 2.3.3-17
Instrument Air System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Drain Trap Body	Structural integrity
Moisture Separator Body	Structural integrity
Piping	Pressure boundary Structural integrity
Tubing	Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.18 Makeup and Purification System

System Description

The Makeup and Purification System is operated during all phases of the Nuclear Steam Supply Systems (NSSS) operating life, including startup, power operation and shutdown. The system is also operated during refueling by employing the purification equipment through interconnections to the Decay Heat Removal and Low Pressure Injection System. During reactor operation, the system is designed to serve multiple functions.

The Makeup and Purification System is designed to control the RCS inventory during all phases of normal reactor operation. The system operates in conjunction with the pressurizer to accommodate changes in the reactor coolant volume due to small temperature changes. The system also serves to receive, purify, and recirculate reactor coolant water during reactor operation.

Proper chemistry in the RCS is maintained by the Makeup and Purification System. The system serves to maintain the required boron concentration in order to control reactivity and adds borated water to the core flooding tanks. The system also serves to maintain the proper concentration of hydrogen and hydrazine for oxygen control, lithium for pH control, and to degas the RCS.

In addition, the Makeup and Purification System also serves to supply high pressure water from the makeup tank to the seals of the reactor coolant pumps. Seal water is supplied continuously by one of the makeup pumps. The system also provides makeup to the RCS for protection against small breaks in the RCS pressure boundary. In the event of a loss of all secondary side cooling, the Makeup and Purification System operates to provide feed and bleed capability to maintain core cooling.

Reason for Scope Determination

The Makeup and Purification System performs the following safety-related system intended function that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Provide containment isolation

The Makeup and Purification System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Makeup and Purification System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Makeup and Purification System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Makeup and Purification System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), and Station Blackout (10 CFR 50.63) regulated events.

USAR References

USAR Section 9.3.4 describes the Makeup and Purification System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M031A, LR-M031B, LR-M031C, LR-M033B, LR-M033C, LR-M036B, LR-M037E, LR-M039A, LR-M040D, LR-M042C, LR-M045, LR-OS002

Components Subject to AMR

Table 2.3.3-18 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-18, Aging Management Review Results – Makeup and Purification System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- Component filter media are evaluated as short-lived components (consumables), not subject to AMR. Note that the housings for the purification demineralizer filter (DB-F-35) and seal injection filters (DB-F59-1 and 2) serve a pressure boundary function and are subject to AMR. The housings for the makeup filters (DB-F12-1 and 2) serve a structural integrity function and are also subject to AMR.
- The letdown coolers (DB-E25-1 & 2) are replaced periodically, and are evaluated as short-lived components (consumables). Therefore, the letdown coolers (DB-E25-1 & 2) are not subject to AMR.
- Makeup pump (DB-P37-1 and DB-P37-2) bearings and speed increaser gear are not subject to AMR because they are active components that perform their function with moving parts. However, the housings for these components are subject to AMR since they are part of the pressure boundary for the makeup pump lubrication oil system.
- Valve actuator housings are evaluated as active components, and as such are not subject to AMR.

Table 2.3.3-18
Makeup and Purification System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bearing Housing	Pressure boundary
Bolting	Pressure boundary Structural integrity
Filter Housing	Pressure boundary
Gear Housing	Pressure boundary
Heat Exchanger (channel, shell, tubesheet) – Makeup pump lube oil coolers (DB-E188-1 & 2 and DB-E212-1 & 2)	Pressure boundary
Heat Exchanger (channel, shell, tubesheet) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary
Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Heat transfer Pressure boundary
Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Heat transfer Pressure boundary
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – Makeup pump lubrication oil pumps (DB-P371A-D & DB-P372A-D)	Pressure boundary
Pump Casing – Makeup Pumps (DB-P37-1 & 2)	Pressure boundary
Strainer (body)	Pressure boundary
Strainer (screen)	Filtration
Tank – Air volume tanks	Pressure boundary
Tank – Air volume tanks (DB-T6406 & DB-T6407)	Pressure boundary

**Table 2.3.3-18 (Continued)
Makeup and Purification System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Tank – Makeup pump lubricating oil reservoir	Pressure boundary
Tank – Makeup storage tank (DB-T4_MU)	Pressure boundary
Tank – Purification demineralizers (DB-T5-1, 2, & 3)	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity
Venturi	Pressure boundary Structural integrity Throttling

2.3.3.19 Makeup Water Treatment System

System Description

Two water treatment feed pumps located in the Intake Structure supply lake water to a vendor supplied demineralized water system. Normally one pump is in operation with the other pump on standby. The water is filtered by basket strainers, chlorinated in chlorine detention tanks, and sent to the vendor system.

Water is provided from the Carroll Township water system. The fire water storage tank is supplied from the discharge of the clearwell transfer pumps.

Reason for Scope Determination

The Makeup Water Treatment System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Makeup Water Treatment System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Makeup Water Treatment System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Makeup Water Treatment System satisfies the scoping criteria of 10 CFR 54.4(a)(2)

The Makeup Water Treatment System is not relied upon to demonstrate compliance with, and does not satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated events.

USAR References

USAR Section 9.2.3 describes the Makeup Water Treatment System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M011

Components Subject to AMR

Table 2.3.3-19 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-19, Aging Management Review Results – Makeup Water Treatment System, provides the results of the AMR.

Table 2.3.3-19
Makeup Water Treatment System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural integrity
Piping	Structural integrity
Tubing	Structural integrity
Valve Body	Structural integrity

2.3.3.20 Miscellaneous Building HVAC System

System Description

The Miscellaneous Building HVAC System consists of the Intake Structure H&V and SBODG Room HVAC. Each of the subsystems is discussed below.

Intake Structure H&V – The intake structure ventilation system is designed to maintain the service water pump room between 40°F and 104°F and the diesel fire pump room between 40°F and 120°F year round for all modes of operation including post-accident at design outside conditions. The system consists of four safety-related ventilation fans with associated temperature switches and controls. Each fan is sized at 50% of capacity needed to maintain the above room temperatures. Each channel of fans is started automatically by temperature switches at a predetermined temperature setpoint. The missile protected supply air penthouse is sized to ensure adequate supply air with all four supply fans operating simultaneously.

SBODG Room HVAC – Five wall fire dampers and two room exhaust fans in the SBODG room are required to operate to demonstrate the functionality of the SBODG.

Reason for Scope Determination

The Miscellaneous Building HVAC System performs the following safety-related system intended function that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Maintain a suitable environment inside the service water pump room and the fire pump room to ensure that the service water pumps, fire pump, and electrical distribution equipment can perform their intended functions

The Miscellaneous Building HVAC System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Also, the Miscellaneous Building HVAC System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Miscellaneous Building HVAC System does not satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The Miscellaneous Building HVAC System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), and Station Blackout (10 CFR 50.63) regulated events.

USAR References

USAR Section 9.4.5 describes the Miscellaneous Building HVAC System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M026B, LR-M026B01

Components Subject to AMR

Table 2.3.3-20 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-20, Aging Management Review Results – Miscellaneous Building HVAC System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, dampers (except housings), and fans (except housings), the following components are within the scope of license renewal, but are not subject to AMR:

- The housings of the roof mounted exhaust fans for the traveling screen area (DB-C100) and for the station blackout diesel room (DB-C152-1 & 2) have no passive pressure boundary function for license renewal; air is moved by the active components of the fans, and the air would move without the housing. Therefore, there are no fan housings in the Miscellaneous Building HVAC System that are subject to AMR. The associated structural components (e.g., equipment component supports, vents and louvers) are subject to AMR.
- The Intake Structure fans (DB-C99-1, 2, 3, & 4) are propeller fans mounted on pedestals that blow through openings in the concrete wall, thus, there is no passive pressure boundary function for these fan housings. Therefore, these fan housings are not subject to AMR. The associated structural components (e.g., fan enclosures) are subject to AMR.

Table 2.3.3-20
Miscellaneous Building HVAC System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure boundary
Damper Housing	Pressure boundary

2.3.3.21 Miscellaneous Liquid Radwaste System

System Description

The miscellaneous waste drain tank (MWDT) receives and collects potentially radioactive liquid waste from various sources. By original design, the liquid in the MWDT was pumped to the waste evaporator. The skid mounted demineralizer now processes liquid radwaste while the evaporator is abandoned.

The demineralizer skid consists of various filters and demineralizers that remove solid and ionic impurities from the liquid. From the skid, liquid is pumped through one of two miscellaneous waste monitor tank (MWMT) filters and is collected in the miscellaneous liquid waste monitor tank. From the monitor tank, liquid is pumped in a controlled manner to the collection box.

The detergent waste drain tank (DWDT 1-1) receives and collects potentially radioactive liquid waste from lab sinks, detergent drains, hot shower drains, and the decontamination area. Should the drain tank become full, the DWDT 1-1 holdup tank can accept waste while the drain tank's contents are being processed.

The liquid contents of the DWDT are normally processed through the demineralizer skid. Liquid from the DWDT may alternatively be pumped to the collection box after sampling and analysis, depending on sample results.

Numerous cross connects between the Boron Recovery System and the Miscellaneous Liquid Radwaste System were provided for processing flexibility between the systems, but liquid is never transferred from the Miscellaneous Liquid Radwaste System and the Boron Recovery System due to chemical impurities.

Reason for Scope Determination

The Miscellaneous Liquid Radwaste System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Miscellaneous Liquid Radwaste System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Miscellaneous Liquid Radwaste System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Miscellaneous Liquid Radwaste System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Miscellaneous Liquid Radwaste System is not relied upon to demonstrate compliance with, and does not satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated events.

USAR References

USAR Section 11.2 describes the Miscellaneous Liquid Radwaste System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M031A, LR-M033A, LR-M036A, LR-M037D, LR-M037E, LR-M037F, LR-M037G, LR-M039A, LR-M039B, LR-M045, LR-M046, LR-M281N13

Components Subject to AMR

Table 2.3.3-21 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-21, Aging Management Review Results – Miscellaneous Liquid Radwaste System, provides the results of the AMR.

Table 2.3.3-21
Miscellaneous Liquid Radwaste System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural integrity
Filter Body	Structural integrity
Flexible Connection	Structural integrity
Orifice	Structural integrity
Piping	Structural integrity
Pump Casing – Detergent waste drain tank pump (DB-P52_WM)	Structural integrity
Pump Casing – Miscellaneous waste drain tank pump (DB-P51_WM)	Structural integrity
Pump Casing – Miscellaneous waste monitor tank pump (DB-P54_WM)	Structural integrity
Rupture Disc	Structural integrity
Strainer (body)	Structural integrity
Tank – DWDT 1-1 (DB-T27)	Structural integrity
Tank – DWDT 1-1 hold-up tank (DB-T161)	Structural integrity
Tank – Miscellaneous liquid waste monitor tank (DB-T29)	Structural integrity
Tank – Miscellaneous waste drain tank (DB-T26)	Structural integrity
Tank – Miscellaneous waste evaporator storage tank (DB-T28)	Structural integrity
Tank – Radwaste demineralizer skid vessel (1, 2, 3, 4 & 5)	Structural integrity
Tank – Waste polishing demineralizer (DB-T125)	Structural integrity
Tubing	Structural integrity
Valve Body	Structural integrity

2.3.3.22 Nitrogen Gas System

System Description

The Nitrogen Gas System supplies nitrogen to various plant components from two primary sources: the Cryogenic Nitrogen Storage System and the High Pressure Nitrogen Storage System. Nitrogen is used for a variety of purposes, including acting as a cover gas on components to exclude oxygen and pressurizing tanks and demineralizers to act as the motive force for expelling the tank's contents.

Reason for Scope Determination

The Nitrogen Gas System performs the following safety-related system intended function that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Provide containment isolation

The Nitrogen Gas System does not contain any NSR components that are identified in the CLB as having the potential to prevent satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Nitrogen Gas System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Nitrogen Gas System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Nitrogen Gas System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Figure 7.3-9 describes the Nitrogen Gas System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M019, LR-M030A

Components Subject to AMR

Table 2.3.3-22 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-22, Aging Management Review Results – Nitrogen Gas System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- Air operators and associated components – The 100 psig nitrogen header containment isolation station air valve, DB-NN236, is an air-operated valve. This valve is normally open and fails closed on loss of the control air supply. Additionally, the solenoid valve that supplies the control air to the operator fails open to vent the control air line. As such, a pressure boundary failure of any component within the control air supply will result in the isolation valve going to its safe position, and the system will perform its intended function. Therefore, the air operator and associated components are not subject to AMR.

Table 2.3.3-22
Nitrogen Gas System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Piping	Pressure boundary Structural integrity
Tubing	Pressure boundary
Valve Body	Pressure boundary Structural integrity

2.3.3.23 Process and Area Radiation Monitoring System

System Description

The Process and Area Radiation Monitoring System includes the Process Radiation Monitoring System and the Area Radiation Monitoring System.

The Process Radiation Monitoring System is designed to continuously detect, compute, display, and record the level of radioactivity in certain processes and all effluent pathways in accordance with the requirements of 10 CFR 20, 10 CFR 50, and Safety Guide 21. The system also provides alarms in the Control Room and other designated areas when the radioactivity level increases beyond the set point of the monitors. It also initiates protective functions to maintain process and effluent radioactive levels within acceptable limits.

The Area Radiation Monitoring System is designed to continuously detect and compute the level of radiation in certain areas. The system also provides alarms in the Control Room and the monitored areas to warn personnel of increasing radiation that may be detrimental to their health when the radiation level increases beyond the setpoint of the monitor.

The detector, on being exposed to a radioactive environment, produces minute voltage pulses in proportion to the radiation level. These pulses are conditioned by the preamplifier, and a corresponding signal is sent to a readout module which displays the radiation level on a graduated scale. The readout module also has the capability to alarm on exceeding a preset radiation level and to provide output signals to a remote device, such as a computer or recorder. The area monitors consist of two types, Geiger-Mueller detectors and ionization chamber detectors.

Reason for Scope Determination

The Process and Area Radiation Monitoring System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Continuously monitor levels of radioactivity, provide alarm indications of all monitored levels, and initiate protective functions, as required:
  - Monitor and indicate radiation levels in designated process streams and provide output control signals (RE1412, RE1413, RE8446, and RE8447)
  - Monitor and indicate containment vessel accident/post-accident radiation levels (RE4596A and RE4596B)
  - Monitor and indicate one noble gas channel and one particulate channel in designated process streams (RE4597AA and RE4597BA)
  - Monitor and indicate containment vessel accident/post-accident radiation levels (RE4597AB and RE4597BB)

- Monitor and indicate one noble gas channel in designated process streams and provide output control signals (RE4598AA and RE4598BA)
- Monitor and indicate post-accident noble gas activity levels in designated process streams and provide output control signals (RE4598AB and RE4598BB)
- Monitor and indicate post accident radiation levels in designated process streams (RE5327A, RE5327B, RE5327C, RE5328A, RE5328B, and RE5328C)

The Process and Area Radiation Monitoring System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Process and Area Radiation Monitoring System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose and failure creates a potential for spatial interaction that could or prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Process and Area Radiation Monitoring System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Process and Area Radiation Monitoring System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 11.4 describes the Process and Area Radiation Monitoring System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M027A, LR-M028D, LR-M029B, LR-M029C, LR-M036A

Components Subject to AMR

Table 2.3.3-23 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-23, Aging Management Review Results – Process and Area Radiation Monitoring System, provides the results of the AMR.

Table 2.3.3-23
Process and Area Radiation Monitoring System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary
Duct	Pressure boundary
Orifice	Pressure boundary Throttling
Piping	Pressure boundary
Pump Casing – Control room emergency ventilation system vacuum pumps (DB-MRE-5327 & 5328)	Pressure boundary
Pump Casing – Kaman radiation monitor pumps (DB-P273-1, -2, -3 & -4 and P274-1, -2, -3 & -4)	Pressure boundary
Trap Body	Pressure boundary
Tubing	Pressure boundary
Valve Body	Pressure boundary

2.3.3.24 Reactor Coolant Vent and Drain System

System Description

The Reactor Coolant Vent and Drain System includes the Reactor Coolant Drain Tank and Containment Vent Header System and the Pressurizer Quench Tank System.

Reactor Coolant Drain Tank and Containment Vent Header System – The reactor coolant drain tank (DB-T14) consolidates clean radioactive liquid effluents from many sources. The liquid is then transferred by the reactor coolant drain tank pumps (DB-P46-1 and 2) to the Clean Liquid Radioactive Waste System for processing. These effluents come from drain and bleed lines and from discharge lines of relief valves in primary plant systems.

The containment vent header collects potentially radioactive gases from the RCS vent connections, the secondary side vent of each steam generator, and the pressurizer quench tank (DB-T3) then conveys the gaseous effluent outside containment to the Gaseous Radwaste System. The containment vent header penetration has isolation valves which automatically close following a LOCA.

The containment drain header conveys fluid drained from the RCS and Core Flooding System out of containment to the reactor coolant drain tank (DB-T14). The containment drain header has isolation valves which are normally closed to prevent leakage from the RCS to the reactor coolant drain tank (DB-T14). The containment isolation valves automatically close following a SFAS actuation.

The system also serves to provide containment penetration isolation for drain and vent piping which penetrates containment to reduce containment radioactivity release following an accident.

Pressurizer Quench Tank System – The Pressurizer Quench Tank System conveys effluents released from the pressurizer power operated relief valve, vent line stop valve, and code safety valves. The pressurizer quench tank (DB-T3) uses a sparger assembly which is submerged in subcooled water to condense any steam which may be conveyed to the tank. The water in the pressurizer quench tank (DB-T3) can be cooled by circulating the water through the pressurizer quench tank cooler (DB-E36). This will be required after steam discharge to the tank, or following excessive valve leakage. The pressurizer quench tank (DB-T3) also serves as a holding tank for highly radioactive fluids from the Post Accident Sampling System following a major accident involving fuel element failure. The Pressurizer Quench Tank System pipes penetrating containment provides containment penetration isolation to reduce containment radioactivity release following a LOCA.

Reason for Scope Determination

The Reactor Coolant Vent and Drain System performs the following safety-related system intended function that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Provide containment isolation

The Reactor Coolant Vent and Drain System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Reactor Coolant Vent and Drain System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Reactor Coolant Vent and Drain System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Reactor Coolant Vent and Drain System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 5.0 describes the Reactor Coolant System, which encompasses the Reactor Coolant Vent and Drain System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M010C, LR-M030A, LR-M031C, LR-M033A, LR-M033B, LR-M033C, LR-M037D, LR-M040A, LR-M040D

Components Subject to AMR

Table 2.3.3-24 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-24, Aging Management Review Results – Reactor Coolant Vent and Drain System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The internals (tubes and tubesheets) for the quench tank cooler (DB-E36) are not subject to AMR because this heat exchanger is in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serves only a structural integrity function.

- The internals (piping) for the pressurizer quench tank (DB-T3) are not subject to AMR because this tank is in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and the tank's shell performs the structural integrity function.
- The diaphragm air operated globe valves (RC1773A and B, RC1719A and B, RC229A and B, and RC 232), as shown on LR-M040A, normally fail closed. Therefore, these valves are fail-safe on loss of the control air supply.

  Additionally, the solenoid valves that supply the control air to the air operators, which are themselves active components, fail open to vent the control air lines. As such, a pressure boundary failure of any component within the control air supply will result in the flow control valves going to their safe positions, and the system will perform its intended function. Therefore, the air operators and associated components are not subject to AMR.

Table 2.3.3-24
Reactor Coolant Vent and Drain System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Heat Exchanger (channel, shell) – Quench tank cooler (DB-E36)	Structural integrity
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – Quench tank circulation pump (DB-P87)	Structural integrity
Pump Casing – Reactor coolant drain tank pumps (DB-P46-1) Quench tank circulation pump (DB-P87)	Structural integrity
Rupture Disc	Structural integrity
Tank – Pressurizer quench tank (DB-T3)	Structural integrity
Tank – Reactor coolant drain tank (DB-T14)	Structural integrity
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.25 Sampling System

System Description

The Sampling System includes the Primary Sampling System and the Secondary Sampling System.

Primary Sampling System – The Primary Sampling System is made up of the Reactor Coolant Sampling System and the Post-Accident Sampling System (PASS).

The PASS liquid provides capability to sample the RCS, Decay Heat Removal and Low Pressure Injection System, and letdown system from the Makeup and Purification System. The fluids from sample locations in these systems are routed to a sample cave through sample coolers. The sample coolers cool the sample fluid to approximately 120°F. The system is purged either to the reactor coolant drain tank or pressurizer quench tank. The system is flushed with demineralized water each time after taking a sample. In addition, the PASS liquid has the capability to obtain high pressure liquid samples in a shielded shipping cask. This shipping cask is used to transport the samples to off-site analytical laboratories.

Each primary system grab sample goes through a heat exchanger to reduce the sample temperature to approximately 120°F using component cooling water on the shell side and a pressure control valve to reduce pressure to approximately 40 psig, except the high pressure module where reactor coolant, pressurizer liquid, and vapor bomb samples are reduced to 500 psig for dissolved gas analysis.

Secondary Sampling System – The Secondary Sampling System includes the Feedwater and Steam Sampling System.

The only portions of the Feedwater and Steam Sampling System that are subject to AMR are the samples taken off of the turbine driven auxiliary feed pumps and the steam generator wet lay-up recirculation pumps.

Reason for Scope Determination

The Sampling System performs the following safety-related system intended function that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Provide containment isolation

The Sampling System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Sampling System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Sampling System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Sampling System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 9.3.2 describes the Sampling System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M006D, LR-M007B, LR-M010D, LR-M031A, LR-M033A, LR-M035, LR-M036A, LR-M036C, LR-M037C, LR-M037D, LR-M037E, LR-M037F, LR-M037G, LR-M037H, LR-M038B, LR-M039A, LR-M039B, LR-M040A, LR-M042B, LR-M042C, LR-M045, LR-M046

Components Subject to AMR

Table 2.3.3-25 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-25, Aging Management Review Results – Sampling System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The internals (tubes) for the PASS sample coolers (DB-E144-1, 2, 3, and 4), reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204, and 205), and local grab sample coolers are not subject to AMR because these heat exchangers are in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.
- Air operators and associated components – The pressurizer quench tank Sample isolation valves, DB-SS235A and DB-SS235B, are air-operated valves. These valves are normally closed and fail closed on loss of the control air supply. Additionally, the solenoid valves that supply the control air to the operator fail open to vent the control air line. As such, a pressure boundary failure of any component within the control air supply will result in the isolation valve going to its safe position, and the system will perform its intended function. Therefore, the air operators and associated components are not subject to AMR.

Table 2.3.3-25
Sampling System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Heat Exchanger (shell) – Local grab sample coolers	Structural integrity
Heat Exchanger (shell) – PASS sample coolers (DB-E144-1, 2, 3 & 4)	Structural integrity
Heat Exchanger (shell) – Reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204 & 205)	Structural integrity
Orifice	Structural integrity
Piping	Pressure boundary Structural integrity
Sample Bomb	Structural integrity
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.26 Service Water System

System Description

The Service Water System is designed to serve two functions during station operation. The first function is to supply cooling water to the component cooling heat exchangers, the containment air coolers, and the cooling water heat exchangers in the Turbine Building during normal operation. The second function is to provide, through automatic valve sequencing, a redundant supply path to the engineered safety features components during an emergency. Only one path, with one service water pump, is necessary to provide adequate cooling during this mode of operation.

The Seismic Class I service water pumps are sized to provide cooling water to the component cooling heat exchangers, containment air coolers, and the emergency core cooling system room cooling coils. Two redundant pumps, of 100% capacity each, are provided to back up the operating pump.

The Service Water System also provides a backup source of water to the Auxiliary Feedwater System and the motor-driven feedwater pump (MDFP). During normal operation service water discharge provides makeup for the Circulating Water System.

The portion of the system required for emergency operation, including the Intake Structure, is designed to the ASME Code, Section III, Nuclear Class 3 and Seismic Class I, as applicable. This design includes protection from a tornado and tornado missiles. The associated containment penetrations are Nuclear Class 2.

Three service water pumps are part of the system. They are installed in the Intake Structure and use Lake Erie as a source of water. The Intake Structure is chlorinated to prevent slime and algae growth in the system. Two pumps are used in normal operation. Motor-operated strainers at the pump outlets filter any material that may plug heat exchanger tubes and the orifices of the auxiliary feedwater pump bearing oil cooler, turbine bearing cooler, and governor oil cooler.

The combined flow leaving the system is normally returned to the Circulating Water System as makeup. This flow may also be diverted to the Intake Structure to prevent icing in winter. All Seismic Class I piping which passes through the Turbine Building is enclosed in a Seismic Class I tunnel.

The service water system is designed to prevent any component failure from curtailing emergency operation. It is possible to isolate all heat exchangers and pumps on an individual basis. Additionally, the dilution pump, DB-P180, can supply water to the Service Water System from the Intake Structure in the event of a fire disabling the service water pumps.

Reason for Scope Determination

The Service Water System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide cooling water from the forebay to the following safe shutdown equipment (safety-related heat loads):
    - Containment air cooling units
    - Component cooling water heat exchangers
    - ECCS room coolers
    - Control room emergency ventilation condenser units
    - Hydrogen dilution system blowers
- Provide the safety-related backup source of water to the auxiliary feedwater pumps
- Provide containment isolation
- Isolate non-essential heat loads
- Provide backup source of makeup water to the Component Cooling Water System

The Service Water System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Service Water System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Service Water System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Service Water System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), and Station Blackout (10 CFR 50.63) regulated events.

USAR References

USAR Section 9.2.1 describes the Service Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M006D, LR-M036A, LR-M036B, LR-M041A, LR-M041B, LR-M041C

Components Subject to AMR

Table 2.3.3-26 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-26, Aging Management Review Results – Service Water System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The radiation element (DB-RE8432), as a radiation monitor, does not meet the requirements of 10 CFR 54.21(a)(1)(i).
- The bolting in the service water pumps and dilution pump (DB-P3-1 through 3 and DB-P180) is within the scope of license renewal. However, in the process of rebuilding the pumps, the bolting is inspected and repaired or replaced as necessary. As such the pump bolting is evaluated as short-lived, subject to replacement based on a qualified life or specified time period, and is not subject to AMR.
- The rubber hoses attached to the service water pumps and dilution pump (DB-P3-1 through 3), the strainers downstream of the pumps (DB-F15-1 through 3), and the radiation element (DB-RE8432) are installed for housekeeping purposes to direct packing leak-off to floor drains, and perform no license renewal intended function. Therefore, the rubber hoses are not subject to AMR.
- The nitrogen bottles (DB-T1356 through 1358) supplying DB-SW1356 through 1358 are within the scope of license renewal. The principal design criterion for these bottles is Department of Transportation (DOT) Standards 3AA2015. The nitrogen bottles comply with the requirements of this standard. The bottles are evaluated as consumables, replaced periodically, and not subject to AMR.
- The valve actuator housings for the valves DB-SW1356 through 1358 and DB-SW1424, DB-SW1429, and DB-SW1434 are evaluated as active components, and as such are not subject to AMR.

Table 2.3.3-26
Service Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Expansion Joint	Pressure boundary
Flow Element	Pressure boundary Throttling
Orifice	Pressure boundary Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – Dilution pump (DB-P180)	Pressure boundary
Pump Casing – Service water pumps (DB-P3-1, 2 & 3)	Pressure boundary
Strainer (body, tubesheet)	Pressure boundary
Strainer (screen, tubes)	Filtration
Tank	Pressure boundary
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.27 Spent Fuel Pool Cooling and Cleanup System

System Description

The Spent Fuel Pool Cooling and Cleanup System serves two main functions. The first function is to remove the decay heat generated by spent fuel stored in the pool as a result of normal refueling conditions. The second function is to provide purification of the spent fuel cooling water.

The decay heat removal function is accomplished by recirculating spent fuel cooling water from the spent fuel pool through the spent fuel pool pumps (DB-P44-1 and 2), the spent fuel cooling heat exchangers (DB-E23-1 and 2) and then back to the pool. The spent fuel pool pumps take suction from the pool, circulate the pool water through the tubeside of two heat exchangers, and discharge back to the pool.

The cleanup function is accomplished by a bypass purification system. The bypass loop branches off from the spent fuel pool pump discharge cross-connect line, bypassing the heat exchangers. After demineralizing and filtering, the bypass flow is directed into the normal line downstream of the heat exchanger and returns to the pool.

Reason for Scope Determination

The Spent Fuel Pool Cooling and Cleanup System performs the following safety-related system intended functions that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Provide containment isolation
- Provide a flow path to and from the Decay Heat Removal System (safety-related backup)

The Spent Fuel Pool Cooling and Cleanup System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Spent Fuel Pool Cooling and Cleanup System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Spent Fuel Pool Cooling and Cleanup System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Spent Fuel Pool Cooling and Cleanup System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 9.1.3 describes the Spent Fuel Pool Cooling and Cleanup System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M033A, LR-M033B, LR-M033C, LR-M035, LR-M036C, LR-M039A, LR-M045

Components Subject to AMR

Table 2.3.3-27 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-27, Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The internals (tubes and tubesheets) for the spent fuel pool heat exchangers (DB-E23-1 and 2) are not subject to AMR because these heat exchangers are in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.
- The internals for the spent fuel pool skimmer filter (DB-F4), refueling canal skimmer filter (DB-F44) and spent fuel pool filter (DB-F3), and for strainers (DB-S379 & DB-S380), are not subject to AMR because these filters and strainers are in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.

Table 2.3.3-27
Spent Fuel Pool Cooling and Cleanup System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Filter Housing	Structural integrity
Heat Exchanger (channel, shell) – Spent fuel pool heat exchangers (DB-E23-1 & 2)	Structural integrity
Orifice	Structural integrity
Piping	Pressure boundary Structural integrity
Pump Casing – Spent fuel pool pumps (DB-P44-1 & 2) Spent fuel pool skimmer pump (DB-P45), Refueling canal skimmer pump (DB-P134)	Structural integrity
Strainer (body)	Structural Integrity
Tank – Spent fuel pool demineralizer (DB-T18)	Structural integrity
Tubing	Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.28 Spent Resin Transfer System

System Description

A spent resin storage tank receives and collects spent resin from various demineralizers. A spent resin tank overflow pump transfers excess liquid from the storage tank, through a spent resin tank strainer, to the MWDT. One of two spent resin transfer pumps is used to transfer spent resin from the spent resin storage tank through the drumming station to a high integrity container. Two resin fill tanks are used to fill demineralizers with fresh resin.

The drumming station is no longer used for processing of solid radwaste. Instead, the spent resin is transferred directly to a high integrity container which is placed inside a transfer cask to reduce radiation levels to operating personnel.

Reason for Scope Determination

The Spent Resin Transfer System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Spent Resin Transfer System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Spent Resin Transfer System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Spent Resin Transfer System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Spent Resin Transfer System is not relied upon to demonstrate compliance with, and does not satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated events.

USAR References

USAR Figure 11.2-2 and Section 11.5.3 describe the Spent Resin Transfer System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M031A, LR-M035, LR-M037C, LR-M037E, LR-M039B, LR-M047

Components Subject to AMR

Table 2.3.3-28 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-28, Aging Management Review Results – Spent Resin Transfer System, provides the results of the AMR.

Table 2.3.3-28
Spent Resin Transfer System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Structural integrity
Flexible Connection	Structural integrity
Orifice	Structural integrity
Piping	Structural integrity
Pump Casing – Spent resin tank overflow pump (DB-P140)	Structural integrity
Pump Casing – Spent resin transfer pump (DB-P121-1 & 2)	Structural integrity
Rupture Disc	Structural integrity
Strainer (body)	Structural integrity
Tank – Resin fill tank (DB-T17-1 & 2)	Structural integrity
Tank – Spent resin storage tank (DB-T22)	Structural integrity
Tubing	Structural integrity
Valve Body	Structural integrity

2.3.3.29 Station Air System

System Description

The Station Air System provides clean compressed air for maintenance, testing, fuel oil atomizing, air operated pumps, and other miscellaneous activities. The Station Air System consists of two station air compressors, each capable of supplying all of the plant station and instrument air requirements. During normal operation, one station air compressor will operate to supply station and instrument air requirements, with the other in standby mode. A temporary air compressor can also be utilized to feed the Station Air System through an external isolation valve.

Reason for Scope Determination

The Station Air System performs the following safety-related system intended function that satisfies the scoping criteria of 10 CFR 54.4(a)(1):

- Provide containment isolation

The Station Air System does not contain any NSR components that are identified in the CLB as having the potential to prevent satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Station Air System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Station Air System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Station Air System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 9.3.1 describes the Station Air System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M015D

Components Subject to AMR

Table 2.3.3-29 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-29, Aging Management Review Results – Station Air System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- Air operators and associated components – The Station Air System containment isolation valve, DB-SA2010, is an air-operated valve. This valve is normally closed and fails closed on loss of the control air supply. Additionally, the solenoid valve that supplies the control air to the operator fails open to vent the control air line. As such, a pressure boundary failure of any component within the control air supply will result in the isolation valve going to its safe position, and the system will perform its intended function. Therefore, the air operator and associated components are not subject to AMR.
- Component filter media are evaluated as short lived components (consumables), not subject to AMR. Note that the housing for the station air to containment filter (DB-F86) serves a structural integrity function and is subject to AMR.

Table 2.3.3-29
Station Air System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Filter Housing	Structural integrity
Piping	Pressure boundary Structural integrity
Tubing	Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.30 Station Blackout Diesel Generator System

System Description

A Station Blackout Diesel Generator (SBODG) is provided to supply power to non-essential bus D2 and essential buses D1 or C1 in the event of a Station Blackout (SBO). The SBODG has the capability of manually starting and loading from the Control Room within 10 minutes of this event. There are no automatic start features or loading sequencers associated with the SBODG.

SBODG Air Start System – The air start system consists of the common air compressors, two air receivers, and associated regulating valves, solenoid valves, relay valves, and air start motors. Nominal system pressure ranges from 220 to 250 psig up to the pressure regulator. Acceptable operating pressure downstream of the pressure regulator is 180 +/- 15 psig.

Each air compressor can supply one or both air receivers. The starting air compressors have sufficient capacity to recharge one or both air receivers from 210 to 250 psig air pressure in not more than 30 minutes.

The discharge of each compressor can be connected to either or both air receivers. The air compressors are automatically controlled only by their associated air receiver pressure.

Each of the two air receivers has a capacity of 32 cubic feet, sufficient to provide four starts to the SBODG before recharging. Both air receivers can be aligned to individually supply the SBODG air start motors, or they can be cross-connected in parallel.

SBODG Lubrication System – The SBODG is identical to the emergency diesel generator lube oil system described in Section 2.3.3.12, except for the following differences:

- The AC soakback (circulating) and turbocharger lube oil pumps run continuously while the SBODG is in standby. When a local or remote start signal is received, the AC soakback and AC turbocharger pumps turn off and the DC turbocharger pump turns on. The DC turbocharger pump will run for thirty seconds to allow oil pressure to build-up on the turbocharger bearings, then the engine will start. The basis for this is that during a loss of offsite power event, the SBODG may be without lubrication for a significant amount of time. The DC turbocharger pump cannot be allowed to run continuously on low AC turbocharger discharge pressure since this may seriously drain the SBODG batteries. Thus the timing circuit ensures the turbocharger bearings receive sufficient lubrication regardless of any start scenario.

- After the SBODG shutdown, the DC turbocharger pump will run for an additional ten minutes to ensure the bearings receive sufficient cooling if all power is not available.
- The SBODG lube oil sump is identical to the emergency diesel generator's except that it has a 349 gallon capacity.

SBODG Jacket Water System – Jacket cooling water is circulated in a closed loop through the engine lubricating oil cooler, the engine cooling water passages, the air intake intercooler and the radiator. To allow sufficient time to energize the SBODG bus D3 and the radiator fans the SBODG can operate for approximately 3 minutes at startup and 1 minute at full load without radiator fans running.

The expansion tank provides a 77 gallon surge volume for the closed system. Its location provides net positive suction head (NPSH) for the cooling water pumps, and is slightly higher than the radiator. A pressure cap is installed on the expansion tank to limit the system pressure to seven psig and reduce water loss due to evaporation. A low level alarm is installed to warn the operator of a coolant leak.

Two single-stage, centrifugal pumps provide the driving head for the system. They are engine-driven pumps that supply their respective sides of the engine.

An external horizontally mounted radiator is used to provide cooling for the SBODG. Two fans are utilized to force air over the cooling coils to aid in heat removal. These fans start automatically when an SBODG start signal is received. If the fans are out of service, and the SBODG must be run, most of the engine cooling can be provided by spraying water on to the radiator coils. Engine load capacity in this case will have to be limited to prevent engine overheating depending on weather conditions.

The SBODG immersion heater functions the same as the emergency diesel generator's with the exception that the SBODG maintains the temperature at 125°F to 155°F.

SBODG Fuel Oil System – The 2,000 gallon fuel oil day tank has sufficient capacity to supply at least four hours of SBODG runtime during a blackout event, and an additional four hours for testing. The tank can only be refilled from an external manual fuel hose connection. There are no provisions provided to directly fill this tank from either the 100,000 gallon fuel oil storage tank or the two emergency diesel generator 40,000 gallon fuel oil storage (week) tanks.

The SBODG is supplied with fuel from two fuel oil pumps mounted on the engine skid. One pump is an engine driven pump, while the other is driven by a DC motor. Either pump is sufficient to supply fuel for engine operation and injector lubrication. The pump suctions are continuously flooded.

SBODG Air Intake and Exhaust – Engine combustion air is drawn through a roof-mounted air inlet, and goes through a replaceable dry-type air filter. The filtered air enters the turbocharger, where its pressure is increased. The air is cooled on its way to the cylinders by the aftercoolers. The aftercoolers use the engine cooling water system to remove the heat of compression and increase the air density. The air is then blown into the cylinders for combustion and exhaust gas removal.

Each cylinder exhausts to a central manifold and is then directed though the turbine end of the turbocharger. The turbine vanes are protected by an exhaust screen, which includes a trap to remove foreign material from the gas flow. An inspection port is provided in the exhaust manifold shroud to allow screen inspection without removal. The exhaust gas is used to drive the turbocharger. The exhaust is directed to a silencer on the roof. There is sufficient separation between the intake and exhaust to minimize the amount of exhaust recirculation into the intake.

The turbocharger is an air pump used to increase engine efficiency and horsepower. During startup and low load conditions, the turbocharger is driven by the engine. When sufficient exhaust energy is available (approximately 2,300 kW), the turbocharger speed increases and disengages from the engine though an overrunning clutch.

Reason for Scope Determination

The Station Blackout Diesel Generator System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Station Blackout Diesel Generator System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Station Blackout Diesel Generator System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Station Blackout Diesel Generator System does not satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The Station Blackout Diesel Generator System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Station Blackout (10 CFR 50.63) regulated event.

USAR References

USAR Section 8.3.1.1.4.2 describes the Station Blackout Diesel Generator System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M017D

Components Subject to AMR

Table 2.3.3-30 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-30, Aging Management Review Results – Station Blackout Diesel Generator System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The SBODG engine and generator are active components and not subject to AMR. The diesel engine boundary extends to the interfaces with the jacket water, intake and exhaust, lubricating oil, and starting air subsystems. The diesel engine boundary includes the engine, intake and exhaust manifolds, gear housings, lube oil pan (crankcase), and the fuel injectors.
- The SBODG main, turbo and aux turbo lubricating oil filter media (DB-F152 through 154) are replaced periodically. Also the air intake filter media are replaced periodically. As such they are short-lived components and not subject to AMR.
- The SBODG fuel oil filter media (DB-F148 and 149) are replaced periodically. As such they are short-lived components and not subject to AMR.
- The SBODG circulating (i.e., soakback) oil pump (DB-P280B) is replaced periodically. As such it is a short-lived component and not subject to AMR.
- The SBODG air line lubricators (DB-S435 and 436) are replaced or rebuilt periodically. As such they are short-lived components and not subject to AMR.
- The SBODG AC turbo lube oil pump (DB-P280A) is replaced periodically. As such it is short-lived component and not subject to AMR.
- The SBODG immersion heater element is replaced periodically. As such it is a short-lived component and not subject to AMR.
- The SBODG jacket water pumps (DB-P284-1 and 2) are replaced periodically. As such they are short-lived components and not subject to AMR.
- The SBODG engine-driven fuel oil pump (DB-P281-1) is replaced periodically. As such it is a short-lived component and not subject to AMR.

- The SBODG air start flexible hoses are replaced periodically. As such they are short-lived components and not subject to AMR.
- The SBODG air start motors (DB-S437 through 440) are replaced periodically. As such they are short-lived components and not subject to AMR.
- The SBODG fuel oil, jacket water, and lube oil flexible connections (including instrumentation hoses), which not all are shown on LR-M017D, are replaced periodically. As such they are short-lived components and not subject to AMR. This does not include the flexible connections between the SBODG and the SBODG day tank (DB-T210) and those between the SBODG radiator (DB-E211) and jacket water system. In addition, the flexible connection between the secondary strainer (DB-F149) and fuel priming pump (DB-P281-2) is not replaced.

Table 2.3.3-30
Station Blackout Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary
Compressor Casing – Turbocharger	Pressure boundary
Filter Body	Pressure boundary
Flexible Connection	Pressure boundary
Heat Exchanger (channel, tubesheet) – Radiator (DB-E211)	Pressure boundary
Heat Exchanger (fins) – Radiator (DB-E211)	Heat transfer
Heat Exchanger (shell) – Aftercooler (DB-E215-1 & 2)	Pressure boundary
Heat Exchanger (shell) – Lube oil cooler (DB-E214)	Pressure boundary
Heat Exchanger (shell) – SBO diesel lube oil immersion heater (DB-E216)	Pressure boundary
Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Heat transfer Pressure boundary
Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Heat transfer Pressure boundary
Heat Exchanger (tubes) – Radiator (DB-E211)	Heat transfer Pressure boundary

Table 2.3.3-30 (Continued)
Station Blackout Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Orifice	Pressure boundary Throttling
Piping	Pressure boundary
Pump Casing – DC turbocharger lube pump (DB-P280C)	Pressure boundary
Pump Casing – Engine-driven main lube oil pump (DB-P286A)	Pressure boundary
Pump Casing – Engine-driven piston cooling oil pump (DB-P286B)	Pressure boundary
Pump Casing – Engine-driven scavenge pump (DB-P286C)	Pressure boundary
Pump Casing – Fuel priming pump (DB-P281-2)	Pressure boundary
Silencer (exhaust)	Pressure boundary
Strainer (body)	Pressure boundary
Strainer (screen)	Filtration
Tank – Air receiver tank (DB-T209-1 & 2)	Pressure boundary
Tank – Jacket water expansion tank	Pressure boundary
Tank – SBODG day tank (DB-T210)	Pressure boundary
Tubing	Pressure boundary
Valve Body	Pressure boundary

2.3.3.31 Station Plumbing, Drains, and Sumps System

System Description

The Auxiliary Building contains the following sumps: Auxiliary Building sumps 1-5 and ECCS sumps 1-3.

All of these sumps are located at elevation 545 feet in flood rooms. These sumps and associated sump pumps are sized to handle normal drainage, such as equipment drainage, small pipe leaks, and partial Fire Suppression System actuations. However, the sumps and sump pumps are not sized to handle major pipe ruptures or large Fire Suppression System discharges. The flood rooms accept the excess flow until such time as the sump pumps can pump the excess volume to the MWDT or, if full, to the clean waste receiver tank (CWRT).

A wafer check valve is installed in all drain lines in negative pressure areas of the Auxiliary Building that communicate with atmospheric pressure areas. The wafer valve, installed directly below the drain grates, is supported by a spring and is normally in the horizontal closed position to maintain the differential pressure boundary. The wafer valve will open when there is a small (approximately 1/4 to 3/4 inch) water accumulation on the valve disc. The wafer valve meets all quality assurance requirements and is Seismic Category I.

Drain lines from the negative pressure area of the annulus go to aux bldg sump #1, which is outside the negative pressure boundary, and ECCS sump #1, which is inside the negative pressure boundary however a drain from outside the boundary ties into the annulus drain line. The annulus drain lines are provided with swing-type check valves located on the pipe end in the sand traps in room 114 and 105. The valve is normally held closed by the weight of the disc itself, opening when there is a minimal head of water in the drain line. This provides the required isolation for the negative pressure boundary. The valves and piping to the valves are considered nuclear safety related for negative pressure boundary purposes and are Seismic Category I.

Duplex pumps are installed in each sump. This allows pump starts to be alternated between the two pumps, extending pump life and maintaining equal pump wear. When one pump cannot handle the sump volume, the second pump actuates to assist in sump fluid removal.

The Containment Building Drainage System includes floor drains, equipment drains, the normal sump, and submersible type sump pumps with associated sump level controls. The normal sump in the containment vessel is pumped directly into the MWDT or alternatively may be aligned to be pumped to the CWRT.

All floor and equipment drains, including the Containment air cooler drains, in the Containment Building discharge to the Containment Vessel normal sump.

Containment vessel normal sump pump discharge piping passes through the Containment wall. Containment isolation requirements are met. Containment isolation valves DB-DR2012A, DB-DR2012B and DB-DR2012 and bounded piping are ASME III Class 2 and Seismic Category I.

The service water valve room sump, located at elevation 566 feet, collects water from piping leaks in the valve room and service water pipe tunnel to prevent water from flooding safety-related equipment in the Service Water System. Discharge from the duplex sump pump is directly to the storm sewer.

Discharge from the intake structure sump pumps DB-P145A and DB-P145B passes through oil interceptors prior to discharge to the storm sewer. A second sump and duplex sump pumps DB-P144A and DB-P144B in the intake structure pump house valve room ensure that water is collected and removed in the event of a postulated pipe break in the service water pipe tunnel so that the safety-related service water pumps are not affected. The intake structure pump house valve room sump pumps discharge directly to the storm drain.

All roof drains are gravity flow and drain to the storm sewer.

The plant sewage collects in wet-wells and the lift stations pump the wet-well contents to the Sewage Treatment Plant for processing.

Reason for Scope Determination

The Station Plumbing, Drains, and Sumps System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Maintain the integrity of the negative pressure boundary in the shield building annulus and penetration rooms following a LOCA
- Remove water accumulation from the ECCS pump rooms
- Provide containment isolation

The Station Plumbing, Drains, and Sumps System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Station Plumbing, Drains, and Sumps System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Station Plumbing, Drains, and Sumps System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Station Plumbing, Drains, and Sumps System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Environmental Qualification (10 CFR 50.49) regulated event.

USAR References

USAR Section 9.3.3 describes the Equipment and Floor Drainage System, which is evaluated for license renewal as the Station Plumbing, Drains, and Sumps System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M033B, LR-M033C, LR-M037C, LR-M039A, LR-M041C, LR-M042C, LR-M046, LR-M090

Components Subject to AMR

Table 2.3.3-31 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-31, Aging Management Review Results – Station Plumbing, Drains, and Sumps System, provides the results of the AMR.

**Table 2.3.3-31
Station Plumbing, Drains, and Sumps System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Orifice	Structural integrity
Piping	Pressure boundary Structural integrity
Pump Casing – ECCS sump pumps (DB-P89-1, 2 & 3)	Pressure boundary
Tubing	Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.3.32 Turbine Plant Cooling Water System

System Description

During normal system operation, two of the three Turbine Plant Cooling Water (TPCW) pumps draw suction from the low level cooling water tank (LLCWT) and discharge through two of the three TPCW heat exchangers to the high level cooling water tank (HLCWT). The water in the HLCWT drains by gravity through each component of the turbine plant auxiliary equipment served by the Turbine Plant Cooling Water System. As the water drains through each load, heat is transferred from that load to the Turbine Plant Cooling Water System. The warm water then drains by gravity from the individual loads to the LLCWT. The Turbine Plant Cooling Water System also provides cooling water to the startup feed pump coolers.

Reason for Scope Determination

The Turbine Plant Cooling Water System does not perform any safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1).

The Turbine Plant Cooling Water System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Turbine Plant Cooling Water System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Turbine Plant Cooling Water System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Turbine Plant Cooling Water System is not relied upon to demonstrate compliance with, and does not satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated events.

USAR References

USAR Sections 1.2.8.2.3 and 3.6.2.7.2.17 describe the Turbine Plant Cooling Water System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M006D, LR-M009B

Components Subject to AMR

Table 2.3.3-32 lists the component types that are subject to AMR and their intended functions.

Table 3.3.2-32, Aging Management Review Results – Turbine Plant Cooling Water System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The internals (tubes and tubesheets) for the startup feed pump lube oil cooler (DB-E30) and startup feed pump seal water cooler (DB-E99) are not subject to AMR because these heat exchangers are in scope only for potential leakage and spray considerations in accordance with 10 CFR 54.4(a)(2), and serve only a structural integrity function.

Table 2.3.3-32
Turbine Plant Cooling Water System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Structural integrity
Heat Exchanger (channel) – Startup feed pump lube oil cooler (DB-E30)	Structural integrity
Heat Exchanger (channel) – Startup feed pump seal water cooler (DB-E99)	Structural integrity
Heat Exchanger (shell) – Startup feed pump lube oil cooler (DB-E30)	Structural integrity
Heat Exchanger (shell) – Startup feed pump seal water cooler (DB-E99)	Structural integrity
Piping	Structural integrity
Tubing	Structural integrity
Valve Body	Structural integrity

2.3.4 STEAM AND POWER CONVERSION SYSTEMS

The following systems are addressed in this section:

- Auxiliary Feedwater System (Section 2.3.4.1)
- Condensate Storage System (Section 2.3.4.2)
- Main Feedwater System (Section 2.3.4.3)
- Main Steam System (Section 2.3.4.4)

2.3.4.1 Auxiliary Feedwater System

System Description

The Auxiliary Feedwater System is designed to provide feedwater to the steam generators when the turbine-driven main feedwater pumps are not available or following a loss of normal and reserve electric power. All components and piping in the system are designed to Class I requirements, except the condensate storage tank (CST) supply sources, and are tornado protected.

On station shutdown, the auxiliary feedwater pumps can be used to remove decay heat until the Decay Heat Removal and Low Pressure Injection System can be placed in service. The Auxiliary Feedwater System consists of two steam turbine-driven feedwater pumps, suction and discharge water piping, valves, and associated instrumentation and controls. The pumps take suction from the CSTs, or from the safety-related Seismic Class I Service Water System. A connection is provided to allow the Fire Protection System to supply water to the pump suctions. The turbine driver receives steam from the steam generators and exhausts to the atmosphere. The condensate storage capacity is sized so that a total condensate inventory may be available to the pumps sufficient to remove decay heat for approximately thirteen hours plus a subsequent cooldown to less than 280°F under normal conditions (i.e., no loss of offsite power). Following a complete loss of normal and reserve power, the Auxiliary Feedwater System supplies water directly to the steam generators through the auxiliary feedwater nozzles to remove reactor decay heat. Reactor decay heat removal after coastdown of the reactor coolant pumps is provided by the natural circulation characteristics of the RCS. Use of the Auxiliary Feedwater System for cooldown is discontinued when the RCS temperature decreases to about 280°F; further cooldown is accomplished by the Decay Heat Removal and Low Pressure Injection System.

The Auxiliary Feedwater System normally takes water from the CSTs, which is normally at a temperature between 50°F and 120°F.

Reason for Scope Determination

The Auxiliary Feedwater System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide a safety-related emergency source of feedwater to the steam generators for the removal of decay heat in the absence of main feedwater, and to promote natural circulation in the RCS on a loss of all four reactor coolant pumps
- Provide containment isolation

The Auxiliary Feedwater System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Auxiliary Feedwater System does, however, contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Auxiliary Feedwater System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Auxiliary Feedwater System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), and Station Blackout (10 CFR 50.63) regulated events.

<u>USAR References</u>

USAR Section 9.2.7 describes the Auxiliary Feedwater System.

<u>License Renewal Drawings</u>

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M003C, LR-M006D, LR-M007A, LR-M007B, LR-M024G, LR-M024H

<u>Components Subject to AMR</u>

Table 2.3.4-1 lists the component types that are subject to AMR and their intended functions.

Table 3.4.2-1, Aging Management Review Results – Auxiliary Feedwater System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following AFW components are within the scope of license renewal, but not subject to AMR:

- Pump seals and bearings – The seals and bearings for the auxiliary feedwater pumps (DB-P14-1 and DB-P14-2) include the mechanical seals and bearings in the flow-path of the feedwater. These seals and bearings perform their function with moving parts and are, therefore, also excluded in 10 CFR 54.21(a)(1)(i). As such, the pump seals and bearings (including their integral parts) are not subject to AMR.
- Filter media are short-lived components (consumables), not subject to an AMR. Note that the filter housings do have a pressure boundary function and are subject to AMR.

Table 2.3.4-1
Auxiliary Feedwater System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Flow Element	Pressure boundary Throttling
Heat Exchanger (casing) – AFW pump oil coolers	Pressure boundary
Heat Exchanger (fins) – AFW pump oil coolers	Heat transfer
Heat Exchanger (tubes) – AFW pump oil coolers	Heat transfer Pressure boundary
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – AFW pumps (DB-P14-1 & 2)	Pressure boundary
Strainer (body)	Pressure boundary
Strainer (screen)	Filtration
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.4.2 Condensate Storage System

System Description

The CSTs provide the primary water source for the Auxiliary Feedwater System. The capacity is based on an assumed available inventory sufficient to remove decay heat for thirteen hours plus a subsequent RCS cooldown to less than 280°F, under normal conditions.

The Condensate Storage System is exposed to ambient conditions of 50°F to 120°F and 100% humidity.

Two 250,000-gallon tanks are provided. The tanks are located within a building adjacent to the Turbine Building. Normally, both tanks are in use, being interconnected by piping and normally locked-opened isolation valves. The tanks provide the suction of the auxiliary feed pumps, motor-driven feed pump, and startup feedwater pump.

Level is normally maintained by makeup directly from the 140,000-gallon demineralized water storage tank. The capability also exists to provide makeup through the condenser hotwell. Three 200 gallon per minute demineralized water transfer pumps are available for makeup supply to the tanks with interlocks permitting any two of the pumps to be operating. The pumps are available provided a sufficient level is maintained in the demineralized water storage tank.

The Condensate Storage System consists of two CSTs, supply and return water piping, valves, and associated instrumentation and controls.

Reason for Scope Determination

The Condensate Storage System does not perform any safety-related system intended functions that satisfy the scoping criteria in 10 CFR 54.4(a)(1).

The Condensate Storage System does not contain any NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). The Condensate Storage System does not contain NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1). Therefore, the Condensate Storage System does not satisfy the scoping criteria of 10 CFR 54.4(a)(2).

The Condensate Storage System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) and Station Blackout (10 CFR 50.63) regulated events.

USAR References

USAR Section 9.2.6 describes the Condensate Storage System.

License Renewal Drawings

The following license renewal drawing depicts the evaluation boundaries for the system components within the scope of license renewal:

LR-M006E

Components Subject to AMR

Table 2.3.4-2 lists the component types that are subject to AMR and their intended functions.

Table 3.4.2-2, Aging Management Review Results – Condensate Storage, provides the results of the AMR.

Table 2.3.4-2
Condensate Storage System
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Bolting	Pressure boundary
Piping	Pressure boundary
Tank – Condensate storage tanks (DB-T31-1 & 2)	Pressure boundary
Tubing	Pressure boundary
Valve Body	Pressure boundary

2.3.4.3 Main Feedwater System

System Description

The Main Feedwater System is a closed system with deaeration accomplished in the main condenser and two one-half capacity deaerators. Six stages of feedwater heating (including the deaerators) are incorporated. Chemical injection is provided for pH control and oxygen removal. Condensate polishing demineralizers provide impurity control. The feed pump system takes suction from the deaerators through two low speed booster pumps driven through gear reduction units from the feed pump driving turbines. The booster pumps discharge into the full speed feed pumps direct-connected to the driving turbines. These turbines are variable speed units controlled by the Integrated Control System, which controls feedwater flow to the two steam generators. There are individual control valves to each steam generator to divide flow between the steam generators. In addition to the two turbine-driven main feedwater pumps, a MDFP is installed to provide feedwater to the steam generators during plant startup and shutdown and for oxygen removal during feedwater cleanup. The startup feed pump (SUFP) may be used as a backup to the MDFP in Modes 4, 5, and 6.

Reason for Scope Determination

The Main Feedwater System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide feedwater isolation
- Provide containment isolation

The Main Feedwater System contains NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of a function identified in 10 CFR 54.4(a)(1):

- Provide feedwater isolation (main and start-up control valves)

The Main Feedwater System also contains NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Main Feedwater System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Main Feedwater System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49) regulated events.

USAR References

USAR Section 10.4.7.2 describes the Main Feedwater System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M006D, LR-M007A, LR-M007B, LR-M041B, LR-M024G, LR-M024H

Components Subject to AMR

Table 2.3.4-3 lists the component types that are subject to AMR and their intended functions.

Table 3.4.2-3, Aging Management Review Results – Main Feedwater System, provides the results of the AMR.

Table 2.3.4-3
Main Feedwater System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Filter Housing	Pressure boundary Structural integrity
Heat Exchanger (casing, tubesheet) – MDFP LO cooler (DB-E183)	Pressure boundary
Heat Exchanger (casing, tubesheet) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary
Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Heat transfer Pressure boundary
Heat Exchanger (tubes) – MDFP seal water coolers (DB-184-1 & 2)	Heat transfer Pressure boundary
Orifice	Pressure boundary Structural integrity Throttling
Piping	Pressure boundary Structural integrity
Pump Casing – MDFP (DB-P241)	Pressure boundary
Pump Casing – Motor driven MDFP LO pump (DB-P242-1)	Pressure boundary
Pump Casing – Shaft driven MDFP LO pump (DB-P242-2)	Pressure boundary
Pump Casing – Motor driven SUFP LO pump	Structural integrity
Pump Casing – Shaft driven SUFP LO pump	Structural integrity
Pump Casing – SUFP (DB-P15)	Structural integrity
Tank – Air volume tank	Pressure boundary
Tank – MDFP LO reservoir	Pressure boundary
Tank – SUFP LO reservoir	Structural Integrity

Table 2.3.4-3 (Continued)
Main Feedwater System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Tubing	Pressure boundary Structural integrity
Valve Body	Pressure boundary Structural integrity

2.3.4.4 Main Steam System

System Description

The main steam line takes steam from each of the two steam generators and conducts it through the main steam isolation, main steam non-return, turbine stop, and control valves to the high pressure turbine. There are several taps off the main steam header.

The atmospheric vent valve, safety valves, and auxiliary feed pump turbine lines tap off of the high pressure header between the steam generator and the main steam isolation valves (MSIVs). This design ensures overpressure protection of the steam generator even with the MSIVs shut. This design also allows for cooldown of the primary plant using auxiliary feed and the atmospheric vents when the condenser is not available for cooldown.

The main feed pump turbine, turbine bypass system, and moisture separator reheater (MSR) second stage reheating steam lines tap off of the high pressure header between the non-return valves and the high pressure turbine stop valves. The Auxiliary Steam System supply taps off the high pressure header from steam generator 1-1 in the same location. This design allows for primary system cooldown using the turbine bypass system and the Main Feedwater System. Steam generator 1-2 can also supply the Gland Seal System from a tap on the main steam line to the No. 1 high pressure turbine stop valve. The main feed pump turbines also receive low pressure main steam from between the MSR and low pressure turbines. Steam is extracted from the second stage of the high pressure turbine and used for first stage reheating steam in the MSR.

Reason for Scoping Determination

The Main Steam System performs the following safety-related system intended functions that satisfy the scoping criteria of 10 CFR 54.4(a)(1):

- Provide main steam isolation
- Provide containment isolation
- Provide over-pressure protection for the steam generators
- Remove post-LOCA decay heat by relieving steam to the atmosphere
- Provide a steam supply to the auxiliary feed pump turbines for emergency cooling
- Provide decay heat removal in hot standby (in conjunction with Auxiliary Feedwater System), and maintain secondary system pressure in steam generators, by relieving steam through the atmospheric vent valves or main steam safety valves

The Main Steam System contains NSR components that are identified in the CLB as having the potential to prevent the satisfactory accomplishment of the following 10 CFR 54.4(a)(1) function:

- Provide main steam isolation (turbine stop valves)

The Main Steam System also contains NSR components that are attached to or located near safety-related SSCs, whose failure creates a potential for spatial interaction that could prevent the satisfactory accomplishment of one or more of the functions identified in 10 CFR 54.4(a)(1). Therefore, the Main Steam System satisfies the scoping criteria of 10 CFR 54.4(a)(2).

The Main Steam System is relied upon to demonstrate compliance with, and satisfies the 10 CFR 54.4(a)(3) scoping criteria for, the Fire Protection (10 CFR 50.48), Environmental Qualification (10 CFR 50.49), and Station Blackout (10 CFR 50.63) regulated events.

USAR References

USAR Section 10.3 describes the Main Steam System.

License Renewal Drawings

The following license renewal drawings depict the evaluation boundaries for the system components within the scope of license renewal:

LR-M003A, LR-M003B, LR-M003C, LR-M007A, LR-M007B, LR-M022A, LR-M039A, LR-M045

Components Subject to AMR

Table 2.3.4-4 lists the component types that are subject to AMR and their intended functions.

Table 3.4.2-4, Aging Management Review Results – Main Steam System, provides the results of the AMR.

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components are within the scope of license renewal, but not subject to AMR:

- The tanks DB-T217 and 218 are in fact level indicators, and as such are instruments, and not subject to AMR.
- Air operators and associated components – The main steam isolation bypass valves (DB-MS100-1 and 101-1), the main steam warmup drains (DB-MS394 and 375), and the sample line containment isolation valves (DB-SS598 and 607)

are air-operated valves. The valves fail closed. Therefore, these valves are fail-safe on loss of the control air supply.

Additionally, the solenoid valves that supply the control air to the air operators, which are themselves active components, fail open to vent the control air lines. As such, a pressure boundary failure of any component within the control air supply will result in the valves going to their safe positions, and the system will perform its intended function. Therefore, the air operators and associated components are not subject to AMR.

Table 2.3.4-4
Main Steam System
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Bolting	Pressure boundary Structural integrity
Heat Exchanger (fins) – AFW pump turbine bearing lube oil cooler	Heat transfer
Heat Exchanger (shell) – AFW pump turbine bearing lube oil cooler	Pressure boundary
Heat Exchanger (tubes) – AFW pump turbine bearing lube oil cooler	Heat transfer Pressure boundary
Heat Exchanger (channel, shell, tubesheet) AFW pump turbine governor lube oil coolers (DB-E194-1 & 2)	Pressure boundary
Heat Exchanger (tubes) – AFW pump turbine governor lube oil coolers (DB-E194-1 & 2)	Heat transfer Pressure boundary
Piping	Pressure boundary Structural integrity
Pump Casing – Steam generator wet layup chemical addition metering pump (DB-P259-1 & 2)	Structural integrity
Pump Casing – Steam generator wet layup recirculation pump (DB-P182-1 & 2)	Structural integrity

**Table 2.3.4-4 (Continued)
Main Steam System
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Tank – Air volume tank (DB-T191-1 & 2 and DB-T143-1 & 2)	Pressure boundary
Tank – Steam generator wet layup chemical addition tank (DB-T139-1 & 2)	Structural integrity
Trap Body	Pressure boundary Structural integrity
Tubing	Pressure boundary Structural integrity
Turbine casing – AFW turbine casing (DB-K3-1 & 2)	Pressure boundary
Valve Body	Pressure boundary Structural integrity

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2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

The determination of the structures within the scope of license renewal is made through the application of the process described in Section 2.1. The results of the structural plant-level scoping review are presented in Section 2.2.

Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section.

The screening results for structures consist of lists of components and commodities that require aging management review (AMR). Brief descriptions of the structures within the scope of license renewal are provided as background information. Structural intended functions are described for in-scope structures.

The structures in the scope of license renewal are the:

- Containment (including Containment Vessel, Shield Building, and Containment internal structures) (Section 2.4.1)
- Auxiliary Building (Section 2.4.2)
- Intake Structure, Forebay, and Service Water Discharge Structure (Section 2.4.3)
- Borated Water Storage Tank Level Transmitter Building (Section 2.4.4)
- Miscellaneous Diesel Generator Building (Section 2.4.5)
- Office Building (Condensate Storage Tanks) (Section 2.4.6)
- Personnel Shop Facility Passageway (Missile Shield Area) (Section 2.4.7)
- Service Water Pipe Tunnel and Valve Rooms (Section 2.4.8)
- Station Blackout Diesel Generator Building (including Transformer X-3051 and Radiator Skid Foundations) (Section 2.4.9)
- Turbine Building (Section 2.4.10)
- Water Treatment Building (Section 2.4.11)
- Yard Structures (Section 2.4.12)

  Note: The yard structures evaluated for license renewal include foundations and structural arrangements for the Borated Water Storage Tank (including Trench); Diesel Oil Pump House, Diesel Oil Storage Tank, Emergency Diesel Generator Fuel Oil Storage Tanks; Fire Hydrant Hose Houses; Fire Walls between Bus-Tie Transformers, between Bus-Tie and Startup Transformer 01, and between Auxiliary and Main Transformers; Fire Water Storage Tank; Nitrogen Storage

Building; Station Blackout Components and Structures In the Yard and Switchyard (Startup Transformers 01 and 02, Bus-Tie Transformers, 345-kV Switchyard circuit breakers ACB34560, ACB34561, ACB34562, ACB34563, ACB34564, air break switch ABS34625, Relay House, “J” and “K” buses); Wave Protection Dikes; Duct Banks; Cable Trenches; and Manholes.

Structural components for in-scope structures are addressed in the structure reviews (Section 2.4.1 through 2.4.12).

Structural commodities (e.g., anchorages, instrument panels, cable trays, conduits, fire seals, fire doors, equipment and component supports, etc.) are addressed in the bulk commodities review (Section 2.4.13).

2.4.1 CONTAINMENT (INCLUDING CONTAINMENT VESSEL, SHIELD BUILDING, AND CONTAINMENT INTERNAL STRUCTURES) – SEISMIC CLASS I

Structure Description

The Seismic Class I Containment consists of three basic structures: a free-standing steel Containment Vessel, a reinforced concrete Shield Building, and the internal structures. The Containment Vessel is a cylindrical steel pressure vessel with hemispherical dome and ellipsoidal bottom which houses the reactor vessel, reactor coolant piping, pressurizer, pressurizer quench tank and coolers, reactor coolant pumps, steam generators, core flooding tanks, letdown coolers, and ventilating systems. It is completely enclosed by a reinforced concrete Shield Building having a cylindrical shape with a shallow dome roof. An annular space is provided between the wall of the Containment Vessel and the Shield Building, and clearance is also provided between the Containment Vessel and the dome of the Shield Building. The Containment Vessel and Shield Building are supported on a concrete foundation founded on a firm rock structure. With the exception of the concrete under the Containment Vessel there are no structural ties between the Containment Vessel and the Shield Building above the foundation slab. Above this there is unlimited freedom of differential movement between the Containment Vessel and the Shield Building. The Containment internal structures are constructed of reinforced concrete and structural steel. These structures are isolated from the Containment Vessel by steel grating panels with sliding supports which allows free differential movement between the internal structures and the vessel. The internal structures are supported by the massive concrete fill within the Containment Vessel bottom head.

The Shield Building is a concrete structure surrounding the Containment Vessel. It is designed to provide biological shielding during normal operation and from hypothetical accident conditions. The building provides a means for collection and filtration of fission product leakage from the Containment Vessel following a hypothetical accident through the Emergency Ventilation System, an engineered safety feature designed for that purpose. In addition, the building provides environmental protection for the Containment Vessel from adverse atmospheric conditions and external missiles.

The Containment Vessel is a Seismic Category I structure which is designed, fabricated, erected, tested, and quality-control documented in accordance with the requirements for Class B vessels of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, 1971. The Containment Vessel is a right cylindrical, freestanding, vertical steel pressure vessel with a hemispherical top head, and an ASME ellipsoidal bottom head. Access to the Containment Vessel is provided by a personnel air lock, an emergency air lock, and an equipment hatch. The equipment hatch is used during plant shutdown maintenance periods. A construction opening has been permanently sealed and leak tested. A similar opening used for reactor vessel head replacement was also permanently sealed and leak tested. Penetrations are provided in the vessel shell for mechanical, electrical, and instrumentation service access to the Containment interior.

Penetration bellows assemblies allow differential movement between the Containment Vessel and the Auxiliary Building. Each penetration bellows assembly is an extension of the Containment and is designed for containment pressure and displacement resulting from thermal expansion and seismic movements. The larger penetrations such as main steam and feedwater are anchored in the Auxiliary Building floor. Flexible bellows type connections are provided at the Containment Vessel shell allowing for all differential movements between the two structures.

The Containment internal structures are comprised of the reactor cavity (primary shield wall), the secondary shield wall, the refueling pool, the operating floors, miscellaneous equipment supports, stairs, and service missile shields. The primary coolant system including the reactor, steam generators, pressurizer and reactor coolant pumps is supported by these structures. Shield walls and floors are constructed of reinforced concrete. Structural steel frames and columns support the floors and transmit loads to the foundations. Metal decks provided support for the concrete floors during concrete placement. The Containment interior structures internal to the Containment Vessel include, but are not limited to:

- Primary shield structure, forming the reactor cavity
- Secondary shield structure, forming the steam generator compartments and the peripheral shield walls
- Polar crane
- Reactor service crane
- Refueling canal and fuel handling bridge
- Platforms and floors
- Elevator shaft and stairway
- Nuclear Steam Supply System (NSSS) components, supports, and restraints
- Pipe supports and restraints
- Missile shields and jet impingement barriers

<u>Reason for Scope Determination</u>

The Containment is within the scope of license renewal as a Seismic Class I structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Containment is to provide physical support and protection for safety-related systems, equipment, and components.

The Containment System is designed to provide protection for the public from the consequences of any break in the reactor coolant piping up to and including a double-ended break of the largest reactor coolant pipe assuming unobstructed discharge from both ends.

The Containment design, along with the engineered safety features provided, ensure that the exposure of the public resulting from a hypothetical accident is below the guidelines established by 10 CFR 100.

The steel Containment Vessel provides a pressure and thermal-resistant barrier to control the release of radiation and radiation-contaminated matter into the environment in the event of a postulated accident.

The Shield Building serves two primary functions: radiation shielding and environmental protection.

The Containment shelters and protects nonsafety-related systems, structures, and components (SSCs) whose failure could prevent performance of a safety-related function. Therefore, it meets the 10 CFR 54.4(a)(2) scoping criteria.

The Containment is relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) and Fire Protection (10 CFR 50.48) regulated events. This meets the 10 CFR 54.4(a)(3) scoping criteria.

USAR References

Updated Safety Analysis Report (USAR) Sections 1.2.10.2, 3.8.2, 3.8.2.1.10, 3.8.2.3.1, and 6.2.1.3.2 describe the Containment and its major structural components.

Components Subject to AMR

Table 2.4-1 lists the component types that require AMR and their intended functions.

The structural commodities for the Containment are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-1, Aging Management Review Results - Containment, provides the results of the AMR.

Table 2.4-1
Containment
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Containment Emergency Sump Recirculation Valve Enclosure Bellows	EN, SPB, SSR
Containment Emergency Sump Recirculation Valve Enclosures	EN, SPB, SSR
Containment Normal Sump	SNS
Containment Normal Sump Liners	SNS
Containment Vessel	EN, FLB, HELB, SHD, SPB, SRE, SSR
Containment Vessel Emergency Sump	DF, SSR
Containment Vessel Emergency Sump (including sump liner, antivortexing gratings, perforated plates, and trash racks)	DF, SSR
Cranes, including Bridge, Trolley, Rails, and Girders	SNS, SSR
Emergency Air Lock (including flange gaskets and closure mechanisms)	EN, SPB, SSR
Equipment Hatch (including flange gaskets and closure mechanisms)	EN, SPB, SSR
Floor Decking	SNS

Table 2.4-1 (Continued)
Containment
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Foundations	EN, EXP, FLB, SRE, SSR
Incore Tunnel	DF, SSR
LOCA Restraint Ring Cooling Fins	SSR
LOCA Restraint Rings	SSR
Lubrite® sliding supports	SSR
Neutron Streaming Shield Panels	SHD, SNS
Nuclear Instrumentation Shielding	SHD, SNS
Nuclear Instrumentation Support	SSR
Penetration Bellows	EN, SPB, SSR
Penetrations (Mechanical and Electrical, containment boundary)	EN, SPB, SSR
Permanent Reactor Cavity Seal Plate	FLB, SSR
Personnel Air Lock (including gaskets, hatch locks, hinges and closure mechanisms)	EN, SPB, SSR
Pressurizer Supports	SSR
Primary Shield Wall	EN, MB, SHD, SSR
Reactor Cavity Missile Shield	EN, MB, SHD, SSR
Reactor Closure Head and CRD Service Structure	SNS
Reactor Coolant Pressure Boundary Thermal Insulation	SNS
Reactor Head Storage Stand	SNS
Reactor Shield Wall Liner	SHD, SSR

Table 2.4-1 (Continued)
Containment
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Reactor Vessel Supports	SSR
Reactor Vessel Thermal Insulation	EN, SNS
Refueling Canal	SHD, SSR
Refueling Canal Fuel Storage Rack	SSR
Refueling Canal Liner	FLB, SSR
Reinforced Concrete: Walls, floors, and ceilings	EN, FLB, HELB, MB, PW, SHD, SNS, SPB, SRE, SSR
Secondary Shield Wall	EN, HELB, MB, SHD, SRE, SSR
Shield Building Dome	EN, MB, SPB, SRE, SSR
Shield Building Emergency Air Lock Enclosure	EN, MB, SSR
Shield Building Walls (above grade)	EN, FB, MB, SHD, SPB, SRE, SSR
Shield Building Walls (below grade)	EN, FB, SPB, SRE, SSR
Station Vent Stack Supports	SNS
Steam Generator Supports	SSR
Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE, SSR
Trash Rack Gates	SSR
Trisodium Phosphate Baskets	SSR

2.4.2 AUXILIARY BUILDING– SEISMIC CLASS I

Structure Description

The Auxiliary Building is a Seismic Class I structure with steel framing and reinforced concrete walls, roofs, and floors. It is a five-story building with two levels below grade. Radioactive waste (radwaste) systems are housed in the basement. The remainder of the building is used for fuel storage and handling, the control room, switchgear, emergency diesel generators, air handling systems and other operational facilities.

The Auxiliary Building is an L-shaped structure that has three foundation levels. The northeast portion of the Auxiliary Building is supported on grade beams connected to pier footings. Pier footings extend through compacted granular backfill beneath the floor slab and are socketed into bedrock. The southeast portion of the Auxiliary Building is supported on a mat foundation that bears on bedrock. The southwest portion of the Auxiliary Building is supported on a mat foundation; the outside walls are supported on strip footings. The bottom of the mat is underlain by concrete backfill over bedrock and can be considered to be supported on bedrock.

The control room contains control panels necessary for maintaining safe plant shutdown. Safe occupancy of the control room during abnormal conditions is provided for in the design of the control room. The Control Room Emergency Ventilation System (CREVS) is provided with radiation detectors and appropriate alarms. When CREVS is operating with makeup air, a positive control room pressure is maintained to minimize in-leakage. The Control Room Emergency Ventilation System is evaluated as a mechanical system.

The two emergency diesel generators are located in separate rooms at the north end of the Auxiliary Building on elevation 585’-0”, adjacent to the Shield Building. A three-hour rated firewall separates the two generators. Independence and physical separation between the two units and between each unit and the other power sources are maintained so that no credible single event will disable more than one unit.

The fuel storage area accommodates the spent fuel storage pool and its spent fuel storage racks, cask pit, transfer pit, storage facilities for new fuel assemblies and control rods, a spent fuel cask washdown facility, and a fuel handling crane.

The main steam line areas on elevation 643’-0” house the main steam lines between the Containment and Turbine Building. In addition to being designed for design loads established for Seismic Class I structures, these areas are designed for postulated accident loads. Explosion roof vents would relieve pressure in the event of a main steam line break.

The Emergency Ventilation System is provided with prefilter, HEPA filter and charcoal absorber banks. In the event radioactivity levels should exceed acceptable limits, the exhaust air may be passed through the Emergency Ventilation System HEPA filters and charcoal absorbers, before being discharged through the station vent stack. The station vent stack is located in the Auxiliary Building at elevation 623'-0" and extends through the Auxiliary Building roof. The station vent stack is supported by the Auxiliary Building and the Shield Building. The Emergency Ventilation System is evaluated as a mechanical system.

Two fuel transfer penetrations are provided to transport fuel assemblies between the refueling canal and the spent fuel pool during refueling operations of the reactor. Each penetration consists of a 30-inch diameter stainless steel pipe installed inside a 42-inch sleeve. The inner pipe acts as the transfer tube. Provisions are made to maintain integrity of containment, allow for differential movement between structures and prevent leakage through the transfer tubes in the event of an accident. The fuel transfer tubes penetration bellows assemblies are addressed with the Containment, in Section 2.4.1.

The penetration bellows assemblies allow differential movement between the Containment Vessel and the Auxiliary Building. Each penetration bellows assembly is an extension of the containment and is designed for containment pressure and displacement resulting from thermal expansion and seismic movements. The larger penetrations such as main steam and feedwater are anchored in the Auxiliary Building floor. Flexible bellows type connections are provided at the Containment Vessel shell allowing for all differential movements between the two structures. Penetration bellows assemblies are addressed with the Containment, in Section 2.4.1.

Access to the containment vessel is provided by a personnel air lock, an emergency air lock, and an equipment hatch. The personnel air lock, emergency air lock, and equipment hatch are addressed with the Containment, in Section 2.4.1.

The Auxiliary Building consists of the following major areas and design considerations:

- The Control Room houses electrical controls to monitor and control plant functions and safety class systems.
- The Mechanical and Electrical Penetration Rooms are maintained under a negative pressure to prevent any contaminants from leaking to clean areas of the Auxiliary Building. The penetration rooms house the process pipe and electrical penetrations that pass through the Shield Building wall.
- The main steam line areas house the main steam lines as they leave the Containment to pass into the Turbine Building. These areas are designed to withstand the design loads established for Seismic Category I structures.
- The Diesel Generator area houses the two emergency diesel generators. A fire wall separating the two engine areas is provided in accordance with Fire Code requirements.

- The Spent Fuel Pool, Fuel Transfer Pit (also known as transfer pit or fuel transfer tube pit) and Cask Pit walls and floors are lined with 1/4-inch-thick stainless steel liner plate. A watertight, bulkhead gate separates the spent fuel pool from the fuel transfer pit and another separates it from the cask pit. Struts are installed on the walls between the fuel transfer pit and the spent fuel pool when the fuel transfer pit water level is below the bottom of the spent fuel pool bulkhead gate. The struts prevent the wall from becoming overstressed during a seismic event.
- New fuel is stored in the New Fuel Storage Area. The storage rack assemblies are constructed of stainless steel.

Reason for Scope Determination

The Auxiliary Building is within the scope of license renewal as a Seismic Class I structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Auxiliary Building is to provide physical support and protection for safety-related systems, equipment, and components.

The Auxiliary Building shelters and protects nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, it meets the 10 CFR 54.4(a)(2) scoping criteria.

The Auxiliary Building is relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) and Fire Protection (10 CFR 50.48) regulated events. This meets the 10 CFR 54.4(a)(3) scoping criteria.

USAR References

USAR Sections 3.8.1.1.1, 3.8.2.1.10, 8.3.1.2.3, 9.1.2.2, 12.2.1, 2C.6.2, and 3D.1.15 describe the Auxiliary Building.

Components Subject to AMR

Table 2.4-2 lists the component types that require AMR and their intended functions.

The structural commodities for the Auxiliary Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-2, Aging Management Review Results - Auxiliary Building, provides the results of the AMR.

Table 2.4-2
Auxiliary Building
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Auxiliary Building Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR
Auxiliary Building Exterior Walls (below grade)	EN, FLB, SNS, SRE, SSR
Auxiliary Feedpump Turbine Exhaust	EN, MB, SRE, SSR
Battery Rack	SSR
Blowoff Roof Vents	EN, PR, SSR
Blowout Panels	PR, SSR
Cask Pit	SSR
Cask Pit Liner	FLB, SSR
Control Room Ceiling	SNS
Cranes, including Bridge, Trolley, Rails, and Girders	SNS, SSR
Floor Decking	SNS
Foundations	EN, EXP, FLB, SNS, SRE, SSR
Fuel Transfer Pit	SSR
Fuel Transfer Pit Liner	FLB, SSR

**Table 2.4-2 (Continued)
Auxiliary Building
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Fuel Transfer Pit Struts	SSR
Fuel Transfer Tubes	SSR
Louvered Penthouses	EN, SSR
Masonry Block Wall Bracings and Frames	SNS, SSR
Masonry Block Walls	EN, FB, FLB, SHD, SNS, SRE, SSR
Missile Shield Walls	MB, SSR
New Fuel Storage Pit	EN, SSR
New Fuel Storage Racks	SSR
Pipe Tunnel	EN, SSR
Reinforced Concrete: Walls, floors, and ceilings	EN, FB, FLB, HELB, MB, PW, SHD, SNS, SPB, SRE, SSR
Roof Decking	SNS
Roof Penthouses	EN, MB, SSR
Roof Slabs	EN, MB, SNS, SRE, SSR
Shield Panels	SHD, SNS
Spent Fuel Pool	SHD, SSR
Spent Fuel Pool Bulkhead Gates	SSR
Spent Fuel Pool Liner	FLB, SSR
Spent Fuel Rack Neutron Absorbers	ABN, SSR
Spent Fuel Storage Racks	SSR

**Table 2.4-2 (Continued)
Auxiliary Building
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Station Vent Stack	RP, SNS
Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE, SSR
Sump	SNS

2.4.3 INTAKE STRUCTURE, FOREBAY, AND SERVICE WATER DISCHARGE STRUCTURE – SEISMIC CLASS I

Intake Structure – Seismic Class I

Structure Description

The ultimate heat sink for Davis-Besse is Lake Erie, which is the source of cooling water for the Service Water System. This single water source is utilized for both normal and emergency shutdown conditions. Lake water is conducted through the intake water system to the Intake Structure, where the service water pumps are located.

The Intake Structure is a Seismic Class I structure of reinforced concrete construction. Each of the three main service water pumps is housed in an individual cell, and each cell is designed to include such features as removable sliding screens for debris control and stop logs (gates) for dewatering cells during maintenance work. The intake structure is supported on a mat foundation bearing on bedrock.

The reinforced concrete substructure of the Intake Structure and enclosures for the service water pumps are designed to withstand a Class I seismic event, as well as tornado and turbine missiles. There are three floors, two of which accommodate all the pumps, traveling screens, and other equipment. The third floor is used as a secondary laydown area. The Seismic Class II structural steel superstructure is provided for Class II equipment on the second floor. A nonsafety-related 40-ton gantry crane is provided above the structure for equipment services and maintenance.

The Intake Structure is designed to withstand the effects of flooding and wave run-up. Water stops are provided at construction joints of Seismic Class I structures which prevent water from entering the structure. Watertight doors at both access openings complete the barrier against water entering the service water pump room. Floor drains and a sump collect seepage which might enter the room during a flood. Seismic Class I systems and structures are completely protected from adverse effects of flooding.

The Intake Structure consists of the following major components and design considerations:

- Service water pumps (Class I) (evaluated by mechanical)
- Diesel-driven fire water pump (Class II) (evaluated by mechanical)
- Backup Service Water Pump (also known as the Dilution Pump) (Class II) (evaluated by mechanical)
- Traveling screens (Class II)
- The Seismic Class II structural steel superstructure of the Intake Structure has insulated metal siding on structural steel frames.

- The diesel-driven fire pump fuel oil day tank is enclosed in a metal sided enclosure adjacent to the diesel-driven fire water pump room.
- The Intake Structure is founded on a 3-foot thick mat foundation bearing on bedrock at elevation 543 feet.

<u>Reason for Scope Determination</u>

The Intake Structure is within the scope of license renewal as a Seismic Class I structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Intake Structure is to provide physical support and protection for the Seismic Category I service water pumps and piping that are a part of the reactor emergency cooling water system. The Intake Structure, in conjunction with the Forebay, functions to provide a source of cooling water for the Service Water System.

The Intake Structure shelters and protects nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, it meets the 10 CFR 54.4(a)(2) scoping criteria.

The Intake Structure provides physical support and the water supply for the diesel-driven fire pump and contains credited fire barriers relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

The Intake Structure provides physical support and the water supply for the backup service water pump for compliance with the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

The Intake Structure provides physical support to the Service Water pumps which are relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

Forebay – Seismic Class I

<u>Structure Description</u>

The Forebay, approximately 700 feet long, impounds a body of water that serves as a heat sink. The dikes on each side are classified and designed as Class I structures. Steel sheet pilings and concrete retaining walls provide slope stability at the Forebay area near the Intake Structure.

The ultimate heat sink for Davis-Besse is Lake Erie, which is the source of cooling water for the Service Water System. This single water source is utilized for both normal and emergency shutdown conditions. Lake water is conducted through the intake water system to the Intake Structure, where the service water pumps are located. An open Forebay area ahead of the Intake Structure serves as a reservoir for an ensured source of water in case of an extreme lowering of the lake due to meteorological conditions, or collapse of the intake canal or submerged pipes.

The Forebay consists of the following major structural components and design considerations:

- Class I Intake Forebay Dike fill (hereafter referred to as Class I intake fill) was placed and compacted along the Intake Canal to elevation 582 feet between approximately station 0+00 and station 7+00. Class I intake fill material consists of compacted glaciolacustrine and till deposit obtained from on-site borrow areas.
- The width of the Intake Canal, measured between the dike crest centerlines, ranges from 430 feet between station 0+00 to 7+00 (Class I portion) to 270 feet beyond station 7+00 (non-Class I portion). The dike slopes of the inboard and outboard canal are 3:1 (3 horizontal to 1 vertical) from Station 0+00 to approximately Station 10+00. From approximately Station 10+00 to Station 27+50, the inboard side of the canal varies with a slope of 3:1 and a slope of 2:1, with a few localized areas down to a 1.5:1 slope. The invert of the canal is in till deposit, except between station 0+00 and approximately station 2+00 where the invert is in bedrock. The inboard sides of the 3:1 canal slopes are lined with a three-foot thick facing of random placed angular quarry stone between station 0+00 and station 5+50. Beyond station 5+50, the canal dike slopes are also lined with smaller size riprap with a depth generally less than three feet thick. The canal invert and outboard side of the canal dike are unlined.
- Steel sheet pilings at the Forebay area adjacent to the Intake Structure are anchored into bedrock via concrete filled borings. Support braces anchored into bedrock via concrete filled borings are provided as lateral support to the sheet pilings. Rock anchors provide rock stability in the vicinity of sheet piling anchors. Reinforced concrete retaining walls at the Forebay area are founded on bedrock.

Reason for Scope Determination

The Forebay is within the scope of license renewal as a Seismic Class I structure, which meets the criteria of 10 CFR 54.4(a)(1).

The function of the Forebay is to impound and supply cooling water to remove heat from all nuclear plant equipment that is essential for a safe and orderly shutdown of the reactor and to maintain it in a safe shutdown condition.

The function of the Forebay is to impound and supply cooling water to the Service Water System which is relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

The function of the Forebay is to impound and supply water to the diesel-driven fire pump which is relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

Service Water Discharge Structure – Seismic Class I

Structure Description

The Service Water Discharge Structure is a partially buried concrete structure located on the intake channel dike and discharges to the south side of the Forebay. The Service Water Discharge Structure consists of a concrete end-wall, slab, and spillway. A buried 42-inch diameter concrete pipe sleeve encases the service water discharge piping below the Forebay dike. The Service Water Discharge Structure is the safety-related Service Water discharge flowpath for Davis-Besse.

The Service Water discharge lines to the Cooling Tower are not seismically qualified and are not credited for accident mitigation. In the event that one of the non-seismic Service Water discharge lines is in use when a Loss of Coolant Accident (LOCA) occurs, the line may be partially or completely blocked. If the pressure in the safety-related common discharge header rises above a pre-determined pressure switch setpoint, one of the seismic flowpaths will be automatically established. Administrative controls have been established for the operators to manually establish a safety-related Service Water discharge flowpath if the common discharge header pressure remains below the pressure switch setpoint. The automatic transfer and manual actions assure that a safety-related Service Water discharge flow path is always established. The Service Water discharge can be redirected from the non-seismic cooling tower path to the seismic forebay path via the Service Water Discharge Structure when required to maintain water level in the Forebay above elevation 564 feet International Great Lakes Datum.

Reason for Scope Determination

The Service Water Discharge Structure is within the scope of license renewal as a Seismic Class I structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Service Water Discharge Structure is to provide physical support and protection for the Seismic Category I service water discharge pipe.

USAR References

USAR Sections 3.4.1, 3.7.2.10, 3.8.1.1.2, 3.8.1.1.6, 9.2.1.2, 9.2.1.3, 9.2.5, 2C.6.2.4.c, 2C.6.3.3, and 2C.6.4 and USAR Figure 3.6-18 describe the Intake Structure, Forebay, and Service Water Discharge Structure.

Components Subject to AMR

Table 2.4-3 lists the component types that require AMR and their intended functions.

The structural commodities for the Intake Structure, Forebay, and Service Water Discharge Structure are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-3, Aging Management Review Results – Intake Structure, Forebay, and Service Water Discharge Structure, provides the results of the AMR.

Table 2.4-3
Intake Structure, Forebay, and Service Water Discharge Structure
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Battery Rack	SRE
Cranes, including Bridge, Trolley, Rails, and Girders	SNS
Fan Enclosure	EN, MB, SSR
Forebay (including riprap)	HS, SRE, SSR
Forebay Retaining Walls	FLB, SSR
Foundations	EN, EXP, FLB, SNS, SRE, SSR
Intake Structure Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR

**Table 2.4-3 (Continued)
Intake Structure, Forebay, and Service Water Discharge Structure
Components Subject to Aging Management Review**

Component Type	Intended Function (as defined in Table 2.0-1)
Intake Structure Exterior Walls (below grade)	EN, FLB, SNS, SRE, SSR
Louvered Penthouse	EN, MB, SSR
Masonry Block Walls	EN, FB, FLB, SRE, SSR
Metal Siding	SNS, SRE
Pump Intake Cells	HS, SRE, SSR
Reinforced Concrete: Walls, floors, and ceilings	EN, FB, FLB, MB, SNS, SRE, SSR
Roof Decking	SNS, SRE
Roof Slabs	EN, MB, SNS, SRE, SSR
Service Water Discharge Pipe Sleeve	EN, SSR
Service Water Discharge Structure	EN, MB, SSR
Sheet Pilings (includes Support Braces and Rock Anchors)	FLB, SNS, SSR
Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE
Sump	SNS
Trash Rack Guides	SNS
Trash Racks	SNS
Traveling Screen Casing and Associated Framing	SNS

2.4.4 BORATED WATER STORAGE TANK LEVEL TRANSMITTER BUILDING – SEISMIC CLASS II

Structure Description

The Borated Water Storage Tank (BWST) Level Transmitter Building is a Seismic Class II structure located adjacent to the BWST. It houses and protects safety-related components associated with the BWST. The BWST Level Transmitter Building is a shed-like structure that consists of steel beam framing with metal siding and roof. The steel framing is supported by reinforced concrete piers. The building has a gravel floor.

The BWST Level Transmitter Building contains safety-related components as identified in the plant configuration database.

Reason for Scope Determination

The BWST Level Transmitter Building is a Seismic Class II structure located adjacent to the Seismic Class I BWST and contains safety-related components, therefore it meets the 10 CFR 54.4(a)(2) scoping criteria.

USAR References

The structural details of the BWST Level Transmitter Building are not described in the USAR.

Components Subject to AMR

Table 2.4-4 lists the component types that require AMR and their intended functions.

The structural commodities for the BWST Level Transmitter Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-4, Aging Management Review Results - BWST Level Transmitter Building, provides the results of the AMR.

Table 2.4-4
Borated Water Storage Tank Level Transmitter Building
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Foundation Piers	SNS
Metal Roof	EN, SNS
Metal Siding	EN, SNS
Structural Steel: Beams, Columns, Plates, and Trusses	SNS

2.4.5 MISCELLANEOUS DIESEL GENERATOR BUILDING – SEISMIC CLASS II

Structure Description

The Miscellaneous Diesel Generator Building is located north of the Water Treatment Building and does not house any equipment that is used for any functions related to license renewal. The structure is a single story structure constructed of concrete masonry units on a concrete slab at grade.

The Yard is designated as a fire area to ensure safe shutdown with a fire outside or in miscellaneous buildings, such as the Miscellaneous Diesel Building, which contain cables that might affect safe shutdown such as the cable bus to the 13.8-kV to 4.16-kV transformer. A credited three-hour interior fire wall separates the miscellaneous diesel room and the oil tank room within the Miscellaneous Diesel Generator Building.

Reason for Scope Determination

The Miscellaneous Diesel Generator Building contains credited fire barriers relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

USAR References

The structural details of the Miscellaneous Diesel Generator Building are not described in the USAR.

Components Subject to AMR

Table 2.4-5 lists the component types that require AMR and their intended functions.

The structural commodities for the Miscellaneous Diesel Generator Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-5, Aging Management Review Results - Miscellaneous Diesel Generator Building, provides the results of the AMR.

Table 2.4-5
Miscellaneous Diesel Generator Building
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Exterior Walls (above grade)	SRE
Foundations	SRE
Masonry Block Walls	FB, SRE
Reinforced Concrete: Walls, floors, and ceilings	SRE
Roof	SRE
Structural Steel: Beams, Columns, Plates, and Trusses	SRE

2.4.6 OFFICE BUILDING (CONDENSATE STORAGE TANKS) – SEISMIC CLASS II

Structure Description

The Office Building is adjacent to the Turbine Building. The Office Building is a Seismic Class II structure with steel framing, reinforced concrete floors and walls, vertical window wall exterior panels and precast concrete exterior wall panels. The structure is supported by reinforced concrete caissons that are socketed into and bear directly on bedrock. The structural steel framing is independent of the Turbine Building, as directed by fire code requirements. Part of the Office Building provides an enclosure for the two nonsafety-related condensate storage tanks and associated piping. The Condensate Storage Tanks provide the primary water source for the Auxiliary Feedwater System. The Office Building provides office space for plant personnel. It also houses other personnel facilities, such as locker rooms, a tool crib, and a storage area.

The Office Building also contains rated fire barriers credited for safe shutdown analysis.

The turbine-driven auxiliary feed pumps provide feedwater to the steam generators by taking suction from the Condensate Storage Tanks and are driven by steam from either steam generator during a Station Blackout event.

Only the Condensate Storage Tank area and credited fire barriers are within the scope of license renewal. The remaining portions of the Office Building are not within the scope of license renewal.

Reason for Scope Determination

The Office Building contains credited fire barriers relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

The function of the Office Building is to provide physical support and shelter for the Condensate Storage Tanks which provide a source of cooling water used for the Station Blackout (10 CFR 50.63) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

USAR References

The structural details of the Office Building are not described in the USAR. The Office Building is depicted in USAR Figures 1.2-2, 1.2-4, 1.2-5, 1.2-10 and 1.2-11.

Components Subject to AMR

Table 2.4-6 lists the component types that require AMR and their intended functions.

The structural commodities for the Office Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-6, Aging Management Review Results - Office Building (Condensate Storage Tanks), provides the results of the AMR.

Table 2.4-6
Office Building (Condensate Storage Tanks)
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Condensate Storage Tanks Foundation	SRE
Exterior Walls (above grade)	SRE
Foundations (including caissons)	SRE
Masonry Block Walls	FB, SRE
Reinforced Concrete: Ceilings	FB, SRE
Reinforced Concrete: Walls and floors	SRE
Structural Steel: Beams, Columns, Plates, and Trusses	SRE
Wall Panel Support Frames	SRE
Window Wall Panels	SRE

2.4.7 PERSONNEL SHOP FACILITY PASSAGEWAY (MISSILE SHIELD AREA) – SEISMIC CLASS I

Structure Description

A Seismic Class I reinforced concrete passageway entry interface with the Auxiliary Building Radiological Restricted Area (RRA) at elevation 603' – 0" provides tornado missile protection to two Auxiliary Building doors.

Only the Missile Shield portion of the Personnel Shop Facility Passageway is within the scope of license renewal. The remaining portions of the Personnel Shop Facility are not within the scope of license renewal.

Reason for Scope Determination

The safety-related Personnel Shop Facility Passageway Missile Shield Area provides missile protection to the Auxiliary Building. This meets the 10 CFR 54.4(a)(1) scoping criteria.

The Personnel Shop Facility Passageway Missile Shield Area shelters and protects nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, it meets the 10 CFR 54.4(a)(2) scoping criteria.

USAR References

The structural details of the Personnel Shop Facility Passageway Missile Shield Area are not described in the USAR. The Personnel Shop Facility Passageway Missile Shield Area is depicted in USAR Figures 1.2-4, 3.6-3 and 3.6-7.

Components Subject to AMR

Table 2.4-7 lists the component types that require AMR and their intended functions.

The structural commodities for the Personnel Shop Facility Passageway Missile Shield Area are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-7, Aging Management Review Results - Personnel Shop Facility Passageway (Missile Shield Area), provides the results of the AMR.

Table 2.4-7
Personnel Shop Facility Passageway (Missile Shield Area)
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Exterior Walls (above grade)	MB, SSR
Foundations	SSR
Metal Floor Deck	SSR
Metal Roof Decking	SNS
Metal Siding	SNS
Reinforced Concrete: Walls, floors, and ceilings	MB, SSR
Roof	MB, SSR
Structural Steel: Beams, Columns, Plates, and Trusses	SSR

2.4.8 SERVICE WATER PIPE TUNNEL AND VALVE ROOMS – SEISMIC CLASS I

Structure Description

The Service Water Pipe Tunnel is located between the Auxiliary Building and the Intake Structure. This reinforced concrete tunnel is buried underground and shields the safety-related Service Water pipes and other minor pipes. Valve Room No. 1 is located adjacent to the Auxiliary Building in the Turbine Building. Valve Room No. 2 is located adjacent to the Intake Structure. Both Valve Rooms are single below ground reinforced concrete rooms, housing required valves and connections for the Service Water pipes. The concrete roofs of these valve rooms are designed for protection from tornado and turbine missiles. These structures are designed for Class I seismic loads.

The portion of the Seismic Class I Service Water Pipe Tunnel that runs to the northeast from the east side of the basement of the Turbine Building is completely surrounded by a granular compacted fill with a minimum top cover of four feet. The 10-inch concrete ground floor slab bears on the compacted fill. The reinforced concrete tunnel, four feet of compacted fill cover and the 10-inch concrete ground floor slab protect the Class I piping against the unlikely failure of the Class II Turbine Building superstructure.

The Seismic Class I Service Water Pipe Tunnel may be flooded due to postulated failures of either the water treatment structures/systems or failure of Seismic Class II pipe within the tunnel. The tunnel is sealed at both ends, thereby preventing flooding of either the Auxiliary Building or the Intake Structure. The Seismic Class I systems within the tunnel are designed to remain operational while flooded.

The Service Water Pipe Tunnel and Valve Rooms contain rated fire barriers credited for safe shutdown analysis.

The Service Water Pipe Tunnel and Valve Rooms provide support to the Service Water system piping and valves which are relied upon to supply cooling water to safe shutdown equipment (safety-related heat loads) during a Station Blackout event.

Reason for Scope Determination

The Service Water Pipe Tunnel and Valve Rooms are within the scope of license renewal as a safety-related structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the Service Water Pipe Tunnel and Valve Rooms is to provide physical support and protection for safety-related equipment.

The Service Water Pipe Tunnel and Valve Rooms shelter and protect nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, it meets the 10 CFR 54.4(a)(2) scoping criteria.

The Service Water Pipe Tunnel and Valve Rooms contain credited fire barriers relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

The Service Water Pipe Tunnel and Valve Rooms provides physical support to the Service Water system piping which are relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

The function of the Service Water Pipe Tunnel and Valve Rooms is to provide protection from damage due to earthquake, tornadoes, or the array of credible missiles.

The function of the Service Water Pipe Tunnel and Valve Rooms is to provide flood protection to the Auxiliary Building and the Intake Structure in the event of postulated failures of either the water treatment structures or systems, or failure of Seismic Class II pipe within the tunnel.

USAR References

USAR Sections 3.4.1, 3.8.1.1.3, and 3.8.1.1.6 describe the Service Water Pipe Tunnel and Valve Rooms. The Service Water Pipe Tunnel and Valve Rooms are depicted in USAR Figures 3.6-18, 3.6-20, 9.3-14 and 9.3-15.

Components Subject to AMR

Table 2.4-8 lists the component types that require AMR and their intended functions.

The structural commodities for the Service Water Pipe Tunnel and Valve Rooms are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-8, Aging Management Review Results - Service Water Pipe Tunnel and Valve Rooms, provides the results of the AMR.

Table 2.4-8
Service Water Pipe Tunnel and Valve Rooms
Components Subject to Aging Management Review

Component Type	**Intended Function (as defined in Table 2.0-1)**
Foundations	SNS, SRE, SSR
Reinforced Concrete: Walls, floors, and ceilings	EN, FB, FLB, MB, SNS, SRE, SSR
Sumps	SNS

2.4.9 STATION BLACKOUT DIESEL GENERATOR BUILDING (INCLUDING TRANSFORMER X-3051 AND RADIATOR SKID FOUNDATIONS) – SEISMIC CLASS II

Structure Description

The Station Blackout Diesel Generator (SBODG) serves as the alternate AC source for station blackout. The SBODG is capable of supplying either of the station's essential 4.16-kV buses through nonessential Bus D2 and is available within ten minutes of the onset of station blackout. The Station Blackout Diesel Generator Building is a prefabricated building with spread footings for building columns and grade beams for the perimeter walls. It is a Seismic Class II structure with an independent reinforced concrete foundation for the diesel generator. The structure houses, supports and protects the SBODG and its supporting equipment.

A 2,000 gallon SBODG fuel oil storage tank is located within the SBODG Building.

The Transformer X-3051 Foundation is located just north of the SBODG Building and provides power to the SBODG generator room and battery room heaters. The Transformer X-3051 Foundation is a reinforced concrete slab on grade.

The Radiator Skid Foundation is a reinforced concrete foundation located outside adjacent to the SBODG Building providing support to the SBODG radiator skid.

Reason for Scope Determination

The function of the Station Blackout Diesel Generator Building is to provide physical support for equipment relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) regulated event and for recovery from a Station Blackout as defined in 10 CFR 50.2. This meets the 10 CFR 54.4(a)(3) scoping criteria.

The function of the Transformer X-3051 Foundation is to provide physical support for Transformer X-3051 which supplies power to the SBODG generator room and battery room heaters.

The function of the Radiator Skid Foundation is to provide physical support for the SBODG radiator skid.

USAR References

USAR Sections 2.2.3.6.2, 8.1.2, and 8.3.1.1.4.2 describe the Station Blackout Diesel Generator. The structural details of the Station Blackout Diesel Generator Building are not described in the USAR.

Components Subject to AMR

Table 2.4-9 lists the component types that require AMR and their intended functions.

The structural commodities for the Station Blackout Diesel Generator Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-9, Aging Management Review Results - Station Blackout Diesel Generator Building, provides the results of the AMR.

Table 2.4-9
Station Blackout Diesel Generator Building
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Battery Rack	SRE
Foundations	SRE
Masonry Block Walls	SRE
Metal Roof	SRE
Metal Siding	SRE
Radiator Skid Foundation	SRE
Reinforced Concrete: Floors and ceilings	SRE
Structural Steel: Beams, Columns, Plates, and Trusses	SRE
Sumps	SRE
Transformer Foundation	SRE

2.4.10 TURBINE BUILDING – SEISMIC CLASS II

Structure Description

The Turbine Building is a Seismic Class II structure with steel framing, exterior metal siding, metal roof deck, and floors of reinforced concrete or steel grating. The structure is supported by concrete caissons and in some areas a mat foundation bearing on bedrock. Two 190-ton capacity bridge cranes are provided to service the building and equipment. The Turbine Building houses the turbine generator unit, condenser, feedwater systems, and associated equipment.

A small portion of the Class I reinforced concrete Auxiliary Building supports the structural steel framing for the heater bay of the Class II Turbine Building. Multi-level steel floor framing, the elevated and ground floor concrete slabs in the heater bay, and the reinforced concrete Auxiliary Building walls and slabs protect the Class I structure from the unlikely failure of the Class II structure or equipment.

The Turbine Building also contains rated and non-rated fire barriers credited for safe shutdown analysis.

The Turbine Building contains safety-related components as identified in the plant configuration database.

Reason for Scope Determination

The Turbine Building is a Seismic Class II structure adjacent to the Auxiliary Building and contains safety-related components; therefore it meets the 10 CFR 54.4(a)(2) scoping criteria.

The Turbine Building contains credited fire barriers and provides physical support to portions of the fire protection piping relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

USAR References

The structural details of the Turbine Building are not described in the USAR. The Turbine Building is depicted in USAR Figures 1.2-2, 1.2-3, 1.2-11, 3.6-20, 3.6-21, 3.6-22, 3.6-23 and 9.3-15.

Components Subject to AMR

Table 2.4-10 lists the component types that require AMR and their intended functions.

The structural commodities for the Turbine Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-10, Aging Management Review Results - Turbine Building, provides the results of the AMR.

Table 2.4-10
Turbine Building
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Foundations	EN, EXP, FLB, SNS, SRE
Masonry Block Walls	FB, SRE
Metal Roof Decking	EN, SNS, SRE
Metal Siding	EN, SNS, SRE
Reinforced Concrete: Walls, floors, and ceilings	EN, FB, SNS, SRE
Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE
Sumps	SNS
Turbine Generator Pedestal	SNS

2.4.11 WATER TREATMENT BUILDING – SEISMIC CLASS II

Structure Description

The Water Treatment Building is a Seismic Class II structure with steel framing, reinforced concrete or steel grated floors, and metal roof deck. The structure is supported on a mat foundation bearing directly on bedrock. The Water Treatment Building houses the electric motor-driven fire pump, jockey fire water pump and associated piping; makeup water treatment system and the systems necessary to provide all plant potable water. The Water Treatment Building also contains rated fire barriers credited for safe shutdown analysis.

Reason for Scope Determination

The function of the Water Treatment Building is to provide physical support and protection for equipment used for the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

The Water Treatment Building contains credited fire barriers relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

USAR References

The structural details of the Water Treatment Building are not described in the USAR.

Components Subject to AMR

Table 2.4-11 lists the component types that require AMR and their intended functions.

The structural commodities for the Water Treatment Building are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-11, Aging Management Review Results - Water Treatment Building, provides the results of the AMR.

Table 2.4-11
Water Treatment Building
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Foundations	EXP, SRE
Masonry Block Walls	FB, SRE
Metal Roof Decking	SRE
Metal Siding	SRE
Reinforced Concrete: Walls, floors, and ceilings	SRE
Structural Steel: Beams, Columns, Plates, and Trusses	SRE
Sumps	SRE

2.4.12 YARD STRUCTURES

Yard Structures are structures at Davis-Besse not contained within or attached to buildings such as the Shield Building, Auxiliary Building, and Turbine Building. The yard structures evaluated for license renewal include foundations and structural arrangements for the:

- Borated Water Storage Tank (Including Trench)
- Diesel Oil Pump House
- Diesel Oil Storage Tank
- Emergency Diesel Generator Fuel Oil Storage Tanks
- Fire Hydrant Hose Houses
- Fire Wall between Bus-Tie Transformers
- Fire Wall between Bus-Tie Transformer and Startup Transformer 01
- Fire Wall between Auxiliary and Main Transformers
- Fire Water Storage Tank
- Nitrogen Storage Building
- Station Blackout Components and Structures in the Yard and Switchyard including Startup Transformers 01 and 02; Bus-Tie Transformers; 345-kV Switchyard circuit breakers ACB34560, ACB34561, ACB34562, ACB34563 and ACB34564; 345-kV Switchyard air break switch ABS34625; Relay House and the 345-kV Switchyard “J” and “K” buses
- Wave Protection Dikes
- Duct Banks
- Cable Trenches
- Manholes

The following yard structures were determined to be within the scope of license renewal:

2.4.12.1 Borated Water Storage Tank Foundation (including trench) – Seismic Class I

<u>Structure Description</u>

The BWST foundation and pipe trench are designed to Seismic Class I requirements and are located to the west of the Auxiliary Building. The foundation of the tank is a reinforced concrete mat resting on Class I structural backfill. The structural backfill extends to the in-situ rock. The below grade portion of the BWST piping is installed inside a pipe trench that is covered with steel plate and concrete hatch covers.

Reason for Scope Determination

The BWST foundation (including trench) is within the scope of license renewal as a Seismic Class I structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the BWST foundation is to provide physical support for the BWST and protection for the piping located in the trench below the BWST foundation. The function of the BWST pipe trench is to provide physical support and shelter for piping associated with the BWST. The BWST itself provides support for some mechanical and electrical components.

The BWST foundation (including trench) shelters and protects nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, it meets the 10 CFR 54.4(a)(2) scoping criteria.

2.4.12.2 Diesel Oil Pump House – Seismic Class II

Structure Description

The Diesel Oil Pump House is a reinforced concrete structure located adjacent to the Diesel Oil Storage Tank. The Diesel Oil Pump House is designed to Seismic Class II requirements. The foundation is situated approximately 10 ft. below grade and is founded on Seismic Class II structural backfill material. The Diesel Oil Pump House allows transfer of fuel oil for the auxiliary boiler, diesel fire pump and miscellaneous diesel generator.

In the event of a postulated fire where the two emergency diesel generator fuel oil storage tanks are located, diesel fuel oil can be transferred from the nonsafety-related diesel oil storage tank using the nonsafety-related diesel oil transfer pump via a flexible hose. The emergency diesel generator fuel oil tank 1 and emergency diesel generator fuel oil transfer pump 1 would then not be used.

Reason for Scope Determination

The function of the Diesel Oil Pump House is to provide physical sheltering and support for the nonsafety-related diesel oil transfer pump and associated components. These components are used to provide an alternate fuel supply to the emergency diesel generator day tanks in the event of a postulated fire where the two emergency diesel generator fuel oil storage tanks are located. This meets the 10 CFR 54.4(a)(3) scoping criteria.

2.4.12.3 Diesel Oil Storage Tank Foundation – Seismic Class II

Structure Description

The diesel oil storage tank foundation rests on a reinforced concrete mat which is also part of the oil spill retention area (retaining area) for the storage tank. The foundation is designed to Seismic Class II requirements and is founded on Seismic Class II structural backfill material. The diesel oil storage tank foundation supports the diesel oil storage tank which supplies on-site fuel oil for the auxiliary boiler, diesel fire pump and miscellaneous diesel generator.

In the event of a postulated fire where the two emergency diesel generator fuel oil storage tanks are located, diesel fuel oil can be transferred from the nonsafety-related diesel oil storage tank using the nonsafety-related diesel oil transfer pump via a flexible hose. The emergency diesel generator fuel oil tank 1 and emergency diesel generator fuel oil transfer pump 1 would then not be used.

Reason for Scope Determination

The function of the diesel oil storage tank foundation is to provide physical support for the diesel oil storage tank which is credited to provide an alternate fuel supply to the emergency diesel generator day tanks in the event of a postulated fire. This meets the 10 CFR 54.4(a)(3) scoping criteria.

2.4.12.4 Emergency Diesel Generator Fuel Oil Storage Tanks Foundation – Seismic Class I

Structure Description

The two Emergency Diesel Generator Fuel Oil Storage (Week) Tanks are buried and are designed to Seismic Category I requirements. These tanks are supported by a reinforced concrete foundation and are covered with compacted material that qualifies as Seismic Category I structural backfill. The structural backfill along with vents and flame arresters reduce the probability of a fire. The structural backfill and other associated concrete and steel components are included for evaluation with the Tanks Foundation. The location of the tanks ensures that the effects of a fire would not affect the safe shutdown of the plant. The truncated pyramid of structural backfill built around the tanks provides tornado missile protection. The Emergency Diesel Generator (EDG) day tanks in the Auxiliary Building are filled automatically via separate transfer systems which receive fuel oil from the two EDG Fuel Oil Storage Tanks.

Reason for Scope Determination

The EDG Fuel Oil Storage Tanks foundation is within the scope of license renewal as a Seismic Class I structure, which meets the criteria of 10 CFR 54.4(a)(1). The function of the EDG Fuel Oil Storage Tanks Foundation with its associated components and structural backfill is to provide physical support and protection for the EDG Fuel Oil Storage Tanks which supply fuel oil to the Emergency Diesel Generators.

2.4.12.5 Fire Hydrant Hose Houses and Foundations – Seismic Class II

Structure Description

The outside manual fire hose installations have been evaluated and are sufficient to reach any location within the protected area with an effective hose stream. Fire hydrants are installed on the yard fire main system approximately every 250 feet.

Fire hydrant hose houses provide storage of necessary fire fighting equipment and the hose house foundations provide support to the hose houses. Fire hydrant hose houses are prefabricated steel sheds with two hinged doors on concrete pier foundations.

Reason for Scope Determination

The function of the in-scope fire hydrant hose houses and foundations is to provide physical sheltering and support for fire hydrants which are part of the fire suppression system. This meets the 10 CFR 54.4(a)(3) scoping criteria.

2.4.12.6 Fire Walls between Bus-Tie Transformers, between Bus-Tie and Startup Transformer 01, and between Auxiliary and Main Transformers – Seismic Class II

Structure Description

The Main, Auxiliary, Bus-Tie, and Startup Transformers are large oil-filled transformers. Three-hour barrier fire walls are provided between the Main and Auxiliary Transformers, the Bus-Tie Transformers, and between the Bus-Tie and Startup Transformer 01.

Reason for Scope Determination

The Fire Walls between Bus-Tie Transformers, between Bus-Tie and Startup Transformer 01, and between Auxiliary and Main Transformers are credited fire barriers relied upon to demonstrate compliance with the Fire Protection (10 CFR 50.48) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

2.4.12.7 Fire Water Storage Tank Foundation – Seismic Class II

Structure Description

The Fire Suppression system provides water for all automatic and manual fire water suppression systems. Two separate water supplies and fire water pumps are utilized to deliver water to the system. The primary supply consists of a fire water storage tank from which an electric motor-driven fire pump receives water, while the secondary water supply is Lake Erie, from which a diesel fire pump takes suction.

The fire water storage tank is a 300,000 gallon storage tank. The tank, foundation, and sub-base are designed to Seismic Class II requirements. The sub-base is constructed of earthen materials and compacted to Seismic Class II structural requirements.

Reason for Scope Determination

The function of the fire water storage tank foundation is to provide physical support for the fire water Storage tank which is the primary fire water supply for the Fire Suppression system. This meets the 10 CFR 54.4(a)(3) scoping criteria.

2.4.12.8 Nitrogen Storage Building – Seismic Class II

Structure Description

The Nitrogen Storage Building is located north-west of the Borated Water Storage Tank. The Nitrogen Storage Building is a single story steel framed storage structure with reinforced concrete foundation, walls, and roof. It provides shelter and support to the cryogenic nitrogen storage tank and the high pressure nitrogen storage system.

The Borated Water Storage Tank does not require protection from potential missiles since the nitrogen storage tank (located within the Nitrogen Storage Building), which is the nearest potential missile source, is enclosed in a structure capable of sustaining potential missiles from this source.

Reason for Scope Determination

The Nitrogen Storage Building provides missile protection to the Borated Water Storage Tank from potential missile sources contained within the Nitrogen Storage Building. This meets the 10 CFR 54.4(a)(2) scoping criteria.

2.4.12.9 Station Blackout Component Foundations and Structures in the Yard and Switchyard (Startup Transformers 01 and 02; Bus-Tie Transformers; 345-kV Switchyard circuit breakers ACB34560, ACB34561, ACB34562, ACB34563 and ACB34564; air break switch ABS34625; Relay House; “J” and “K” buses) – Seismic Class II

Structure Description

The station blackout component foundations and structures in the yard and switchyard (Startup Transformers 01 and 02; Bus-Tie Transformers; 345-kV switchyard circuit breakers ACB34560, ACB34561, ACB34562, ACB34563 and ACB34564; air break switch ABS34625; Relay House; “J” and “K” buses) are Seismic Class II structures. Startup Transformers 01 and 02, Bus-Tie Transformers, and associated breakers (circuit breakers ACB34560, ACB34561, ACB34562, ACB34563, ACB34564 and air break switch ABS34625) define the physical boundary that provides an offsite alternating current (AC) source for recovery from a station blackout regulated event.

Startup Transformer 01, Startup Transformer 02, and the Bus-Tie Transformers have reinforced concrete foundations that rest on structural backfill. The transformers are supported on wall and column footings. The switchyard breakers are supported by steel frame structures and the bus support structures are supported by reinforced concrete caisson foundations. Cable trenches provide routing space and support to electrical cables within the station blackout boundary. The concrete cable trench is provided with removable checkered plates and top slabs for access.

The Relay House is a Seismic Class II structure located at the southeast corner of the switchyard. It is a single story building with a basement constructed with reinforced concrete and concrete masonry blocks with precast decorative panels above grade. The Relay House contains the metering and relaying panels, supervisory controls, and the DC system equipment for the 345-kV switchyard and transmission systems.

Circuit breakers ACB34560, ACB34561, ACB34562, ACB34563 and ACB34564; air break switch ABS34625; the Relay House and “J” and “K” Bus Support Structures are located within the 345-kV Switchyard. The Relay House is located just east of the switchyard.

Reason for Scope Determination

The station blackout component foundations and structures in the yard and switchyard provide physical support for equipment relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) regulated event. This meets the 10 CFR 54.4(a)(3) scoping criteria.

2.4.12.10 Wave Protection Dikes – Seismic Class II

Structure Description

The Wave Protection Dikes are Seismic Class II earthen dikes. The north, east and a small portion of the south sides of the station area with exposure to the lake are provided with dikes to elevation 591 feet International Great Lakes Datum to protect the facility from wave effects during the maximum credible water level conditions. Wave protection dike fill material consists of topsoil obtained from the on-site topsoil stockpile.

Reason for Scope Determination

The Wave Protection Dikes provide protection for the Davis-Besse site facilities from wave effects during the maximum credible water level conditions. This meets the 10 CFR 54.4(a)(2) scoping criteria.

2.4.12.11 Duct Banks, Cable Trenches, and Manholes – Seismic Class I and II

Structure Description

Duct banks, cable trenches, and manholes are installed and routed in the yard to provide physical support and shelter for in-scope electrical components such as electric cables and conduits.

Reason for Scope Determination

Duct banks and manholes located in the yard are structural component groups not identified as a structure or building. They provide physical support and shelter to safety-related equipment and therefore meet the criteria of 10 CFR 54.4(a)(1).

Duct banks and manholes located in the yard provide physical support and shelter to nonsafety-related equipment whose failure could prevent satisfactory accomplishment of required safety functions; therefore, they meet the scoping criteria of 10 CFR 54.4(a)(2).

Duct banks, cable trenches, and manholes located in the yard provide physical support and shelter to equipment relied upon to demonstrate compliance with the Station Blackout (10 CFR 50.63) and Fire Protection (10 CFR 50.48) regulated events. This meets the 10 CFR 54.4(a)(3) scoping criteria.

USAR References

USAR Section 3.7.2.3.4 describes the BWST foundation. The structural details of the BWST Pipe Trench are not described in the USAR.

The structural details of the Diesel Oil Pump House are not described in the USAR.

USAR Section 2.2.3.6.2 describes the Diesel Oil Storage Tank. The structural details of the Diesel Oil Storage Tank foundation are not described in the USAR.

USAR Section 9.5.4.2 describes the truncated pyramid of structural backfill built around the Emergency Diesel Generator Fuel Oil Storage Tanks. The structural details of the EDG Fuel Oil Storage Tanks foundation are not described in the USAR.

The structural details of the Fire Hydrant Hose Houses and Foundations are not described in the USAR.

The structural details of the Fire Walls between Bus-Tie Transformers, between Bus-Tie and Startup Transformer 01, and between Auxiliary and Main Transformers are not described in the USAR.

The structural details of the Fire Water Storage Tank Foundation are not described in the USAR.

The structural details of the Nitrogen Storage Building are not described in the USAR.

The structural details of the Station Blackout (SBO) Component Foundations and Structures in the Yard and Switchyard are not described in the USAR.

USAR Sections 1.2.1.1, 2C.6.3, and USAR Figure 2C.6-1 describe the Wave Protection Dikes.

The structural details of the duct banks, cable trenches, and manholes are not described in the USAR.

Components Subject to AMR

Table 2.4-12 lists the component types that require AMR and their intended functions.

Field erected tanks are evaluated in Section 2.3 as mechanical components within their corresponding system. The structural commodities for the yard structures are addressed in the bulk commodities evaluation in Section 2.4.13.

Table 3.5.2-12, Aging Management Review Results - Yard Structures, provides the results of the AMR.

Table 2.4-12
Yard Structures
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
BWST Foundation	EN, SSR
BWST Pipe Trench	EN, SNS, SSR
BWST Pipe Trench Cover Plates	EN, SNS
BWST Pipe Trench Hatch Covers	EN, SSR
Cable Trench Cover Plates	SRE
Cable Trench Top Slabs	SRE
Cable Trenches	SRE
Diesel Oil Pump House Foundation	SRE

Table 2.4-12 (Continued)
Yard Structures
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Diesel Oil Storage Tank Foundation	SRE
Diesel Oil Storage Tank Retaining Area and Dike	SRE
Duct Banks	EN, SNS, SRE, SSR
EDG Fuel Oil Storage Tank Hold Down Restraints	SSR
EDG Fuel Oil Storage Tanks Backfill	EN, MB, SSR
EDG Fuel Oil Storage Tanks Foundation	SSR
Fire Hydrant Hose Houses	SRE
Fire Hydrant Hose House Foundations	SRE
Fire Walls (transformers)	FB, SRE
Fire Water Piping Thrust Blocks	SRE
Fire Water Storage Tank Foundation	SRE
Manhole Covers and Frames	EN, SNS, SRE
Manhole Missile Shields	MB, SSR
Manholes	EN, SNS, SRE, SSR
Masonry Block Walls (Relay House)	SRE
Metal Roof Decking (Nitrogen Storage Building)	SNS
Nitrogen Storage Building Foundation	SNS
Precast Panels (Relay House)	SRE
Reinforced Concrete: Walls, Floors, and Ceilings (Diesel Oil Pump House)	SRE

Table 2.4-12 (Continued)
Yard Structures
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Reinforced Concrete: Walls, Floors, and Ceilings (Nitrogen Storage Building)	MB, SNS
Reinforced Concrete: Walls, Floors, and Ceilings (Relay House)	SRE
Relay House Foundation	SRE
Roof (Diesel Oil Pump House)	SRE
Roof (Nitrogen Storage Building)	MB, SNS
Roof (Relay House)	SRE
SBO Component Foundations	SRE
SBO Component Support Structures	SRE
Structural Steel: Beams, Columns, Plates, and Trusses (BWST trench cover support)	SNS
Structural Steel: Beams, Columns, Plates, and Trusses (Diesel Oil Pump House)	SRE
Structural Steel: Beams, Columns, Plates, and Trusses (Nitrogen Storage Building)	SNS
Structural Steel: Beams, Columns, Plates, and Trusses (Relay House)	SRE
Sumps (Diesel Oil Pump House and Diesel Oil Storage Tank Retaining Area)	SRE
Sumps (Manholes)	SRE
Sumps (Relay House)	SRE
Sumps (Transformer Foundations)	SRE
Transformer Foundations	SRE
Wave Protection Dike Corrugated Pipe Casings	EN, SNS

Table 2.4-12 (Continued)
Yard Structures
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Wave Protection Dike Piles	SNS
Wave Protection Dikes (including riprap)	FLB, SNS

2.4.13 BULK COMMODITIES

Structure Description

Bulk commodities are structural component groups that support in-scope structures' mechanical and electrical systems (e.g., anchorages, embedments, instrument panels, racks, cable trays, conduits, fire seals, fire doors, hatches, monorails, equipment and component supports). They are common to multiple systems, structures, and components and share material and environment properties which allow a common program or inspection to manage their aging effects.

Reason for Scope Determination

Bulk commodities are in scope based on the equipment that they support or protect.

Bulk commodities are in the scope of license renewal because they:

- provide structural or functional support to safety-related equipment. Therefore, they meet the 10 CFR 54.4(a)(1) scoping criteria.
- provide structural or functional support to nonsafety-related equipment whose failure could prevent satisfactory accomplishment of required safety functions (includes seismic II/I considerations). Therefore, they meet the 10 CFR 54.4(a)(2) scoping criteria.
- provide structural or functional support required to meet the Commission's regulations for any of the regulated events in 10 CFR 54.4(a)(3). Therefore, they meet the 10 CFR 54.4(a)(3) scoping criteria.

USAR References

The USAR does not specifically discuss or describe commodities.

Components Subject to AMR

Table 2.4-13 lists the component types that require AMR and their intended functions.

Table 3.5.2-13, Aging Management Review Results - Bulk Commodities, provides the results of the AMR.

Table 2.4-13
Bulk Commodities
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Steel and Other Metals	
Anchorage / Embedments	SNS, SRE, SSR
Cable Tray and Conduit Supports	SNS, SRE, SSR
Cable Trays and Conduits	EN, SNS, SRE, SSR
Component and Piping Supports (ASME Class 1, 2, and 3)	SRE, SSR
Damper Framing (in-wall)	SNS, SRE, SSR
Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR
Electrical Cable Bus Ducts	EN, SRE, SSR
Equipment Component Supports	SNS, SRE, SSR
Flood Curbs	FLB, SNS
Flood, Pressure, and Specialty Doors	FLB, MB, SPB, SHD, SNS, SRE, SSR
HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR
HVAC Duct Supports	SNS, SRE, SSR
Instrument Line Supports	SNS, SRE, SSR
Instrument Racks and Frames	SNS, SRE, SSR
Missile Barriers	MB, SSR
Monorails, Hoists and Miscellaneous Cranes	SNS
Penetrations (Mechanical and Electrical)	EN, FB, FLB, SPB, SNS, SRE, SSR
Pipe Supports	SNS, SRE, SSR

Table 2.4-13 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Stairs, Ladders, Platforms, and Gratings	FLB, SNS, SRE
Tube Track Supports	SNS, SRE, SSR
Tube Tracks	SNS, SRE, SSR
Vents and Louvers	SNS, SRE, SSR
Vibration Isolators	SNS, SRE
Threaded Fasteners	
Anchor Bolts	SNS, SRE, SSR
Anchor Bolts (ASME Class 1, 2, and 3 Supports Bolting)	SRE, SSR
Blowout Panel Release Fasteners	PR, SSR
Expansion Anchors	SNS, SRE, SSR
Concrete Components	
Equipment Pads	SNS, SRE, SSR
Flood Curbs	FLB, SNS
Hatches & Hatch Plugs	EN, FB, FLB, MB, SPB, SHD, SNS, SRE, SSR
Support Pedestals	SNS, SRE, SSR
Elastomeric Components	
Compressible Joints and Seals	EXP, FLB, SNS, SSR
Expansion Boots	EXP, FLB, SNS, SRE, SSR
Flexible Conduit Fittings	EN, SNS, SRE, SSR
Roof Membrane	EN, FLB, SNS, SRE, SSR

Table 2.4-13 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Waterproofing Membrane	FLB, SNS, SSR
Waterstops	FLB, SNS, SSR
Fire Barrier Commodities Note: Masonry and concrete fire barriers, such as walls, ceilings, and floors, are evaluated under the “Masonry Block Walls” and “Reinforced Concrete: walls, floors, and ceilings” component groups with the respective structure.	
Fire Doors	FB, SNS, SRE, SSR
Fire Stops	FB, FLB, SPB, SNS, SRE, SSR
Fireproofing	FB, SNS, SRE, SSR
Fire Wraps	FB, SNS, SRE, SSR
Miscellaneous Materials	
Containment Penetration Insulation	SNS
Piping and Mechanical Equipment Insulation	SNS

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROLS SYSTEMS

The determination of electrical and instrumentation and controls (I&C) systems within the scope of license renewal is made through the application of the process described in Section 2.1. The results of the electrical and I&C systems scoping review are contained in Section 2.2.

Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section. These identified components require an aging management review (AMR) for license renewal.

Components that support or interface with electrical and I&C components, for example, instrument racks, panels, cabinets, cable trays, conduit, and their supports (including foundations for outdoor equipment), are included in the civil-structural assessment documented in Section 2.4.

Information describing the electrical and I&C systems can be found in the Updated Safety Analysis Report (USAR) Chapter 7 for the instrumentation and control systems, USAR Chapter 8 for the electrical power systems, and USAR Section 8.2 for the station offsite power system. The Fire Hazards Analysis Report provides requirements regarding fire protection for electrical and I&C components. USAR Chapter 3 provides requirements regarding environmental qualification for electrical and I&C components.

2.5.1 ELECTRICAL AND I&C SCREENING PROCESS

The screening process identifies the electrical component commodity groups that are subject to AMR for in-scope plant systems that include electrical and I&C components. Electrical component commodity group identification is done in accordance with the requirements of 10 CFR 54.21(a) and the guidance of NEI 95-10, Appendix B. Electrical components that are active and electrical components that are replaced on a specified time schedule do not have a license renewal intended function and have been excluded from AMR. Only long-lived and passive components that perform a license renewal intended function are subject to AMR.

2.5.2 APPLICATION OF SCREENING CRITERIA 10 CFR 54.21(a)(1)(i) TO ELECTRICAL AND I&C COMPONENT COMMODITY GROUPS

The screening determination with respect to the passive criterion is taken directly from NEI 95-10. Appendix B of NEI 95-10 delineates which commodity groups are active and which are passive. The active components are excluded from further review, by the direction of 10 CFR 54.21(a)(1)(i).

Table 2.5.2-1 is a listing of the industry standard passive electrical component commodity groups and their generic intended functions. In the performance of the screening review, these commodity groups were taken as the base case. Specific Davis-Besse documents were reviewed to determine the applicability of the industry standard commodity groups (i.e., single-line drawings, maintenance rule functions, Chapter 7 and Chapter 8 of the USAR, the Fire Hazards Analysis Report, and electrical layout drawings, etc.). The screening review also evaluated the environmental qualification status of the electrical and I&C components. The screening review did not identify any additional commodity groups for evaluation – the list in Table 2.5.2-1 is complete.

Table 2.5.2-1
Industry Standard List of Passive Electrical Commodities

<table>
<tr><th>Passive Electrical Commodities</th><th>Intended Function</th></tr>
<tr><td>Insulated Cables and Connections -
(e.g., power, instrumentation, control, fiber optic cables, communication applications; connections include connectors, splices, terminal blocks, and electrical portions of electrical and I&C penetration assemblies)</td><td rowspan="5">Conduct electricity –
Provide electrical connection to specified portions of an electrical circuit to deliver voltage, current, or signals</td></tr>
<tr><td>Metal Enclosed Bus -
(e.g., iso-phase bus, non-segregated phase bus, segregated phase bus, and bus duct)</td></tr>
<tr><td>Switchyard Bus and Connections</td></tr>
<tr><td>Transmission Conductors and Connections</td></tr>
<tr><td>Uninsulated Ground Conductors and Connections</td></tr>
<tr><td>High-voltage Insulators -
(e.g., porcelain switchyard insulators, transmission line insulators)</td><td rowspan="2">Insulation (and support)</td></tr>
<tr><td>Fuse Holders</td></tr>
<tr><td>Tie Wraps</td><td>Support</td></tr>
</table>

2.5.3 ELIMINATION OF COMPONENT COMMODITY GROUPS WITH NO LICENSE RENEWAL INTENDED FUNCTIONS

The following electrical and I&C component commodity groups do not perform a license renewal function and are excluded from AMR, in accordance with 10 CFR 54.21(a)(1)(i).

2.5.3.1 Uninsulated Ground Conductors

Uninsulated ground conductors limit equipment damage and provide personnel protection in the event of a circuit failure.

Uninsulated ground conductors are not safety-related and their failure cannot cause the loss of a safety-related function. They are not required for any fire protection commitment, and they are not part of the station blackout or anticipated transients without scram evaluations. They are not included in the environmental qualification (EQ) program. Uninsulated ground conductors are not relied upon in safety analyses or plant evaluations to perform any function consistent with the requirements of 10 CFR 54.4(a)(3). Therefore, uninsulated ground conductors do not perform a license renewal intended function as described in 10 CFR 54.4 and are excluded from further license renewal evaluation.

2.5.3.2 Metal-Enclosed Bus

There is no metal-enclosed bus within the license renewal evaluation boundary. The in-scope bus components for the 13.8-kV and 4.16-kV electrical systems utilize cable bus.

2.5.3.3 Fuse Holders

Fuse holders are blocks of rigid insulation material with metallic clamps attached to the blocks to hold each end of the fuse. The clamps can be spring-loaded clips, or they can be bolt lugs.

The fuse holders evaluated for license renewal are those in passive, stand-alone applications. Fuse holders in active electrical panels (those containing active electrical components) are excluded. Based on review of Davis-Besse electrical drawings, the fuse documentation, and other engineering documents, the plant fuse holders are either part of an active electrical panel or are located in circuits that perform no license renewal intended function.

2.5.3.4 Tie Wraps

Tie wraps are used in cable installations (in panels, in tray, etc.) as cable ties. Tie wraps hold groups of cables together for restraint and for ease of maintenance. Tie wraps are used to bundle wires together and to keep the wire and cable runs neat and orderly. Tie wraps are used to restrain wires and cables within raceway to facilitate cable installation. There are no current license basis requirements for tie wraps at Davis-Besse. Tie wraps are not required to remain functional during and following design basis events. Tie wraps are not required for maintaining cable ampacity, ensuring the maintenance of minimum bend radius, or maintaining cables within vertical raceways. Tie wraps are not required for any seismic analysis. Therefore, tie wraps are not within the scope of license renewal at Davis-Besse.

2.5.4 Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical and I&C Component Commodity Groups

The next step in the electrical screening process is to segregate the "long-lived" electrical components from those that are subject to replacement based on a qualified life or a specified time schedule. In general, components that are screened out of license renewal consideration based on the "long-lived" criterion are those included in the plant EQ program. Electrical components included in the plant EQ program have qualified lives and are replaced based on their qualified life determination, as discussed in Section 2.5.4.2. Therefore, environmentally qualified components do not meet the "long-lived" criterion of 10 CFR 54.21(a)(1)(ii) and are excluded from AMR. EQ evaluations that meet the criteria for a time-limited aging analysis are addressed in Section 4.4.

2.5.4.1 Electrical Portions of Electrical and I&C Penetration Assemblies

Some primary containment electrical penetrations are environmentally qualified. The electrical continuity of the environmentally qualified penetrations is managed under the EQ Program which is evaluated as a time-limited aging analysis as described in Section 4.4. The non-EQ electrical penetrations are subject to AMR. All the electrical penetrations have a structural function (pressure boundary) which is addressed in Section 2.4.1.

2.5.4.2 Insulated Cables and Connections in the EQ Program

The insulated cables and connections that are included in the plant EQ program have qualified lives and are replaced based on their qualified life determination. Therefore, insulated cables and connections that are included in the EQ program are managed under the EQ Program which is evaluated as a time-limited aging analysis as described in Section 4.4.

2.5.5 Electrical and I&C Component Commodity Groups Requiring an Aging Management Review

The electrical and I&C component commodity groups that require AMR are listed in Table 2.5-1, along with their intended functions. Intended functions are defined in Table 2.0-1.

Table 3.6.2-1, Aging Management Review Results - Electrical and I&C Components, lists the results of the AMR.

Electrical and I&C component commodity groups that require an AMR are discussed in the following sections.

2.5.5.1 Non-Environmentally Qualified Insulated Cables and Connections

The non-EQ insulated cables and connections commodity group includes all in-scope electric power cables, control cables, and instrumentation cables that are not addressed by the EQ program, and those in-scope connections (e.g., splices, terminal blocks, electrical penetration assemblies, and electrical connectors) that are not addressed by the EQ program. Also included in this group are the metallic parts of electrical cable connections (typically bolted connections).

An insulated cable is an assembly consisting of one or more conductors (aluminum or copper) with a covering of insulation, and may include fillers and a jacket to cover the entire assembly. The assembly may also include a metallic shield. The jacket, filler, and metallic shield are not evaluated for the purposes of license renewal; the insulation is the only portion subject to evaluation.

Cable connectors are used to connect the cable conductors with other cables or with a variety of electrical devices (e.g., motors or instruments). Examples of connectors are compression fittings, fusion connectors (used primarily for uninsulated ground conductors), plug-in connectors, and terminal blocks (including fuse blocks).

Splices are used to connect cable conductors to penetration pigtails or to motor leads, and are also used to connect sections of cable during repair or replacement. Splices may also have been utilized during original cable installation.

A terminal block consists of an insulating base with fixed metallic points for landing wires (conductors) or for connecting terminal rings (lugs). Terminal blocks are installed in an enclosure such as a panel, control board, motor control center, terminal box, or other enclosure.

Electrical penetration assemblies are components utilized to carry electrical conductors through the Shield Building and Containment Vessel (via a canister-type configuration), while providing electrical continuity for the applicable circuits. The electrical penetrations consist of sealants, feed-throughs (the conductors), connections, and plates and other support sub-components.

The function of insulated cables and connections is to provide electrical connection to specified portions of an electrical circuit to deliver voltage, current, or signals. Non-EQ insulated cables and connections are passive, long-lived components. Therefore, non-

EQ insulated cables and connections meet the criteria of 10 CFR 54.21(a)(1) and are subject to an AMR.

2.5.5.2 Switchyard Bus and Connections

Switchyard bus is uninsulated, unenclosed, rigid electrical conductor used in plant switchyards and switching stations to connect two or more elements of an electrical power circuit. Portions of the switchyard bus equipment located in the plant switchyard (associated with the “J” and “K” buses and the switchyard circuit breakers) are within the license renewal evaluation boundary. The switchyard bus connections associated with these portions of bus are also in the license renewal scope.

The switchyard bus is connected to flexible connectors that are supported by insulators and ultimately by structural components such as concrete footings and structural steel.

The switchyard bus and connections provide electrical connection between the plant electrical system and the transmission grid to deliver voltage and current. Switchyard bus and connections are passive, long-lived components. Therefore, the switchyard bus and connections meet the criteria of 10 CFR 54.21(a)(1) and are subject to an AMR.

2.5.5.3 Transmission Conductors and Connections

Transmission conductors are category ACAR (aluminum conductor aluminum reinforced), stranded aluminum conductors wrapped around an aluminum wire core. They are uninsulated, high-voltage conductors used to carry loads in plant switchyards and in distribution applications. The connections are cast aluminum or galvanized steel, with stainless steel washers.

The section of transmission conductor within the scope of license renewal is located between startup transformers 01 and 02 and the plant switchyard, and also within the switchyard itself. The in-scope transmissions conductors are shown in Figure 2.5-1 (the conductor from the switchyard to the startup transformers).

The function of transmission conductors and connections is to provide electrical connection to specified portions of an electrical circuit to deliver voltage and current. Transmission conductors provide the supply of off-site power to the plant under station blackout conditions. Transmission conductors and connections are passive, long-lived components. Therefore, the transmission conductors and connections meet the criteria of 10 CFR 54.21(a)(1) and are subject to an AMR.

2.5.5.4 High-Voltage Insulators

A high-voltage insulator is a component uniquely designed to physically support a high-voltage conductor and to separate the conductor electrically from another conductor or object. The high-voltage insulators evaluated for license renewal include those associated with startup transformers 01 and 02, and the high-voltage insulators found in the in-scope portion of the plant switchyard.

There are two basic types of insulators: station post insulators, and strain (or suspension) insulators. Station post insulators are large and rigid and are used to support stationary equipment, such as short lengths of transmission conductors, switchyard bus, and disconnect switches. Strain insulators are used in applications where movement of the supported conductor is expected and allowed, including maintaining tensional support of transmission conductors between transmission towers or other supporting structures.

The high-voltage insulators within the license renewal scope are the station post insulators associated with startup transformers 01 and 02, and the high-voltage insulators (post and suspension insulators) associated with the 345-kV switchyard.

The function of high-voltage insulators is to insulate and support an electrical conductor (transmission conductor and switchyard bus). High voltage insulators are passive, long-lived components. Therefore, high voltage insulators meet the criteria of 10 CFR 54.21(a)(1) and are subject to an AMR.

2.5.6 EVALUATION BOUNDARIES

2.5.6.1 System Evaluation Boundaries

The evaluation boundaries for the electrical and I&C systems within the scope of license renewal include the entire system. Electrical and I&C component types within the boundaries of in-scope mechanical systems are also included within the electrical and I&C evaluation boundaries.

2.5.6.2 Station Blackout Recovery Path Evaluation Boundaries

The License Renewal Rule, 10 CFR 54.4(a)(3), requires that plant systems, structures, and components relied on for compliance with the NRC regulation on station blackout, 10 CFR 50.63, be included in the scope of license renewal. In April 2002, the NRC issued additional guidance on the (license renewal) scoping of equipment relied on to meet the requirements of 10 CFR 50.63 in the form of an Interim Staff Guidance (ISG) document (ISG-02). Subsequently, this guidance was incorporated into NUREG-1800, Revision 1.

Using the requirements of the License Renewal Rule, the guidance provided in NUREG-1800, the insights of ISG-02, and the current licensing basis documentation, the station blackout license renewal scoping boundary was established and the in-scope systems, structures, and components for station blackout were identified. The following paragraphs describe the station blackout license renewal off-site power recovery paths for Davis-Besse. USAR Sections 8.1.1 and 8.2 provide a detailed description of the offsite power system and offsite power pathways for Davis-Besse. USAR Figure 8.2-2 provides a simplified single-line diagram showing the switchyard configuration.

There are three independent sources of offsite power provided to the site - the Bayshore Line, the Lemoyne Line, and the Ohio Edison Line. These 345-kV lines enter the Davis-Besse switchyard, and form a ring bus configuration via the switchyard circuit breakers and the "J" and "K" buses in the switchyard. Startup transformers 01 and 02 provide the in-scope power pathways into the plant and to the safety buses, as shown in Figure 2.5-1.

Startup transformers 01 and 02 provide a step-down from 345-kV to 13.8-kV, and then the bus-tie transformers step the voltage down to 4.16-kV just prior to the pathway entering the Auxiliary Building. The 4.16-kV cable bus then enters the Auxiliary Building and is routed to the 4.16-kV essential buses C1 and D1. This configuration is shown in Figure 2.5-1. The power recovery pathway (into the plant) is comprised of transmission conductor (and connections) and switchyard bus (and connections). The in-scope structural items (towers and foundations) are evaluated in Section 2.4.12.

Within the switchyard, there are two 345-kV buses – the "J" (East) bus and the "K" (West) bus. The "J" bus is closest to the plant and the "K" bus is located on the farther side of the switchyard, closer to the grid. The current switchyard configuration includes circuit breakers ACB34560, ACB34561, ACB34562, ACB34563, and ACB34564 in a ring bus configuration. These circuit breakers and the switchyard buses are within the license renewal evaluation boundary. This configuration is shown in simplified graphical form in USAR Figure 8.2-2 and in Figure 2.5-1 below.

The control circuits and protective relays for the switchyard circuit breakers (and the equipment associated with the "J" and "K" buses), as well as disconnect switch ABS34625 are within the scope of license renewal. The switchyard Relay House, where the switchyard control circuits and relays are located, is within the scope of license renewal, and is addressed in Section 2.4.12.

Figure 2.5-1
Davis-Besse Station Blackout Recovery Path

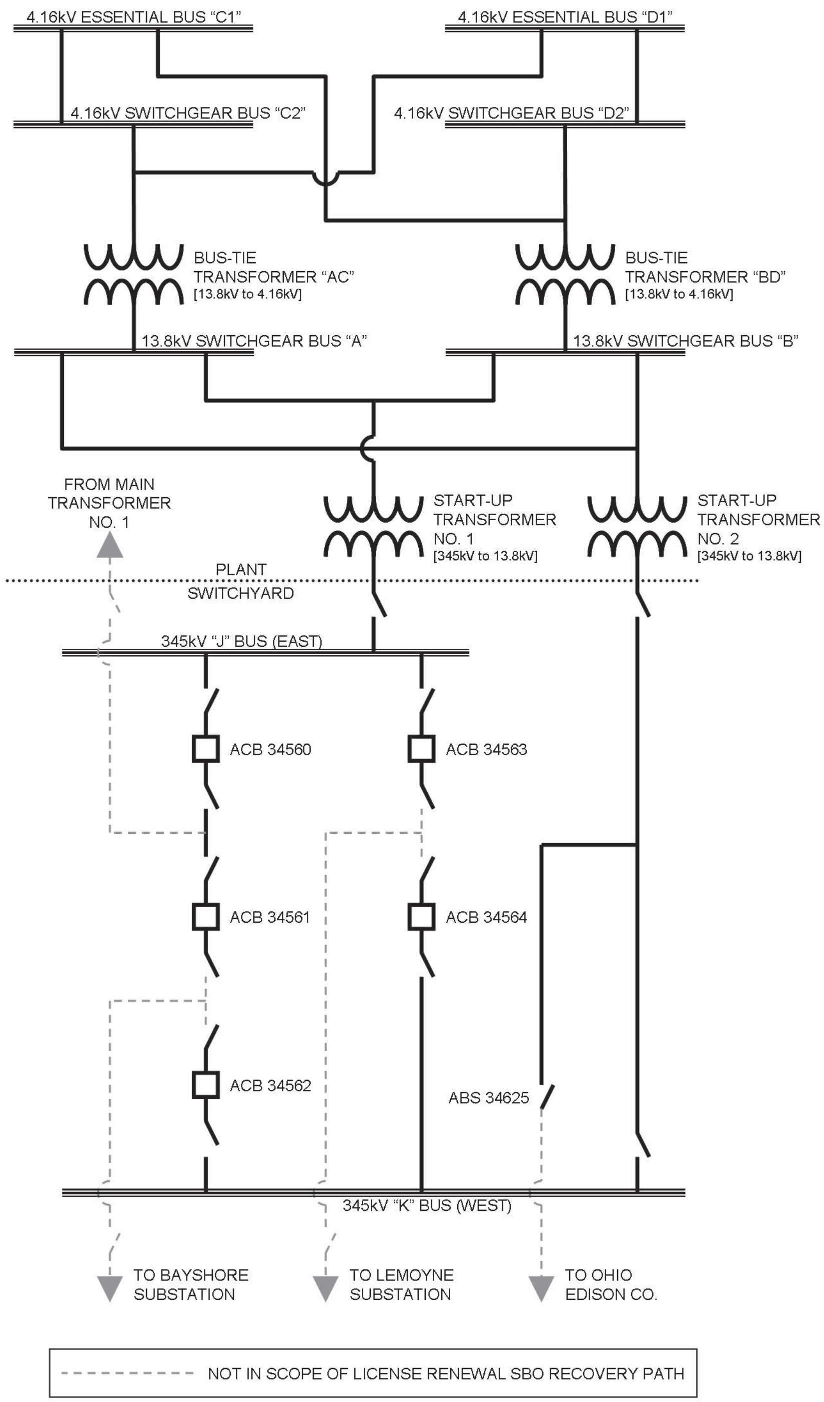

Table 2.5-1
Electrical and Instrumentation and Control System Components Subject to Aging Management Review

Component and Commodity Group	Intended Function (as defined in Table 2.0-1)
Non-EQ Insulated Cables and Connections includes non-EQ electrical penetration assemblies, non-EQ cable connections (metallic parts)	Conduct Electricity
Non-EQ Sensitive, High-Voltage, Low-Level Signal Instrument Cables and Connections	Conduct Electricity
Non-EQ Medium-Voltage Power Cables	Conduct Electricity
Switchyard Bus and Connections	Conduct Electricity
Transmission Conductors and Connections	Conduct Electricity
High-Voltage Insulators	Insulation (and support)

3.0 AGING MANAGEMENT REVIEW RESULTS

For those systems, structures, and components identified as being subject to an aging management review (AMR) in Section 2, 10 CFR 54.21(a)(3) requires demonstration that the effects of aging will be adequately managed so that their intended functions will be maintained consistent with the current licensing basis for the period of extended operation.

This section provides the results of the AMR of the systems, structures, and components determined, during the scoping and screening processes, to be subject to an AMR. Organization of this section is based on NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, Revision 6." This section is organized as follows:

- Aging Management of Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators (Section 3.1)
- Aging Management of Engineered Safety Features Systems (Section 3.2)
- Aging Management of Auxiliary Systems (Section 3.3)
- Aging Management of Steam and Power Conversion Systems (Section 3.4)
- Aging Management of Containment, Structures, and Component Supports (Section 3.5)
- Aging Management of Electrical and Instrumentation and Controls Systems (Section 3.6)

Results of the AMRs are presented in two types of tables:

Table 3.x.1 – where

'3' indicates the table pertains to a Section 3 AMR,

'x' indicates the table number from NUREG-1801, Volume 1; and

'1' indicates the first table type.

For example, in the Reactor Vessel, Internals, and Reactor Coolant System section, this table would be numbered 3.1.1, and in the Auxiliary Systems section, this table would be numbered 3.3.1. This table type will be referred to as "Table 1." These tables are derived from the corresponding tables in Volume 1 of NUREG-1801 and present summary information from the AMR results.

Table 3.x.2-y – where

‘3’ indicates Section 3 of the license renewal application (LRA);

‘x’ indicates the table number from NUREG-1801, Volume 1;

‘2’ indicates the second table type; and

‘y’ indicates the specific system, structure or commodity being addressed.

For example, within the Reactor Vessel, Internals, and Reactor Coolant System section, the AMR results for the Reactor Pressure Vessel are presented in Table 3.1.2-1. In the Engineered Safety Features section, the AMR results for the Containment Air Cooling and Recirculation System are presented in Table 3.2.2-1, and the AMR results for the Containment Spray System are presented in Table 3.2.2-2. This table type will be referred to as “Table 2.” These tables present the results of the AMRs.

Table Descriptions and Usage

NUREG-1801 contains the NRC staff’s generic evaluation of existing plant programs. It documents the technical basis for determining where existing plant programs are adequate without modification and where the programs should be augmented for the period of extended operation. The evaluation results documented in the report indicate that many of the existing plant programs are adequate to manage the aging effects for particular components or commodities within the scope of license renewal without change. NUREG-1801 also contains recommendations on the specific areas for which an existing program should be augmented for license renewal. In order to take full advantage of NUREG-1801, a comparison between the AMR results and the tables of NUREG-1801 has been made. The results of that comparison are provided in tables in this section.

The purpose of Table 1 (refer to Sample Table 1 below) is to provide a summary comparison of specific plant AMR details with the corresponding tables of NUREG-1801, Volume 1. The table is essentially the same as Tables 3.1-1 through 3.6-1 of NUREG-1800, except that the “ID” column has been renamed the “Item Number” column, the “component” column has been expanded to “component/commodity,” the “Type” column has been deleted, and the “Related Item” column has been replaced by a “Discussion” column. The number in the “Item Number” column is the number in the “ID” column prefixed by the table number to provide the reviewer with a cross-reference from Table 1 to Table 2. The “Discussion” column is used to provide clarifying information. The following are examples of information that might be contained within the “Discussion” column.

- “Further Evaluation Recommended” – Information or reference to where that information is located.

- The name of a plant-specific program being used.
- Exceptions to NUREG-1801 assumptions.
- A discussion of how the line is consistent with the corresponding line item in NUREG-1801, Volume 1, when it may appear inconsistent.
- A discussion of how the item is different from the corresponding line item in NUREG-1801, Volume 1, when it may appear to be consistent (e.g., when there is exception taken to an aging management program that is listed in NUREG-1801).

The format of Table 1 provides a reviewer with a means of aligning a specific Table 1 row with the corresponding NUREG-1801, Volume 1 table row, thereby allowing for ease of consistency verification.

Sample Table 1

Table 3.x.1 Summary of Aging Management Programs for __ Evaluated in Chapter __ of NUREG-1801

Item Number	Component / Commodity	Aging Effect / Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.x.1-01					
3.x.1-02					
3.x.1-03					

Table 2 (refer to Sample Table 2 below) provides the detailed results of the AMRs for those components and commodities identified in Section 2 as being subject to AMR. There is a Table 2 for each system and structure in Section 2 that contains components and commodities subject to AMR. Table 2 consists of the following 10 columns:

Row No. – The first column provides a sequential row number for the rows in each table. The row number permits the easy identification of a specific line of AMR results within a table.

Component Type (or Component/Commodity) – The second column identifies the component and commodity types from Section 2 that are subject to AMR, listed in alphabetical order. During the screening process, some components were incorporated into commodity groups based on similarity of their design or materials of construction. Use of commodity groups made it possible to address an entire group of components with a single evaluation. In the AMRs described in the following sections, further definition of commodity groups was performed based on design, material, environmental, and functional characteristics in order to disposition an entire group with a single AMR.

Intended Function(s) – The third column contains the license renewal intended function (abbreviations are used for structural functions) for each listed component and commodity type. Definitions (and the corresponding abbreviations, where used) of intended functions are contained in Table 2.0-1.

Material – The fourth column lists the material of construction for each component and commodity type.

Environment – The fifth column lists the environment to which each component and commodity type is exposed. Internal and external environments are indicated. The process and ambient environments used in the AMRs are listed below in Table 3.0-1 and Table 3.0-2 respectively.

Aging Effect Requiring Management – As part of the AMR process, aging effects requiring management were identified for material and environment combinations; these aging effects are listed in the sixth column. The AMR methodology was based on generic industry guidance for determining aging effects for electrical, mechanical, and structural components and commodities based on the materials of construction and applicable environmental conditions. The material and environment-based rules in the industry guidance documents were derived from known age-related degradation mechanisms and industry operating experience. The aging effect determination was supplemented by review of Davis-Besse operating experience.

Aging Management Program – The aging management program used to manage the aging effects requiring management is identified in the seventh column of Table 2. Aging management programs are described in Appendix B.

NUREG-1801, Volume 2 Item – Each combination of component and commodity type, material, environment, aging effect requiring management, and aging management program that is listed in Table 2 was compared to NUREG-1801, Volume 2, with consideration given to the standard (generic) notes, to identify consistencies. When they were identified, consistencies were documented by noting the appropriate NUREG-1801, Volume 2 item number in column eight of Table 2. If there is no corresponding item number in NUREG-1801, Volume 2, the entry was indicated as “not applicable” (N/A). Thus, a reviewer can readily identify where there is correspondence between the plant-specific tables and the NUREG-1801, Volume 2 tables.

Table 1 Item – Each combination of component or commodity, material, environment, aging effect requiring management, and aging management program that has an identified NUREG-1801, Volume 2 item number also has a Table 3.x.1 line item reference number. The corresponding line item from Table 1 is listed in column nine of Table 2. If there is no corresponding item in NUREG-1801, Volume 1, the entry was indicated as “not applicable” (N/A). Therefore, the information from the two tables can be correlated.

Notes – To realize the full benefit of NUREG-1801, a series of notes is used to identify how the information in Table 2 aligns with the information in NUREG-1801, Volume 2. Notes designated with letters are industry standard (generic) notes from NEI 95-10. Additional information is provided in plant-specific notes, which are identified by a number. Plant-specific notes provide information or clarification regarding the AMR of the Table 2 line item. The generic and plant-specific notes are listed at the end of Sections 3.1 through 3.6. Section 3.1 uses plant-specific notes numbered in the 0100-series (e.g., 0101, 0102, etc.). Section 3.2 uses plant-specific notes numbered in the 0200-series; Section 3.3, in the 0300-series; Section 3.4, in the 0400-series; Section 3.5, in the 0500-series; and Section 3.6, in the 0600-series.

Generic notes A through E indicate that a comparison may be made between the Table 2 line item and NUREG-1801. Therefore, items associated with notes A through E will also contain a NUREG-1801, Volume 2 item and reference to a Table 1 item.

Sample Table 2

Table 3.x.2-y Aging Management Review Results–<System Name>

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801, Volume 2 Item	Table 1 Item	Notes

Service Environments

Service (operating) environments for license renewal purposes are defined as the fluids and the ambient conditions of temperature, humidity, and radiation to which structures and components are expected to be exposed during normal plant operating conditions. Service environments include both process environments internal to components such as piping, valves, and tanks, and the ambient environments on the external surfaces of structures and components. External surfaces of certain mechanical components may also be exposed to predominantly internal environments, such as heat exchanger tubes and coils, or components that are submerged in fluid in a tank or a sump or in the fuel pool.

The service environments evaluated for Davis-Besse license renewal are described in Table 3.0-1 and Table 3.0-2 below, for process and ambient environments respectively. These environments were aligned with the corresponding terminology in Sections IV and IX of NUREG-1801, as much as was practical.

Table 3.0-1
Process Environments

Davis-Besse Environments	NUREG-1801 Environments	Description
• Dried air • Gas	• Dried air • Gas	Dried air is compressed air that has been filtered, compressed, and dried for use in plant equipment. Compressed air that has not been dried is considered to be air. Gas is a compressed gas such as carbon dioxide, Halon, hydrogen, nitrogen, Freon, or other refrigeration gases. Such gases are received in bulk and are dry and free of contaminants, except when used in a manner that allows contact with water or condensation, in which case the gas becomes moist.
• Air • Moist air	• Air - indoor uncontrolled • Moist air or condensation (internal)	Air and moist air are defined to be air environments that contain some amount of moisture or contaminants. This includes: 1) air for use in plant components before it has been dried (moisture content is enough to facilitate general corrosion of steel), or 2) process air in locations where condensation, water pooling, or accumulation of contaminants could occur (moisture content is enough to facilitate crevice and pitting corrosion in various metals, as well as general corrosion of steel), or 3) air-water interfaces where alternate wetting and drying can concentrate contaminants so that they become aggressive to metal, or 4) air contained in the space above the air-water interface inside a component that contains water.
• Closed cycle cooling water • Closed cycle cooling water > 60°C (> 140°F)	• Closed cycle cooling water • Closed cycle cooling water >60°C (>140°F)	Includes treated water, as defined below, which is from and returns to a closed source (e.g., a tank) that is not open to the elements, and is used for cooling of plant components. That is, demineralized water that may contain additives in a: 1) closed cooling water system such as the chilled water system, fuel pool cooling system, component cooling water system, and decay heat removal system; or 2) heat exchanger, cooler, or other component in another system that is served by cooling water from a closed system.

Table 3.0-1
Process Environments (continued)

Davis-Besse Environments	NUREG-1801 Environments	Description
• Fuel oil	• Fuel oil	Fuel oil is usually diesel grade number 2 that is used to fuel engines, such as for the emergency diesel generators and the diesel-driven fire pump. Fuel oil is typically stored in tanks that are open to the environment (through vents) and will therefore be exposed to moist air at the surface level and possibly subject to water contamination.
• Lubricating oil	• Lubricating oil	Lubricating oil is typical of oil used in bearings, gear boxes, etc., for lubrication. Lubricating oil environments do not typically contain significant amounts of water, but are conservatively assumed to contain some amount of water contamination for the purposes of aging management review.
• Raw water • Condensation	• Raw water • Condensation • Water - flowing • Water - flowing under foundation • Water - standing	Water from a lake, pond, river or other reservoir that is open to the elements. Raw water is considered to be rough-filtered and possibly treated with a biocide or other chemicals for control of micro- and macro-organisms. In addition, the contents of various sumps, tanks and other drainage components are considered to be raw water environments, as is the potable water environment, since their contents are not treated or controlled by a credited site program and may contain unknown contaminants. The internal environment of drain pans and drain piping associated with air-handling units, fan cooler units, and moisture separators is untreated and uncontrolled water, resulting from the condensation of moisture from the ventilation air environment.

Table 3.0-1
Process Environments (continued)

Davis-Besse Environments	NUREG-1801 Environments	Description
• Borated reactor coolant	• Reactor coolant • Reactor coolant >250ºC (>482ºF) • Reactor coolant and secondary feedwater / steam • Air with reactor coolant leakage • Air with reactor coolant leakage (internal)	Treated water, as defined below, that is in the Reactor Coolant System and systems that are directly connected to it (Class 1 portions) at or near normal operating temperature.
• Borated reactor coolant with neutron fluence	• Reactor coolant and neutron flux • Reactor coolant >250ºC (>482ºF) and neutron flux	The same as the borated reactor coolant environment with the added condition of neutron radiation (E, which represents average neutron energy, greater than 1MeV) in excess of 1.0 E+17 neutrons per square centimeter (n/cm^2). This environment is unique to the region of the reactor pressure vessel immediately around the reactor core and the beltline region of the reactor vessel. This region is above 482ºF during normal operation, and all components with high neutron fluence also experience reactor coolant temperatures.

Table 3.0-1
Process Environments (continued)

Davis-Besse Environments	NUREG-1801 Environments	Description
• Steam • Treated water • Treated water > 60ºC (> 140ºF) • Treated borated water • Treated borated water > 60ºC (> 140ºF)	• Steam • Treated water • Treated water >60ºC (>140ºF) • Treated borated water • Treated borated water >60ºC (>140ºF) • Secondary feedwater • Secondary feedwater / steam • Treated borated water >250ºC (>482ºF) • Water - standing	Treated water is filtered and chemically treated demineralized water that may be deaerated, treated with a biocide, antifreeze agent, corrosion inhibitor, dispersant, boric acid, or a combination of these treatments. This environment includes both the liquid and steam phase of chemically treated water, and the boric acid solution dissolved in treated water. The closed cycle cooling water and borated reactor coolant environments, defined above, are subsets of the treated water environment.

Table 3.0-2
Ambient Environments

Davis-Besse Environment	NUREG-1801 Environments	Description
• Adverse localized environment caused by exposure to moisture and voltage • Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	• Adverse localized environment caused by exposure to moisture and voltage • Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen • Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen or >60-year service limiting temperature • Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage	Environment that could exist in limited plant areas caused by heat, moisture, oxygen, radiation, or voltage. Used for electrical evaluations only.

Table 3.0-2
Ambient Environments (continued)

Davis-Besse Environment	NUREG-1801 Environments	Description
• Air-indoor • Air-indoor uncontrolled • Air with borated water leakage • Air with steam or water leakage • Condensation	• Air - indoor • Air - indoor uncontrolled • Air with borated water leakage • Air with steam or water leakage • Condensation (internal / external) • Air - indoor uncontrolled >35ºC (>95ºF) • Air with leaking secondary-side water and/or steam • Air with metal temperature up to 288ºC (550ºF) • Any • Air • Air - indoor controlled • Moist air or condensation (internal) • System temperature up to 288ºC (550ºF) • System temperature up to 340ºC (644ºF) • Various	Equipment and components located in buildings or structures such that they are sheltered from external weather conditions are in an indoor air environment. Components in systems with external surface temperatures below ambient conditions have the potential to be wet due to the formation of condensation. Components in systems with high external surface temperatures (greater than dew point) are considered to be dry. Other component surfaces are exposed to moist ambient air (where moisture content is sufficient to facilitate general corrosion of steel), with the exception of surfaces in the control room envelope. Indoor air may be conditioned by filtering, heating, cooling, dehumidification, or some combination. However, for aging management review purposes, the environment is considered to be “uncontrolled” (where moisture content is sufficient to facilitate general corrosion of steel). This environment (identified as air-indoor uncontrolled) is also used for the air inside heating, ventilation, and air conditioning components; for components that are vented or otherwise open to ambient conditions; and for components that are isolated and empty. Indoor air that is humidity-controlled (e.g., air-conditioned) is identified as air-indoor controlled; however, for the Davis-Besse aging management review process, all indoor air environments are evaluated as air-indoor uncontrolled environments. The evaluation of the air-indoor uncontrolled environment considers the potential for high temperatures, humidity, and radiation, where applicable. The air-indoor uncontrolled environment also includes consideration of the potential for aggressive contaminants on surfaces and structural components, including external air-water interfaces where alternate wetting and drying can concentrate contaminants such that they become aggressive to metal. Evaluation of the indoor air environment includes consideration of the potential for leakage of borated water and its affect on susceptible materials. For evaluations of structural components and commodities, the indoor environment is referred to as air-indoor.

Table 3.0-2
Ambient Environments (continued)

Davis-Besse Environment	NUREG-1801 Environments	Description
• Air-outdoor • Air with borated water leakage	• Air - outdoor • Air with borated water leakage • Condensation (internal / external) • Any • Various • Water - flowing	Equipment and components located in the outdoor air environment are exposed to heat, cold, various forms of precipitation, and the effects of sunlight. This outdoor air environment is a moist air environment with the potential for accumulation of aggressive contaminants. Components in systems with external surface temperatures the same or higher than ambient conditions due to normal system operation are considered to be mostly dry with occasional short term wetting from precipitation. Components in systems with external surface temperatures below ambient conditions also have the potential for prolonged wetting due to the formation of condensation. Davis-Besse is located in a temperate, lakeshore climate environment. There are no nearby major industrial plants that could raise the possibility of exposure to sulfates or chlorides, but the groundwater at the site contains sulfates and dissolved solids in relatively high concentrations, so these stressors must be addressed as part of the aging management review. Because Davis-Besse is located in a temperate, lakeshore climate environment with moderate rainfall where airborne particle concentrations are comparatively low, air pollution and potential surface contamination of the high-voltage insulators in the switchyard is not significant. The lakeshore environment creates the potential for conditions of lake-effect snow and icing which may affect equipment located at the intake structure and in the yard. Evaluation of the outdoor air environment includes consideration of the potential for leakage of borated water and its affect on susceptible materials. For evaluations of structural components and commodities, the outdoor environment is referred to as air-outdoor.
• Soil • Water-flowing • Structural backfill	• Soil • Water - flowing • Water - flowing under foundation • Groundwater / Soil • Any • Various	The buried environment is defined as equipment or components beneath ground level in contact with soil and potentially subject to groundwater. Components that are buried are normally coated and wrapped to prevent the soil and groundwater from contacting the component surface. However, no credit for this coating/wrap is explicitly taken in the identification of aging effects requiring evaluation. For structural evaluations, a beneath ground level environment is referred to as either soil or structural backfill. The below grade environment has the potential for groundwater, which may be referred to as water-flowing. Coatings, if present, are not credited.

Table 3.0-2
Ambient Environments (continued)

Davis-Besse Environment	NUREG-1801 Environments	Description
• Concrete	• Concrete	The concrete environment is defined for components that are embedded (encased) in concrete, which forms a tight seal around the external surfaces of the component.

3.1 AGING MANAGEMENT OF REACTOR VESSEL, INTERNALS, REACTOR COOLANT SYSTEM AND REACTOR COOLANT PRESSURE BOUNDARY, AND STEAM GENERATORS

3.1.1 INTRODUCTION

Section 3.1 provides the results of the aging management reviews (AMRs) for those components identified in Section 2.3.1, Reactor Pressure Vessel, Reactor Vessel Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators, as subject to AMR. The systems or portions of systems are described in the indicated sections.

- Reactor Pressure Vessel (Section 2.3.1.1)
- Reactor Vessel Internals (Section 2.3.1.2)
- Reactor Coolant System and Reactor Coolant Pressure Boundary (Section 2.3.1.3)
- Steam Generators (Section 2.3.1.4)

Table 3.1.1, Summary of Aging Management Programs for Reactor Pressure Vessel, Reactor Vessel Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.1.2.2.

3.1.2 RESULTS

The following tables summarize the results of the AMR for systems in the Reactor Pressure Vessel, Reactor Vessel Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators area.

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Table 3.1.2-4 Aging Management Review Results – Steam Generators

3.1.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the aging effects requiring management, and the aging management programs (AMPs) used to manage these aging effects are provided for each of the above systems in the following sections.

3.1.2.1.1 Reactor Pressure Vessel

Materials

The materials of construction for the subject mechanical components of the reactor pressure vessel are:

- Nickel alloy
- Stainless steel
- Steel
- Steel with stainless steel cladding

Environments

Subject mechanical components of the reactor pressure vessel are exposed to the following normal operating environments:

- Air with borated water leakage
- Air with steam or water leakage
- Borated reactor coolant
- Borated reactor coolant with neutron fluence

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the reactor pressure vessel:

- Cracking - due to Fatigue, Flaw Growth, Primary Water Stress Corrosion Cracking (PWSCC), Stress Corrosion Cracking (SCC), Stress Corrosion Cracking/Intergranular Attack (SCC/IGA) and Underclad Cracking (UCC)
- Loss of material

- Loss of preload
- Reduction in fracture toughness

Aging Management Programs

The following aging management programs address the aging effects requiring management for the reactor pressure vessel:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Fatigue Monitoring Program (fatigue time-limited aging analyses (TLAAs))
- Inservice Inspection Program
- Nickel-Alloy Management Program
- Nickel-Alloy Reactor Vessel Closure Head Nozzles Program
- PWR Water Chemistry Program
- Reactor Head Closure Studs Program
- Reactor Vessel Surveillance Program

3.1.2.1.2 Reactor Vessel Internals

Materials

The materials of construction for the subject mechanical components of the reactor vessel internals are:

- Cast austenitic stainless steel
- Nickel alloy
- Stainless steel

Environments

Subject mechanical components of the reactor vessel internals are exposed to the following normal operating environments:

- Borated reactor coolant
- Borated reactor coolant with neutron fluence

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the reactor vessel internals:

- Change in dimension
- Cracking - due to Fatigue, Flaw Growth, SCC/IGA, and Irradiation Assisted Stress Corrosion Cracking (IASCC)
- Loss of material
- Loss of preload
- Reduction in fracture toughness

Aging Management Programs

The following aging management programs address the aging effects requiring management for the reactor vessel internals:

- Fatigue Monitoring Program (fatigue TLAAs)
- PWR Reactor Vessel Internals Program
- PWR Water Chemistry Program

3.1.2.1.3 Reactor Coolant System and Reactor Coolant Pressure Boundary

Materials

The materials of construction for subject mechanical components of the Reactor Coolant System (RCS) and Reactor Coolant Pressure Boundary (RCPB) are:

- Cast austenitic stainless steel
- Nickel alloy
- Stainless steel
- Steel
- Steel with stainless steel cladding

Environments

Subject mechanical components of the RCS and RCPB are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Borated reactor coolant
- Borated reactor coolant > 250°C (> 482°F)
- Closed cycle cooling water
- Lubricating oil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of RCS and RCPB:

- Cracking - due to Fatigue, Flaw Growth, PWSCC, SCC and SCC/IGA
- Loss of material
- Loss of preload
- Reduction in fracture toughness
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the RCS and RCPB:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- Fatigue Monitoring Program (fatigue TLAAs)
- Inservice Inspection
- Lubricating Oil Analysis
- Nickel-Alloy Management Program
- One-Time Inspection
- PWR Water Chemistry Program

- Small Bore Class 1 Piping Inspection

3.1.2.1.4 Steam Generators

Materials

The materials of construction for subject items of the Steam Generators are:

- Nickel alloy
- Steel
- Steel with nickel alloy cladding
- Steel with stainless steel backing
- Steel with stainless steel cladding

Environments

Subject items of the Steam Generators are exposed to the following normal operating environments:

- Air with borated water leakage
- Air with steam or water leakage
- Borated reactor coolant
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject items of the Steam Generators:

- Cracking - due to Fatigue, Flaw Growth, PWSCC, SCC, SCC/IGA
- Denting
- Ligament cracking
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject items of the Steam Generators:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Fatigue Monitoring Program (fatigue TLAAs)
- Flow-Accelerated Corrosion (FAC) Program
- Inservice Inspection Program
- Nickel-Alloy Management Program
- One-Time Inspection
- PWR Water Chemistry Program
- Steam Generator Tube Integrity Program

3.1.2.2 Aging Management Review Results for Which Further Evaluation is Recommended by NUREG-1801

For the Reactor Pressure Vessel, Reactor Vessel Internals, Reactor Coolant System and Pressure Boundary, and Steam Generators, those items requiring further evaluation are addressed in the following sections.

3.1.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis as defined in 10 CFR 54.3. Time limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluations of the fatigue time-limited aging analyses are addressed in Section 4.

3.1.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

3.1.2.2.2.1 Steel PWR Steam Generator Shell Assembly-Secondary Feedwater and Steam; Steel BWR Top Head and Top Head Nozzles-Reactor Coolant

Loss of material due to general, pitting, and crevice corrosion could occur in the steel pressurized water reactor (PWR) steam generator shell assembly exposed to secondary feedwater and steam. Loss of material due to general, pitting, and crevice corrosion in the Davis-Besse steel steam generator shell assemblies that are exposed to secondary feedwater and steam is managed by the PWR Water Chemistry Program. The PWR Water Chemistry Program manages loss of material through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material.

Loss of material due to general, pitting, and crevice corrosion for steel top head enclosures exposed to reactor coolant is applicable to BWR plants only.

3.1.2.2.2.2 Stainless Steel BWR Isolation Condenser Components – Reactor Coolant

Loss of material of boiling water reactor (BWR) isolation condenser components is applicable to BWR plants only.

3.1.2.2.2.3 Stainless Steel, Nickel Alloy, and Steel with Stainless Steel or Nickel Alloy Cladding Flanges, Nozzles, Penetrations, Pressure Housings, Safe Ends, and Vessel Shells, Heads, and Welds – Reactor Coolant

Loss of material of BWR reactor vessel and reactor coolant pressure boundary components is applicable to BWR plants only.

3.1.2.2.2.4 Steel PWR Steam Generator Upper and Lower Shell and Transition Cone-Secondary Feedwater and Steam

Loss of material due to general, pitting, and crevice corrosion could occur in Westinghouse Model 44 and 51 Steam Generators. Davis-Besse does not have Westinghouse Model 44 and 51 steam generators; therefore, this item is not applicable to Davis-Besse.

3.1.2.2.3 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement

3.1.2.2.3.1 Ferritic Materials-Neutron Fluence greater than 10^{17} n/cm^2 (E >1 MeV)

Certain aspects of neutron irradiation embrittlement are TLAAs as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4.2.

3.1.2.2.3.2 Reactor Vessel Beltline Shell, Nozzle, and Welds-Reactor Coolant and Neutron Flux

Reduction of fracture toughness due to radiation embrittlement could occur for reactor vessel beltline region materials exposed to reactor coolant and neutron flux. A reactor vessel materials surveillance program manages radiation embrittlement of the reactor vessel beltline materials. The Davis-Besse Reactor Vessel Surveillance Program and the results of its evaluation for license renewal are presented in Appendix B.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

3.1.2.2.4.1 Stainless Steel and Nickel Alloy BWR Top Head Enclosure Vessel Flange Leak Detection Lines

Cracking of BWR vessel leak detection lines is applicable to BWR plants only.

3.1.2.2.4.2 Stainless Steel BWR Isolation Condenser Components – Reactor Coolant

Cracking of isolation condenser components is applicable to BWR plants only.

3.1.2.2.5 Crack Growth due to Cyclic Loading

Crack growth due to cyclic loading (i.e., underclad cracking) is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of crack growth due to cyclic loading as a TLAA for the Davis-Besse Reactor Vessel is discussed in Section 4.2.

3.1.2.2.6 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement and Void Swelling

Loss of fracture toughness due to neutron irradiation embrittlement and void swelling could occur in stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux. At Davis-Besse, reduction in fracture toughness due to radiation embrittlement for stainless steel and nickel alloy reactor vessel internals components that are exposed to reactor coolant and neutron flux will be managed by the PWR Reactor Vessel Internals Program. Further evaluation for change in dimension due to void swelling is addressed in Section 3.1.2.2.15.

3.1.2.2.7 Cracking due to Stress Corrosion Cracking

3.1.2.2.7.1 Stainless Steel Reactor Vessel Flange Leak Detection Lines and Bottom-Mounted Instrument Guide Tubes – Reactor Coolant

Cracking due to SCC could occur in the PWR stainless steel reactor vessel flange leak detection lines and bottom-mounted instrument guide tubes exposed to reactor coolant. SCC for the Davis-Besse incore piping and flange leak detection piping is managed by the PWR Water Chemistry Program and will also be managed by the Small Bore Class 1 Piping Inspection.

3.1.2.2.7.2 Cast Austenitic Stainless Steel (CASS) Piping, Piping Components, and Piping Elements – Reactor Coolant

Cracking due to SCC could occur in Class 1 PWR CASS piping and components exposed to reactor coolant. Davis-Besse has no Class 1 CASS piping or fittings exposed to reactor coolant; therefore, this item is not applicable to Davis-Besse. For CASS valve bodies and pump casings exposed to reactor coolant see Table 3.1.1, Item 3.1.1-68.

3.1.2.2.8 Cracking due to Cyclic Loading

3.1.2.2.8.1 Stainless Steel BWR Jet Pump Sensing Lines – Reactor Coolant

Cracking of BWR jet pump sensing lines is applicable to BWR plants only.

3.1.2.2.8.2 Steel and Stainless Steel BWR Isolation Condenser Components-Reactor Coolant

Cracking of BWR isolation condenser components is applicable to BWR plants only.

3.1.2.2.9 Loss of Preload due to Stress Relaxation

Loss of preload due to stress relaxation could occur in stainless steel and nickel alloy PWR reactor vessel internals screws and bolts exposed to reactor coolant. Loss of preload for the Davis-Besse internals screws and bolts will be managed by the PWR Reactor Vessel Internals Program.

3.1.2.2.10 Loss of Material due to Erosion

Loss of material due to erosion could occur in steel steam generator feedwater impingement plates and supports exposed to secondary feedwater. Davis-Besse has no feedwater impingement plates; therefore, this item is not applicable to Davis-Besse.

3.1.2.2.11 Cracking due to Flow-Induced Vibration of BWR Steam Dryers

Cracking of BWR steam dryer components is applicable to BWR plants only.

3.1.2.2.12 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking (IASCC)

Cracking due to SCC and IASCC could occur in PWR stainless steel reactor internals exposed to reactor coolant. At Davis-Besse, cracking due to SCC and IASCC in stainless steel reactor internals that are exposed to reactor coolant is managed by the PWR Water Chemistry Program and will also be managed by the PWR Reactor Vessel Internals Program.

3.1.2.2.13 Cracking due to Primary Water Stress Corrosion Cracking (PWSCC)

Cracking due to PWSCC could occur in PWR components made with nickel alloy and steel with nickel alloy cladding exposed to reactor coolant. Cracking due to SCC (including PWSCC) in Davis-Besse PWR components made with nickel alloy is managed by the Inservice Inspection Program, Nickel-Alloy Management Program, and PWR Water Chemistry Program.

3.1.2.2.14 Wall Thinning due to Flow-Accelerated Corrosion

Wall thinning due to flow-accelerated corrosion could occur in steel feedwater inlet rings and supports. The Davis-Besse once-through steam generators have no feedwater inlet rings; therefore, this item is not applicable to Davis-Besse.

3.1.2.2.15 Changes in Dimension due to Void Swelling

Changes in dimensions due to void swelling could occur in stainless steel and nickel alloy PWR reactor internal components exposed to reactor coolant. Changes in dimensions due to void swelling for Davis-Besse stainless steel and nickel alloy reactor internals components that are exposed to reactor coolant will be managed by the PWR Reactor Vessel Internals Program.

3.1.2.2.16 Cracking due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

3.1.2.2.16.1 Stainless Steel or Nickel-Alloy Steam Generator Components – Reactor Coolant

Cracking due to SCC could occur on the primary coolant side of stainless steel, stainless steel clad, and nickel-alloy clad components. Cracking due to SCC (including PWSCC) on the primary coolant side of Davis-Besse stainless steel, stainless steel clad, and nickel-alloy clad components is managed by the Inservice Inspection Program, Nickel-Alloy Management Program and PWR Water Chemistry Program.

3.1.2.2.16.2 Stainless Steel and Nickel-Alloy Pressurizer Spray Heads – Reactor Coolant

Cracking due to SCC could occur on stainless steel pressurizer spray heads. At Davis-Besse, the pressurizer spray head has no intended function; therefore, this item is not applicable to Davis-Besse.

3.1.2.2.17 Cracking due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

Cracking due to SCC, PWSCC, and IASCC could occur in PWR stainless steel and nickel alloy reactor vessel internals components. At Davis-Besse, cracking due to SCC or IASCC for stainless steel and nickel alloy reactor vessel internals components is managed by the PWR Water Chemistry Program and will also be managed by the PWR Reactor Vessel Internals Program. Cracking due to PWSCC is not identified as an aging effect requiring management for these components.

3.1.2.2.18 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B, Section B.1.3, for a discussion of FirstEnergy Nuclear Operating Company quality assurance procedures and administrative controls for aging management programs.

3.1.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the Reactor Pressure Vessel, Reactor Vessel Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators components. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

1. Class 1 Metal Fatigue (Section 4.3.2)
2. Reactor Vessel Neutron Embrittlement (Section 4.2)
3. Underclad Cracking (Section 4.2.6)

3.1.3 CONCLUSIONS

The Reactor Pressure Vessel, Reactor Vessel Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators components and commodities subject to AMR have been identified in accordance with 10 CFR 54.21. The aging management programs selected to manage the effects of aging for the mechanical components and commodities are identified in the following tables and Section 3.1.2.1. A description of the aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging associated with the Reactor Pressure Vessel, Reactor Vessel Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators components and commodities will be managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-01	BWR only				
3.1.1-02	BWR only				
3.1.1-03	BWR only				
3.1.1-04	BWR only				
3.1.1-05	Stainless steel and nickel alloy reactor vessel internals components	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Consistent with NUREG-1801. Fatigue of metal components is addressed as a TLAA in Section 4.3. Further evaluation is documented in Section 3.1.2.2.1.
3.1.1-06	Nickel Alloy tubes and sleeves in a reactor coolant and secondary feedwater/steam environment	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Consistent with NUREG-1801. Fatigue of metal components is addressed as a TLAA in Section 4.3. Further evaluation is documented in Section 3.1.2.2.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-07	Steel and stainless steel reactor coolant pressure boundary closure bolting, head closure studs, support skirts and attachment welds, pressurizer relief tank components, steam generator components, piping and components external surfaces and bolting	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Consistent with NUREG-1801. Fatigue of metal components is addressed as a TLAA in Section 4.3. Further evaluation is documented in Section 3.1.2.2.1.
3.1.1-08	Steel; stainless steel; and nickel-alloy reactor coolant pressure boundary piping, piping components, piping elements; flanges; nozzles and safe ends; pressurizer vessel shell heads and welds; heater sheaths and sleeves; penetrations; and thermal sleeves	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Consistent with NUREG-1801. Fatigue of metal components is addressed as a TLAA in Section 4.3. Further evaluation is documented in Section 3.1.2.2.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-09	Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor vessel components: flanges; nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Consistent with NUREG-1801, Fatigue of metal components is addressed as a TLAA in Section 4.3. Further evaluation is documented in Section 3.1.2.2.1.
3.1.1-10	Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy steam generator components (flanges; penetrations; nozzles; safe ends, lower heads and welds)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Consistent with NUREG-1801. Fatigue of metal components is addressed as a TLAA in Section 4.3. Further evaluation is documented in Section 3.1.2.2.1.
3.1.1-11	BWR only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-12	Steel steam generator shell assembly exposed to secondary feedwater and steam	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel steam generator components exposed to treated water (feedwater and steam) will be managed by the PWR Water Chemistry Program. The One-Time Inspection will verify the effectiveness of the PWR Water Chemistry Program. Further evaluation is documented in Section 3.1.2.2.2.1.
3.1.1-13	BWR only				
3.1.1-14	BWR only				
3.1.1-15	BWR only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-16	Steel steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam	Loss of material due to general, pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry and, for Westinghouse Model 44 and 51 S/G, if general and pitting corrosion of the shell is known to exist, additional inspection procedures are to be developed.	Yes, detection of aging effects is to be evaluated	Not applicable. Davis-Besse does not have Westinghouse Model 44 or 51 steam generators. Further evaluation is documented in Section 3.1.2.2.2.4.
3.1.1-17	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR Part 50 and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations.	Yes, TLAA	Consistent with NUREG-1801. Reduction in fracture toughness due to radiation embrittlement is evaluated as a TLAA in Section 4.2. Further evaluation is documented in Section 3.1.2.2.3.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-18	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor Vessel Surveillance	Yes, plant specific	Consistent with NUREG-1801. Reduction in fracture toughness due to radiation embrittlement of the reactor vessel beltline materials is managed by the Reactor Vessel Surveillance Program. The TLAA associated with embrittlement of the reactor vessel are discussed in Section 4.2. Further evaluation is documented in Section 3.1.2.2.3.2.
3.1.1-19	BWR only				
3.1.1-20	BWR only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-21	Reactor vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process	Crack growth due to cyclic loading	TLAA	Yes, TLAA	Consistent with NUREG-1801. The TLAA associated with underclad cracking of SA 508, Class 2 steel is discussed in Section 4.2. Further evaluation is documented in Section 3.1.2.2.5.
3.1.1-22	Stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement, void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment to be confirmed	Consistent with NUREG-1801, but a different program is used. Reduction in fracture toughness due to radiation embrittlement for stainless steel and nickel alloy reactor vessel internals components that are exposed to reactor coolant and neutron flux will be managed by the PWR Reactor Vessel Internals Program. Change in dimension due to void swelling is addressed in Item 3.1.1-33. Further evaluation is documented in Section 3.1.2.2.6.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-23	Stainless steel reactor vessel closure head flange leak detection line and bottom-mounted instrument guide tubes	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Stress corrosion cracking for the Davis-Besse incore monitoring piping and flange leakage detection piping is managed by the PWR Water Chemistry Program and will be verified by the Small Bore Class 1 Piping Inspection. Further evaluation is documented in Section 3.1.2.2.7.1.
3.1.1-24	Class 1 cast austenitic stainless steel piping, piping components, and piping elements exposed to reactor coolant	Cracking due to stress corrosion cracking	Water Chemistry and, for CASS components that do not meet the NUREG-0313 guidelines, a plant specific aging management program	Yes, plant specific	Not applicable. Davis-Besse has no Class 1 cast austenitic stainless steel piping or fittings exposed to reactor coolant. Further evaluation is documented in Section 3.1.2.2.7.2.
3.1.1-25	BWR only				
3.1.1-26	BWR only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-27	Stainless steel and nickel alloy reactor vessel internals screws, bolts, tie rods, and hold-down springs	Loss of preload due to stress relaxation	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment to be confirmed	Consistent with NUREG-1801, but a different program is used. Loss of preload due to stress relaxation in reactor vessel internals screws and bolts exposed to reactor coolant will be managed by the PWR Reactor Vessel Internals Program. Further evaluation is documented in Section 3.1.2.2.9.
3.1.1-28	Steel steam generator feedwater impingement plate and support exposed to secondary feedwater	Loss of material due to erosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. Davis-Besse does not have feedwater impingement plates. Class 1 feedwater components susceptible to flow accelerated corrosion use Item 3.1.1-59. See discussion in further evaluation Section 3.1.2.2.10.
3.1.1-29	BWR only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-30	Stainless steel reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Baffle/former assembly, Lower internal assembly, shroud assemblies, Plenum cover and plenum cylinder, Upper grid assembly, Control rod guide tube (CRGT) assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly, Thermal shield, Instrumentation support structures)	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment needs to be confirmed	Consistent with NUREG-1801. Cracking due to SCC and IASCC in reactor internals is managed by the PWR Water Chemistry Program and will also be managed by the PWR Reactor Vessel Internals Program. Further evaluation is documented in Section 3.1.2.2.12.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-31	Nickel alloy and steel with nickel-alloy cladding piping, piping component, piping elements, penetrations, nozzles, safe ends, and welds (other than reactor vessel head); pressurizer heater sheaths, sleeves, diaphragm plate, manways and flanges; core support pads/core guide lugs	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and FSAR supp commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins, and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	No, but licensee commitment needs to be confirmed	Consistent with NUREG-1801. Cracking due to SCC (including PWSCC) in nickel alloy components is managed by the Inservice Inspection Program, PWR Water Chemistry Program, and Nickel-Alloy Management Program. Further evaluation is documented in Section 3.1.2.2.13.
3.1.1-32	Steel steam generator feedwater inlet ring and supports	Wall thinning due to flow-accelerated corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. Davis-Besse once-through steam generators have no feedwater inlet rings. Further evaluation is documented in Section 3.1.2.2.14.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-33	Stainless steel and nickel alloy reactor vessel internals components	Changes in dimensions due to void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment to be confirmed	Changes in dimensions due to void swelling will be managed by the PWR Reactor Vessel Internals Program. Further evaluation is documented in Section 3.1.2.2.15.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-34	Stainless steel and nickel alloy reactor control rod drive head penetration pressure housings	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, FSAR supplement commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	No, but licensee commitment needs to be confirmed	Consistent with NUREG-1801. Cracking due to SCC in the stainless steel CRD flanges is managed by the Inservice Inspection Program and PWR Water Chemistry Program. Davis-Besse has no nickel alloy components that refer to this item. Further evaluation is documented in Section 3.1.2.2.16.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-35	Steel with stainless steel or nickel alloy cladding primary side components; steam generator upper and lower heads, tubesheets and tube-to-tube sheet welds	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, FSAR supplement commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	No, but licensee commitment needs to be confirmed	Consistent with NUREG-1801. Cracking due to SCC (including PWSCC) in steel steam generator components with stainless steel or nickel alloy cladding is managed by the Inservice Inspection Program and PWR Water Chemistry Program. Davis-Besse has no nickel-alloy components that refer to this item. Further evaluation is documented in Section 3.1.2.2.16.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-36	Nickel alloy, stainless steel pressurizer spray head	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Water Chemistry and One-Time Inspection and, for nickel alloy welded spray heads, provide commitment in FSAR supplement to submit AMP delineating commitments to Orders, Bulletins, or Generic Letters that inspect stipulated components for cracking of wetted surfaces.	No, unless licensee commitment needs to be confirmed	Not applicable. The Davis-Besse pressurizer spray nozzle has no license renewal function and thus is not in the scope of license renewal. Further evaluation is documented in Section 3.1.2.2.16.2.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-37	Stainless steel and nickel alloy reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Lower internal assembly, CEA shroud assemblies, Core shroud assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment needs to be confirmed	Consistent with NUREG-1801. Cracking due to SCC and IASCC for stainless steel and nickel alloy reactor vessel internals components is managed by the PWR Water Chemistry Program and will also be managed by the PWR Reactor Vessel Internals Program. Further evaluation is documented in Section 3.1.2.2.17.
3.1.1-38	BWR only				
3.1.1-39	BWR only				
3.1.1-40	BWR only				
3.1.1-41	BWR only				
3.1.1-42	BWR only				
3.1.1-43	BWR only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-44	BWR only				
3.1.1-45	BWR only				
3.1.1-46	BWR only				
3.1.1-47	BWR only				
3.1.1-48	BWR only				
3.1.1-49	BWR only				
3.1.1-50	BWR only				
3.1.1-51	BWR only				
3.1.1-52	Steel and stainless steel reactor coolant pressure boundary (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems	Cracking due to stress corrosion cracking, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Cracking, loss of material, and loss of preload for Class 1 pressure boundary bolting are managed by the Bolting Integrity Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-53	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable. Davis-Besse has no Class 1 steel components exposed to closed cycle cooling water.
3.1.1-54	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. Davis-Besse has no Class 1 copper alloy components.
3.1.1-55	Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant >250 °C (>482 °F)	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection (IWB, IWC, and IWD). Thermal aging susceptibility screening is not necessary, inservice inspection requirements are sufficient for managing these aging effects. ASME Code Case N-481 also provides an alternative for pump casings.	No	Consistent with NUREG-1801. Reduction in fracture toughness due to thermal embrittlement in cast austenitic stainless steel Class 1 pump casings and valve bodies is managed by the Inservice Inspection Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-56	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. Davis-Besse has no Class 1 copper alloy components.
3.1.1-57	Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and CRD pressure housings exposed to reactor coolant >250 °C (>482 °F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable. Davis-Besse has no CASS piping. CASS pump casings and valve bodies are addressed in Item Number 3.1.1-55.
3.1.1-58	Steel reactor coolant pressure boundary external surfaces exposed to air with borated water leakage	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	No	Consistent with NUREG-1801 Loss of material due to boric acid corrosion on steel Class 1 components exposed to air with borated water leakage is managed by the Boric Acid Corrosion Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-59	Steel steam generator steam nozzle and safe end, feedwater nozzle and safe end, AFW nozzles and safe ends exposed to secondary feedwater/steam	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Consistent with NUREG-1801. Loss of material due to flow-accelerated corrosion in the Davis-Besse Feedwater System is managed by the Flow-Accelerated Corrosion (FAC) Program.
3.1.1-60	Stainless steel flux thimble tubes (with or without chrome plating)	Loss of material due to Wear	Flux Thimble Tube Inspection	No	Not applicable. Davis-Besse has no flux thimble tubes.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-61	Stainless steel, steel pressurizer integral support exposed to air with metal temperature up to 288°C (550°F)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD)	No	Consistent with NUREG-1801. Davis-Besse manages cracking due to flaw growth (cyclic loading) of the pressurizer support plate assembly using the Inservice Inspection Program. In addition, Davis-Besse manages cracking due to flaw growth of the CRD bolts and nut rings using the Inservice Inspection Program, and refers to this line item as it is the same material, environment and aging effect combination.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-62	Stainless steel, steel with stainless steel cladding reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings exposed to reactor coolant	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD)	No	Consistent with NUREG-1801. Cracking due to flaw growth (cyclic loading) of stainless steel, steel with stainless steel cladding and nickel alloy pressure boundary and support components is managed by the Inservice Inspection Program. Cracking due to flaw growth (cyclic loading) of stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant will be managed by the PWR Reactor Vessel Internals Program.
3.1.1-63	Steel reactor vessel flange, stainless steel and nickel alloy reactor vessel internals exposed to reactor coolant (e.g., upper and lower internals assembly, CEA shroud assembly, core support barrel, upper grid assembly, core support shield assembly, lower grid assembly)	Loss of material due to Wear	Inservice Inspection (IWB, IWC, and IWD)	No	Consistent with NUREG-1801, but a different aging management program is assigned. Loss of material for stainless steel reactor vessel internals will be managed by the PWR Reactor Vessel Internals Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-64	Stainless steel and steel with stainless steel or nickel alloy cladding pressurizer components	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to SCC/IGA is managed for stainless steel or steel with stainless steel cladding pressure boundary components by a combination of the PWR Water Chemistry Program and the Inservice Inspection Program.
3.1.1-65	Nickel alloy reactor vessel upper head and control rod drive penetration nozzles, instrument tubes, head vent pipe (top head), and welds	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	No	Consistent with NUREG-1801. Cracking due to PWSCC and SCC/IGA of the CRD nozzles is managed by a combination of the PWR Water Chemistry Program, the Nickel-Alloy Reactor Vessel Closure Head Nozzle Program, and the Inservice Inspection Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-66	Steel steam generator secondary manways and handholds (cover only) exposed to air with leaking secondary-side water and/or steam	Loss of material due to erosion	Inservice Inspection (IWB, IWC, and IWD) for Class 2 components	No	Not applicable. Loss of material due to erosion was not identified as an aging effect requiring management for the steam generator secondary side manways and handholes.
3.1.1-67	Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to flaw growth (cyclic loading) for pressurizer components is managed by the Inservice Inspection Program.
3.1.1-68	Stainless steel, steel with stainless steel cladding Class 1 piping, fittings, pump casings, valve bodies, nozzles, safe ends, manways, flanges, CRD housing; pressurizer heater sheaths, sleeves, diaphragm plate; pressurizer relief tank components, reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings	Cracking due to stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to SCC/IGA is managed by a combination of the PWR Water Chemistry Program and the Inservice Inspection Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-69	Stainless steel, nickel alloy safety injection nozzles, safe ends, and associated welds and buttering exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to SCC/IGA in stainless steel or steel with stainless steel cladding components is managed by a combination of the PWR Water Chemistry Program and the Inservice Inspection Program.
3.1.1-70	Stainless steel; steel with stainless steel cladding Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant	Cracking due to stress corrosion cracking, thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	No	Consistent with NUREG-1801. Cracking due to SCC/IGA and flaw growth (cyclic loading) is managed by a combination of the PWR Water Chemistry Program, the Inservice Inspection Program, and the Small Bore Class 1 Pipe Inspection.
3.1.1-71	High-strength low alloy steel closure head stud assembly exposed to air with reactor coolant leakage	Cracking due to stress corrosion cracking; loss of material due to wear	Reactor Head Closure Studs	No	Consistent with NUREG-1801. Cracking and loss of material for the reactor vessel head closure studs are managed by the Reactor Head Closure Studs Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-72	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater/ steam	Cracking due to OD stress corrosion cracking and intergranular attack, loss of material due to fretting and wear	Steam Generator Tube Integrity and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to SCC/IGA and loss of material for nickel-alloy steam generator tubes and sleeves is managed by a combination of the PWR Water Chemistry Program and the Steam Generator Tube Integrity Program.
3.1.1-73	Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Steam Generator Tube Integrity and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to SCC/IGA and PWSCC for nickel-alloy steam generator tubes and sleeves, and tube plugs is managed by a combination of the PWR Water Chemistry Program and the Steam Generator Tube Integrity Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-74	Chrome plated steel, stainless steel, nickel alloy steam generator anti-vibration bars exposed to secondary feedwater/ steam	Cracking due to stress corrosion cracking, loss of material due to crevice corrosion and fretting	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable. Davis-Besse has once-through steam generators and the item applies only to recirculating steam generators.
3.1.1-75	Nickel alloy once-through steam generator tubes exposed to secondary feedwater/ steam	Denting due to corrosion of carbon steel tube support plate	Steam Generator Tube Integrity and Water Chemistry	No	Consistent with NUREG-1801. Denting of nickel-alloy steam generator tubes and sleeves is managed by a combination of the PWR Water Chemistry Program and the Steam Generator Tube Integrity Program.
3.1.1-76	Steel steam generator tube support plate, tube bundle wrapper exposed to secondary feedwater/steam	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Consistent with NUREG-1801. Loss of material and ligament cracking of the tube support plates is managed by a combination of the Steam Generator Tube Integrity Program and the PWR Water Chemistry Program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-77	Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary feedwater/ steam	Loss of material due to wastage and pitting corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable. Davis-Besse does not use phosphate chemistry in the steam generators.
3.1.1-78	Steel steam generator tube support lattice bars exposed to secondary feedwater/ steam	Wall thinning due to flow-accelerated corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable. Davis-Besse steam generators have tube support plates (Item 3.1.1-76) rather than lattice bars.
3.1.1-79	Nickel alloy steam generator tubes exposed to secondary feedwater/ steam	Denting due to corrosion of steel tube support plate	Steam Generator Tube Integrity; Water Chemistry and, for plants that could experience denting at the upper support plates, evaluate potential for rapidly propagating cracks and then develop and take corrective actions consistent with Bulletin 88-02.	No	Not applicable. Denting of steam generator tubes is addressed in Item Number 3.1.1-75.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-80	Cast austenitic stainless steel reactor vessel internals (e.g., upper internals assembly, lower internal assembly, CEA shroud assemblies, control rod guide tube assembly, core support shield assembly, lower grid assembly)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	No	Consistent with NUREG-1801, but a different aging management program is assigned. Reduction in fracture toughness due to radiation and thermal embrittlement of cast austenitic stainless steel reactor vessel internals will be managed by the PWR Reactor Vessel Internals Program.
3.1.1-81	Nickel alloy or nickel-alloy clad steam generator divider plate exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Water Chemistry	No	Not applicable. Davis-Besse steam generators do not have divider plates.
3.1.1-82	Stainless steel steam generator primary side divider plate exposed to reactor coolant	Cracking due to stress corrosion cracking	Water Chemistry	No	Not applicable. Davis-Besse steam generators do not have divider plates.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-83	Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor vessel internals and reactor coolant pressure boundary components exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Consistent with NUREG-1801. Loss of material for components exposed to reactor coolant is managed by the PWR Water Chemistry Program.
3.1.1-84	Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary feedwater/ steam	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection or Inservice Inspection (IWB, IWC, and IWD).	No	Consistent with NUREG-1801. Cracking due to SCC/IGA of nickel-alloy steam generator components (other than the tubes and sleeves addressed in Item 3.1.1-72) is managed by a combination of the PWR Water Chemistry Program and the Inservice Inspection Program.
3.1.1-85	Nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	N/A - No AEM or AMP	Not applicable. Air-indoor uncontrolled is not used as an external environment for Class 1 components; they all have the harsher environment of air with borated water leakage.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, Reactor Coolant System and Reactor Coolant Pressure Boundary, and Steam Generators Evaluated in Chapter IV of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-86	Stainless steel piping, piping components, and piping elements exposed to air – indoor uncontrolled (External); air with borated water leakage; concrete; gas	None	None	N/A - No AEM or AMP	Consistent with NUREG-1801. Davis-Besse agrees that stainless steel components exposed to air with borated water leakage have no aging effects requiring management.
3.1.1-87	Steel piping, piping components, and piping elements in concrete	None	None	N/A - No AEM or AMP	Not applicable. Davis-Besse has no Class 1 piping embedded in concrete.

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bottom Head	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
2	Bottom Head	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
3	Bottom Head	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-15	3.1.1-69	C
4	Bottom Head	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-15	3.1.1-69	C
5	Bottom Head	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
6	Bottom Head	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Closure Studs, Nuts, and Washers	Pressure boundary	Steel	Air with borated water leakage (External)	Cracking - Fatigue	TLAA	IV.A2-4	3.1.1-07	A
8	Closure Studs, Nuts, and Washers	Pressure boundary	Steel	Air with borated water leakage (External)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-16	3.1.1-61	C 0102
9	Closure Studs, Nuts, and Washers	Pressure boundary	Steel	Air with borated water leakage (External)	Cracking - SCC	Reactor Head Closure Studs	IV.A2-2	3.1.1-71	A
10	Closure Studs, Nuts, and Washers	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Reactor Head Closure Studs	IV.A2-3	3.1.1-71	A
11	Core Flooding Nozzle Safe Ends	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
12	Core Flooding Nozzle Safe Ends	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
13	Core Flooding Nozzle Safe Ends	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-15	3.1.1-69	A
14	Core Flooding Nozzle Safe Ends	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-15	3.1.1-69	A
15	Core Flooding Nozzle Safe Ends	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
16	Core Flooding Nozzle Safe Ends	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
17	Core Flooding Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
18	Core Flooding Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
19	Core Flooding Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-15	3.1.1-69	C

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
20	Core Flooding Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-15	3.1.1-69	C
21	Core Flooding Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
22	Core Flooding Nozzles	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
23	Core Guide Lugs	Support	Nickel Alloy	Borated reactor coolant (External)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A 0101
24	Core Guide Lugs	Support	Nickel Alloy	Borated reactor coolant (External)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0101 0102 0103
25	Core Guide Lugs	Support	Nickel Alloy	Borated reactor coolant (External)	Cracking - SCC/IGA, PWSCC	PWR Water Chemistry	IV.A2-12	3.1.1-31	A 0101
26	Core Guide Lugs	Support	Nickel Alloy	Borated reactor coolant (External)	Cracking - SCC/IGA, PWSCC	Inservice Inspection	IV.A2-12	3.1.1-31	A 0101

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
27	Core Guide Lugs	Support	Nickel Alloy	Borated reactor coolant (External)	Cracking - SCC/IGA, PWSCC	Nickel-Alloy Management	IV.A2-12	3.1.1-31	A 0101 0110
28	Core Guide Lugs	Support	Nickel Alloy	Borated reactor coolant (External)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A 0101
29	CRD Bolts	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	C
30	CRD Bolts	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-16	3.1.1-61	C 0102
31	CRD Bolts	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking - SCC/IGA	Bolting Integrity	IV.A2-6	3.1.1-52	B
32	CRD Bolts	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	IV.A2-7	3.1.1-52	B

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
33	CRD Bolts	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of preload	Bolting Integrity	IV.A2-8	3.1.1-52	B
34	CRD flanges	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
35	CRD flanges	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
36	CRD flanges	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-11	3.1.1-34	C
37	CRD flanges	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-11	3.1.1-34	C
38	CRD flanges	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
39	CRD flanges	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
40	CRD Nut Rings	Pressure boundary	Steel	Air with borated water leakage (External)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
41	CRD Nut Rings	Pressure boundary	Steel	Air with borated water leakage (External)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-16	3.1.1-61	C 0102
42	CRD Nut Rings	Pressure boundary	Steel	Air with borated water leakage (External)	Cracking - SCC	Bolting Integrity	IV.A2-6	3.1.1-52	B
43	CRD Nut Rings	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
44	CRD nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
45	CRD nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
46	CRD nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - SCC/IGA, PWSCC	PWR Water Chemistry	IV.A2-9	3.1.1-65	A
47	CRD nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - SCC/IGA, PWSCC	Inservice Inspection	IV.A2-9	3.1.1-65	A
48	CRD nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - SCC/IGA, PWSCC	Nickel-Alloy Reactor Vessel Closure Head Nozzles	IV.A2-9	3.1.1-65	A
49	CRD nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
50	CRD nozzles	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	C 0103
51	Incore instrument nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
52	Incore instrument nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Incore instrument nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - SCC/IGA, PWSCC	PWR Water Chemistry	IV.A2-19	3.1.1-31	A
54	Incore instrument nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - SCC/IGA, PWSCC	Inservice Inspection	IV.A2-19	3.1.1-31	A
55	Incore instrument nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - SCC/IGA, PWSCC	Nickel-Alloy Management	IV.A2-19	3.1.1-31	A 0110
56	Incore instrument nozzles	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
57	Incore instrument nozzles	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	C 0103
58	Inlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
59	Inlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
60	Inlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-15	3.1.1-69	C
61	Inlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-15	3.1.1-69	C
62	Inlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
63	Inlet Nozzles	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
64	Outlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
65	Outlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
66	Outlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-15	3.1.1-69	C

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
67	Outlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-15	3.1.1-69	C
68	Outlet Nozzles	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
69	Outlet Nozzles	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
70	Shell (Beltline Plates)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant with neutron fluence (Internal)	Reduction in Fracture Toughness	Reactor Vessel Surveillance	IV.A2-24	3.1.1-18	A
71	Shell (Beltline Plates)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant with neutron fluence (Internal)	Reduction in Fracture Toughness	TLAA	IV.A2-23	3.1.1-17	A

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Shell (Beltline Welds)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant with neutron fluence (Internal)	Reduction in Fracture Toughness	Reactor Vessel Surveillance	IV.A2-24	3.1.1-18	A
73	Shell (Beltline Welds)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant with neutron fluence (Internal)	Reduction in Fracture Toughness	TLAA	IV.A2-23	3.1.1-17	A
74	Shell (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
75	Shell (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
76	Shell (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-15	3.1.1-69	C
77	Shell (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-15	3.1.1-69	C

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
78	Shell (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - UCC	TLAA	IV.A2-22	3.1.1-21	C 0105
79	Shell (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
80	Shell (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
81	Shell (Shell Rings)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
82	Shell (Shell Rings)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
83	Shell (Shell Rings)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-15	3.1.1-69	C
84	Shell (Shell Rings)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-15	3.1.1-69	C

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
85	Shell (Shell Rings)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - UCC	TLAA	IV.A2-22	3.1.1-21	A 0105
86	Shell (Shell Rings)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
87	Shell (Shell Rings)	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
88	Upper Head (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
89	Upper Head (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
90	Upper Head (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-15	3.1.1-69	C

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
91	Upper Head (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-15	3.1.1-69	C
92	Upper Head (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
93	Upper Head (Closure Flange)	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
94	Upper Head (Dome)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.A2-21	3.1.1-09	A
95	Upper Head (Dome)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
96	Upper Head (Dome)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-15	3.1.1-69	C

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
97	Upper Head (Dome)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.A2-15	3.1.1-69	C
98	Upper Head (Dome)	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of material	PWR Water Chemistry	IV.A2-14	3.1.1-83	A
99	Upper Head (Dome)	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (LCB - original)	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-17	3.1.1-33	E
2	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (LCB - original)	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
3	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (LCB - original)	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
4	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (LCB - original)	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-20	3.1.1-37	E
5	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (LCB - original)	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-20	3.1.1-37	A
6	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (LCB - original)	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (LCB - original)	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-19	3.1.1-27	E
8	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (LCB - original)	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-16	3.1.1-22	E
9	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (UCB and LCB - replacement)	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-30	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
10	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (UCB and LCB - replacement)	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
11	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (UCB and LCB - replacement)	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102 0103
12	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (UCB and LCB - replacement)	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-32	3.1.1-37	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
13	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (UCB and LCB - replacement)	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-32	3.1.1-37	A
14	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (UCB and LCB - replacement)	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
15	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (UCB and LCB - replacement)	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-33	3.1.1-27	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
16	CSA, Core Support Shield, Bolt - Core Support Shield to Core Barrel (UCB and LCB - replacement)	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-31	3.1.1-22	E
17	CSA, Core Support Shield, Cylinder and Flanges, Reinforcing Rings/Nozzles, Misc. Parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-17	3.1.1-33	E
18	CSA, Core Support Shield, Cylinder and Flanges, Reinforcing Rings/Nozzles, Misc. Parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
19	CSA, Core Support Shield, Cylinder and Flanges, Reinforcing Rings/Nozzles, Misc. Parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
20	CSA, Core Support Shield, Cylinder and Flanges, Reinforcing Rings/Nozzles, Misc. Parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-18	3.1.1-30	E
21	CSA, Core Support Shield, Cylinder and Flanges, Reinforcing Rings/Nozzles, Misc. Parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-18	3.1.1-30	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	CSA, Core Support Shield, Cylinder and Flanges, Reinforcing Rings/Nozzles, Misc. Parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
23	CSA, Core Support Shield, Cylinder and Flanges, Reinforcing Rings/Nozzles, Misc. Parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Reactor Vessel Internals	IV.B4-15	3.1.1-63	E
24	CSA, Core Support Shield, Cylinder and Flanges, Reinforcing Rings/Nozzles, Misc. Parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-16	3.1.1-22	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
25	CSA, Core Barrel, Bolts and Screws - Baffle-to-Former and Baffle-to-baffle	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-8	3.1.1-33	E
26	CSA, Core Barrel, Bolts and Screws - Baffle-to-Former and Baffle-to-baffle	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
27	CSA, Core Barrel, Bolts and Screws - Baffle-to-Former and Baffle-to-baffle	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
28	CSA, Core Barrel, Bolts and Screws - Baffle-to-Former and Baffle-to-baffle	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-7	3.1.1-30	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
29	CSA, Core Barrel, Bolts and Screws - Baffle-to-Former and Baffle-to-baffle	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-7	3.1.1-30	A
30	CSA, Core Barrel, Bolts and Screws - Baffle-to-Former and Baffle-to-baffle	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
31	CSA, Core Barrel, Bolts and Screws - Baffle-to-Former and Baffle-to-baffle	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-9	3.1.1-27	E
32	CSA, Core Barrel, Bolts and Screws - Baffle-to-Former and Baffle-to-baffle	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-1	3.1.1-22	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
33	CSA, Core Barrel; Bolt - Core Barrel-to-Former	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-11	3.1.1-33	E
34	CSA, Core Barrel; Bolt - Core Barrel-to-Former	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
35	CSA, Core Barrel; Bolt - Core Barrel-to-Former	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
36	CSA, Core Barrel; Bolt - Core Barrel-to-Former	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-13	3.1.1-37	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
37	CSA, Core Barrel; Bolt - Core Barrel-to-Former	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-13	3.1.1-37	C
38	CSA, Core Barrel; Bolt - Core Barrel-to-Former	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
39	CSA, Core Barrel; Bolt - Core Barrel-to-Former	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-9	3.1.1-27	E
40	CSA, Core Barrel; Bolt - Core Barrel-to-Former	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-12	3.1.1-22	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
41	CSA, Core Barrel; Bolt - Thermal Shield (UTS) and Lower Internals to Core Barrel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-11	3.1.1-33	E
42	CSA, Core Barrel; Bolt - Thermal Shield (UTS) and Lower Internals to Core Barrel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
43	CSA, Core Barrel; Bolt - Thermal Shield (UTS) and Lower Internals to Core Barrel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
44	CSA, Core Barrel; Bolt - Thermal Shield (UTS) and Lower Internals to Core Barrel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-13	3.1.1-37	E
45	CSA, Core Barrel; Bolt - Thermal Shield (UTS) and Lower Internals to Core Barrel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-13	3.1.1-37	A
46	CSA, Core Barrel; Bolt - Thermal Shield (UTS) and Lower Internals to Core Barrel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
47	CSA, Core Barrel; Bolt - Thermal Shield (UTS) and Lower Internals to Core Barrel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-14	3.1.1-27	E
48	CSA, Core Barrel; Bolt - Thermal Shield (UTS) and Lower Internals to Core Barrel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-12	3.1.1-22	E
49	CSA, Core Barrel; Cylinder, Flange, Plate, Formers, Pin, Ring, Dowel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-11	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
50	CSA, Core Barrel; Cylinder, Flange, Plate, Formers, Pin, Ring, Dowel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
51	CSA, Core Barrel; Cylinder, Flange, Plate, Formers, Pin, Ring, Dowel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
52	CSA, Core Barrel; Cylinder, Flange, Plate, Formers, Pin, Ring, Dowel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-10	3.1.1-30	E
53	CSA, Core Barrel; Cylinder, Flange, Plate, Formers, Pin, Ring, Dowel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-10	3.1.1-30	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
54	CSA, Core Barrel; Cylinder, Flange, Plate, Formers, Pin, Ring, Dowel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
55	CSA, Core Barrel; Cylinder, Flange, Plate, Formers, Pin, Ring, Dowel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-12	3.1.1-22	E
56	CSA, Lower Grid; Bolt - Lower Internals Assembly-to-Thermal Shield (LTS)	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-30	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
57	CSA, Lower Grid; Bolt - Lower Internals Assembly-to-Thermal Shield (LTS)	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
58	CSA, Lower Grid; Bolt - Lower Internals Assembly-to-Thermal Shield (LTS)	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102 0103
59	CSA, Lower Grid; Bolt - Lower Internals Assembly-to-Thermal Shield (LTS)	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-32	3.1.1-37	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
60	CSA, Lower Grid; Bolt - Lower Internals Assembly-to-Thermal Shield (LTS)	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-32	3.1.1-37	A
61	CSA, Lower Grid; Bolt - Lower Internals Assembly-to-Thermal Shield (LTS)	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
62	CSA, Lower Grid; Bolt - Lower Internals Assembly-to-Thermal Shield (LTS)	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-33	3.1.1-27	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
63	CSA, Lower Grid; Bolt - Lower Internals Assembly-to-Thermal Shield (LTS)	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-31	3.1.1-22	E
64	CSA, Lower Grid; Bolt, Screw, Washer	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-30	3.1.1-33	E
65	CSA, Lower Grid; Bolt, Screw, Washer	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
66	CSA, Lower Grid; Bolt, Screw, Washer	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
67	CSA, Lower Grid; Bolt, Screw, Washer	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-32	3.1.1-37	E
68	CSA, Lower Grid; Bolt, Screw, Washer	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-32	3.1.1-37	A
69	CSA, Lower Grid; Bolt, Screw, Washer	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
70	CSA, Lower Grid; Bolt, Screw, Washer	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-33	3.1.1-27	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
71	CSA, Lower Grid; Bolt, Screw, Washer	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-31	3.1.1-22	E
72	CSA, Lower Grid; Compression Collar and Dowel	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-30	3.1.1-33	E
73	CSA, Lower Grid; Compression Collar and Dowel	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
74	CSA, Lower Grid; Compression Collar and Dowel	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102 0103

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
75	CSA, Lower Grid; Compression Collar and Dowel	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-32	3.1.1-37	E
76	CSA, Lower Grid; Compression Collar and Dowel	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-32	3.1.1-37	A
77	CSA, Lower Grid; Compression Collar and Dowel	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
78	CSA, Lower Grid; Compression Collar and Dowel	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-31	3.1.1-22	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
79	CSA, Lower Grid; Forging, Flange, Plate, and piece parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-30	3.1.1-33	E
80	CSA, Lower Grid; Forging, Flange, Plate, and piece parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
81	CSA, Lower Grid; Forging, Flange, Plate, and piece parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
82	CSA, Lower Grid; Forging, Flange, Plate, and piece parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-29	3.1.1-30	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
83	CSA, Lower Grid; Forging, Flange, Plate, and piece parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-29	3.1.1-30	A
84	CSA, Lower Grid; Forging, Flange, Plate, and piece parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
85	CSA, Lower Grid; Forging, Flange, Plate, and piece parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-31	3.1.1-22	E
86	CSA, Lower Grid; Fuel Assembly Support Pad and Guide Block	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-30	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
87	CSA, Lower Grid; Fuel Assembly Support Pad and Guide Block	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
88	CSA, Lower Grid; Fuel Assembly Support Pad and Guide Block	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
89	CSA, Lower Grid; Fuel Assembly Support Pad and Guide Block	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-29	3.1.1-30	E
90	CSA, Lower Grid; Fuel Assembly Support Pad and Guide Block	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-29	3.1.1-30	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
91	CSA, Lower Grid; Fuel Assembly Support Pad and Guide Block	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
92	CSA, Lower Grid; Fuel Assembly Support Pad and Guide Block	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Reactor Vessel Internals	IV.B4-27	3.1.1-63	E
93	CSA, Lower Grid; Fuel Assembly Support Pad and Guide Block	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-31	3.1.1-22	E
94	CSA, Flow Distributor; Clamping Ring, Dowel, Flange, Plate, Clip	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-23	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
95	CSA, Flow Distributor; Clamping Ring, Dowel, Flange, Plate, Clip	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
96	CSA, Flow Distributor; Clamping Ring, Dowel, Flange, Plate, Clip	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
97	CSA, Flow Distributor; Clamping Ring, Dowel, Flange, Plate, Clip	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-22	3.1.1-30	E
98	CSA, Flow Distributor; Clamping Ring, Dowel, Flange, Plate, Clip	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-22	3.1.1-30	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
99	CSA, Flow Distributor; Clamping Ring, Dowel, Flange, Plate, Clip	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
100	CSA, Flow Distributor; Clamping Ring, Dowel, Flange, Plate, Clip	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Reactor Vessel Internals	IV.B4-15	3.1.1-63	E
101	CSA, Flow Distributor; Clamping Ring, Dowel, Flange, Plate, Clip	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-24	3.1.1-22	E
102	CSA, Flow Distributor; Head	Flow control	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-23	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
103	CSA, Flow Distributor; Head	Flow control	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
104	CSA, Flow Distributor; Head	Flow control	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
105	CSA, Flow Distributor; Head	Flow control	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-22	3.1.1-30	E
106	CSA, Flow Distributor; Head	Flow control	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-22	3.1.1-30	A
107	CSA, Flow Distributor; Head	Flow control	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
108	CSA, Flow Distributor; Head	Flow control	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-24	3.1.1-22	E
109	CSA, Flow Distributor; Bolt - Shell Forging-to-Flow Distributor	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-23	3.1.1-33	E
110	CSA, Flow Distributor; Bolt - Shell Forging-to-Flow Distributor	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
111	CSA, Flow Distributor; Bolt - Shell Forging-to-Flow Distributor	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
112	CSA, Flow Distributor; Bolt - Shell Forging-to-Flow Distributor	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-25	3.1.1-37	E
113	CSA, Flow Distributor; Bolt - Shell Forging-to-Flow Distributor	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-25	3.1.1-37	A
114	CSA, Flow Distributor; Bolt - Shell Forging-to-Flow Distributor	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
115	CSA, Flow Distributor; Bolt - Shell Forging-to-Flow Distributor	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-26	3.1.1-27	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
116	CSA, Flow Distributor; Bolt - Shell Forging-to-Flow Distributor	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-24	3.1.1-22	E
117	CSA, Thermal Shield; Shield, Dowel, Restraint	Shielding	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-39	3.1.1-33	E
118	CSA, Thermal Shield; Shield, Dowel, Restraint	Shielding	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
119	CSA, Thermal Shield; Shield, Dowel, Restraint	Shielding	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
120	CSA, Thermal Shield; Shield, Dowel, Restraint	Shielding	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-40	3.1.1-30	E
121	CSA, Thermal Shield; Shield, Dowel, Restraint	Shielding	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-40	3.1.1-30	A
122	CSA, Thermal Shield; Shield, Dowel, Restraint	Shielding	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
123	CSA, Thermal Shield; Shield, Dowel, Restraint	Shielding	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-41	3.1.1-22	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
124	CSA, Incore Guide Tube Assembly; Spider	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-23	3.1.1-33	E
125	CSA, Incore Guide Tube Assembly; Spider	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
126	CSA, Incore Guide Tube Assembly; Spider	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
127	CSA, Incore Guide Tube Assembly; Spider	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-29	3.1.1-30	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
128	CSA, Incore Guide Tube Assembly; Spider	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-29	3.1.1-30	A
129	CSA, Incore Guide Tube Assembly; Spider	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
130	CSA, Incore Guide Tube Assembly; Spider	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-28	3.1.1-80	E
131	CSA, Incore Guide Tube Assembly; Tube, Gusset, Clip, Nut and Washer	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-23	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
132	CSA, Incore Guide Tube Assembly; Tube, Gusset, Clip, Nut and Washer	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
133	CSA, Incore Guide Tube Assembly; Tube, Gusset, Clip, Nut and Washer	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
134	CSA, Incore Guide Tube Assembly; Tube, Gusset, Clip, Nut and Washer	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-29	3.1.1-30	E
135	CSA, Incore Guide Tube Assembly; Tube, Gusset, Clip, Nut and Washer	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-29	3.1.1-30	C

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
136	CSA, Incore Guide Tube Assembly; Tube, Gusset, Clip, Nut and Washer	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
137	CSA, Incore Guide Tube Assembly; Tube, Gusset, Clip, Nut and Washer	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-24	3.1.1-22	E
138	CSA, Vent Valve Assembly; Valve Body	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-17	3.1.1-33	E
139	CSA, Vent Valve Assembly; Valve Body	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
140	CSA, Vent Valve Assembly; Valve Body	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
141	CSA, Vent Valve Assembly; Valve Body	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-18	3.1.1-30	E
142	CSA, Vent Valve Assembly; Valve Body	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-18	3.1.1-30	A
143	CSA, Vent Valve Assembly; Valve Body	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
144	CSA, Vent Valve Assembly; Valve Body	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-21	3.1.1-80	E
145	CSA, Vent Valve Assembly; Vent Valve Parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-17	3.1.1-33	E
146	CSA, Vent Valve Assembly; Vent Valve Parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
147	CSA, Vent Valve Assembly; Vent Valve Parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
148	CSA, Vent Valve Assembly; Vent Valve Parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-18	3.1.1-30	E
149	CSA, Vent Valve Assembly; Vent Valve Parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-18	3.1.1-30	A
150	CSA, Vent Valve Assembly; Vent Valve Parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
151	CSA, Vent Valve Assembly; Vent Valve Parts	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Reactor Vessel Internals	IV.B4-15	3.1.1-63	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
152	CSA, Vent Valve Assembly; Vent Valve Parts	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-16	3.1.1-22	E
153	Plenum Cover Base Block, Bolt, Locking cup, Lifting Lug	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
154	Plenum Cover Base Block, Bolt, Locking cup, Lifting Lug	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
155	Plenum Cover Base Block, Bolt, Locking cup, Lifting Lug	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - SCC/IGA	PWR Reactor Vessel Internals	IV.B4-34	3.1.1-30	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
156	Plenum Cover Base Block, Bolt, Locking cup, Lifting Lug	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.B4-34	3.1.1-30	A
157	Plenum Cover Base Block, Bolt, Locking cup, Lifting Lug	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
158	Plenum Cover Rib Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
159	Plenum Cover Rib Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
160	Plenum Cover Rib Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - SCC/IGA	PWR Reactor Vessel Internals	IV.B4-44	3.1.1-30	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
161	Plenum Cover Rib Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.B4-44	3.1.1-30	A
162	Plenum Cover Rib Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Reactor Vessel Internals	IV.B4-42	3.1.1-63	E
163	Plenum Cover Rib Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
164	Plenum Cover Flange, Plate, Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
165	Plenum Cover Flange, Plate, Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
166	Plenum Cover Flange, Plate, Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - SCC/IGA	PWR Reactor Vessel Internals	IV.B4-34	3.1.1-30	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
167	Plenum Cover Flange, Plate, Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.B4-34	3.1.1-30	A
168	Plenum Cover Flange, Plate, Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
169	Plenum CRGT; Pipe, Flange, Tube, Tube Sector	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-3	3.1.1-33	E
170	Plenum CRGT; Pipe, Flange, Tube, Tube Sector	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
171	Plenum CRGT; Pipe, Flange, Tube, Tube Sector	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
172	Plenum CRGT; Pipe, Flange, Tube, Tube Sector	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-2	3.1.1-30	E
173	Plenum CRGT; Pipe, Flange, Tube, Tube Sector	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-2	3.1.1-30	A
174	Plenum CRGT; Pipe, Flange, Tube, Tube Sector	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
175	Plenum CRGT; Pipe, Flange, Tube, Tube Sector	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-46	3.1.1-22	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
176	Plenum CRGT; Spacer Casting	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-3	3.1.1-33	E
177	Plenum CRGT; Spacer Casting	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
178	Plenum CRGT; Spacer Casting	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
179	Plenum CRGT; Spacer Casting	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-2	3.1.1-30	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
180	Plenum CRGT; Spacer Casting	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-2	3.1.1-30	A
181	Plenum CRGT; Spacer Casting	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
182	Plenum CRGT; Spacer Casting	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-4	3.1.1-80	E
183	Plenum CRGT; Screw, Washer, and Dowel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-3	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
184	Plenum CRGT; Screw, Washer, and Dowel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
185	Plenum CRGT; Screw, Washer, and Dowel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
186	Plenum CRGT; Screw, Washer, and Dowel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-5	3.1.1-30	E
187	Plenum CRGT; Screw, Washer, and Dowel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-5	3.1.1-30	A
188	Plenum CRGT; Screw, Washer, and Dowel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
189	Plenum CRGT; Screw, Washer, and Dowel	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-6	3.1.1-27	E
190	Plenum CRGT; Screw, Washer, and Dowel	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-46	3.1.1-22	E
191	Plenum Cylinder; Cylinder and Flange	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-35	3.1.1-33	E
192	Plenum Cylinder; Cylinder and Flange	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
193	Plenum Cylinder; Cylinder and Flange	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
194	Plenum Cylinder; Cylinder and Flange	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-34	3.1.1-30	E
195	Plenum Cylinder; Cylinder and Flange	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-34	3.1.1-30	A
196	Plenum Cylinder; Cylinder and Flange	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
197	Plenum Cylinder; Cylinder and Flange	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-46	3.1.1-22	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
198	Plenum Cylinder; Reinforcing Plate	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-35	3.1.1-33	E
199	Plenum Cylinder; Reinforcing Plate	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
200	Plenum Cylinder; Reinforcing Plate	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
201	Plenum Cylinder; Reinforcing Plate	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-34	3.1.1-30	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
202	Plenum Cylinder; Reinforcing Plate	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-34	3.1.1-30	A
203	Plenum Cylinder; Reinforcing Plate	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
204	Plenum Cylinder; Reinforcing Plate	Support	Cast Austenitic Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-4	3.1.1-80	E
205	Plenum Cylinder; Screw, Bolt, and Locking cup	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-35	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
206	Plenum Cylinder; Screw, Bolt, and Locking cup	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
207	Plenum Cylinder; Screw, Bolt, and Locking cup	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
208	Plenum Cylinder; Screw, Bolt, and Locking cup	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-36	3.1.1-30	E
209	Plenum Cylinder; Screw, Bolt, and Locking cup	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-36	3.1.1-30	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
210	Plenum Cylinder; Screw, Bolt, and Locking cup	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
211	Plenum Cylinder; Screw, Bolt, and Locking cup	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of preload	PWR Reactor Vessel Internals	IV.B4-14	3.1.1-27	E
212	Plenum Cylinder; Screw, Bolt, and Locking cup	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-46	3.1.1-22	E
213	Plenum Upper Grid; Dowel	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-17	3.1.1-33	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
214	Plenum Upper Grid; Dowel	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
215	Plenum Upper Grid; Dowel	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102 0103
216	Plenum Upper Grid; Dowel	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-13	3.1.1-37	E
217	Plenum Upper Grid; Dowel	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-13	3.1.1-37	C
218	Plenum Upper Grid; Dowel	Support	Nickel Alloy	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
219	Plenum Upper Grid; Dowel	Support	Nickel Alloy	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-12	3.1.1-22	E
220	Plenum Upper Grid; Fuel Assembly Support Pad	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-45	3.1.1-33	E
221	Plenum Upper Grid; Fuel Assembly Support Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
222	Plenum Upper Grid; Fuel Assembly Support Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
223	Plenum Upper Grid; Fuel Assembly Support Pad	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-44	3.1.1-30	E
224	Plenum Upper Grid; Fuel Assembly Support Pad	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-44	3.1.1-30	A
225	Plenum Upper Grid; Fuel Assembly Support Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
226	Plenum Upper Grid; Fuel Assembly Support Pad	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Reactor Vessel Internals	IV.B4-42	3.1.1-63	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
227	Plenum Upper Grid; Fuel Assembly Support Pad	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-46	3.1.1-22	E
228	Plenum Upper Grid; Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-45	3.1.1-33	E
229	Plenum Upper Grid; Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
230	Plenum Upper Grid; Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
231	Plenum Upper Grid; Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-44	3.1.1-30	E
232	Plenum Upper Grid; Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-44	3.1.1-30	A
233	Plenum Upper Grid; Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
234	Plenum Upper Grid; Ring and Rib	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-46	3.1.1-22	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
235	Plenum Upper Grid Screw and Pin	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Change in dimension	PWR Reactor Vessel Internals	IV.B4-45	3.1.1-33	E
236	Plenum Upper Grid Screw and Pin	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - fatigue	TLAA	IV.B4-37	3.1.1-05	A
237	Plenum Upper Grid Screw and Pin	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Cracking - flaw growth	PWR Reactor Vessel Internals	IV.C2-26	3.1.1-62	E 0102
238	Plenum Upper Grid Screw and Pin	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Reactor Vessel Internals	IV.B4-43	3.1.1-30	E

Table 3.1.2-2 Aging Management Review Results – Reactor Vessel Internals

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
239	Plenum Upper Grid Screw and Pin	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Cracking - IASCC, SCC/IGA	PWR Water Chemistry	IV.B4-43	3.1.1-30	A
240	Plenum Upper Grid Screw and Pin	Support	Stainless Steel	Borated Reactor Coolant (Internal)	Loss of material	PWR Water Chemistry	IV.B4-38	3.1.1-83	A
241	Plenum Upper Grid Screw and Pin	Support	Stainless Steel	Borated Reactor Coolant with Neutron Fluence (Internal)	Reduction in fracture toughness	PWR Reactor Vessel Internals	IV.B4-46	3.1.1-22	E

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking - Fatigue	TLAA	IV.C2-10	3.1.1-07	A 0111
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking - SCC/IGA	Bolting Integrity	IV.C2-7	3.1.1-52	B
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	H
4	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of preload	Bolting Integrity	IV.C2-8	3.1.1-52	B
5	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking - Fatigue	TLAA	IV.C2-10	3.1.1-07	A 0111

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
6	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking - SCC	Bolting Integrity	IV.C2-7	3.1.1-52	B
7	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A
8	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	V.E-6	3.2.1-22	B
9	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of preload	Bolting Integrity	IV.C2-8	3.1.1-52	B
10	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking - Fatigue	TLAA	IV.C2-10	3.1.1-07	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
11	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking - SCC/IGA	Bolting Integrity	IV.C2-7	3.1.1-52	B
12	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	H
13	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of preload	Bolting Integrity	IV.C2-8	3.1.1-52	B
14	CRDM Motor Tube Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	C
15	CRDM Motor Tube Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
16	CRDM Motor Tube Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-27	3.1.1-68	C

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
17	CRDM Motor Tube Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-27	3.1.1-68	C
18	CRDM Motor Tube Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	C
19	CRDM Motor Tube Assembly	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	C
20	Drain Pan	Pressure boundary	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis	V.D1-24	3.2.1-06	C
21	Drain Pan	Pressure boundary	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection	V.D1-24	3.2.1-06	C
22	Drain Pan	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
23	Flexible Connection	Pressure boundary	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis	V.D1-24	3.2.1-06	C
24	Flexible Connection	Pressure boundary	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection	V.D1-24	3.2.1-06	C

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
25	Flexible Connection	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
26	Flow Element	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
27	Flow Element	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	A 0102
28	Flow Element	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-27	3.1.1-68	A
29	Flow Element	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-27	3.1.1-68	A
30	Flow Element	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
31	Flow Element	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Flow Element	Throttling	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
33	Flow Element	Throttling	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	A 0102
34	Flow Element	Throttling	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-27	3.1.1-68	A
35	Flow Element	Throttling	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-27	3.1.1-68	A
36	Flow Element	Throttling	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
37	Flow Element	Throttling	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A
38	Orifice < 4 inches	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	IV.E-2	3.1.1-86	A 0109

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Orifice < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
40	Orifice < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Inservice Inspection	IV.C2-1	3.1.1-70	A 0102
41	Orifice < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	PWR Water Chemistry	IV.C2-1	3.1.1-70	A 0102
42	Orifice < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C2-1	3.1.1-70	A 0102
43	Orifice < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
44	Orifice < 4 inches	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
45	Orifice < 4 inches	Throttling	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	IV.E-2	3.1.1-86	A 0109

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
46	Orifice < 4 inches	Throttling	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
47	Orifice < 4 inches	Throttling	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Inservice Inspection	IV.C2-1	3.1.1-70	A 0102
48	Orifice < 4 inches	Throttling	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	PWR Water Chemistry	IV.C2-1	3.1.1-70	A 0102
49	Orifice < 4 inches	Throttling	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C2-1	3.1.1-70	A 0102
50	Orifice < 4 inches	Throttling	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
51	Orifice < 4 inches	Throttling	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
52	Piping	Pressure boundary	Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis	VII.G-26	3.3.1-15	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Piping	Pressure boundary	Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection	VII.G-26	3.3.1-15	A
54	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
55	Piping - Cold Leg and Hot Leg	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
56	Piping - Cold Leg and Hot Leg	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	A 0102
57	Piping - Cold Leg and Hot Leg	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-27	3.1.1-68	A
58	Piping - Cold Leg and Hot Leg	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-27	3.1.1-68	A
59	Piping - Cold Leg and Hot Leg	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
60	Piping - Cold Leg and Hot Leg	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A
61	Piping - DMW	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
62	Piping - DMW	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103
63	Piping - DMW	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Inservice Inspection	IV.C2-13	3.1.1-31	A
64	Piping - DMW	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.C2-13	3.1.1-31	A 0110
65	Piping - DMW	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.C2-13	3.1.1-31	A
66	Piping - DMW	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
67	Piping - DMW	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A 0103
68	Piping < 4 inches	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	IV.E-2	3.1.1-86	A 0109
69	Piping < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
70	Piping < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Inservice Inspection	IV.C2-1	3.1.1-70	A 0102
71	Piping < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	PWR Water Chemistry	IV.C2-1	3.1.1-70	A 0102
72	Piping < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C2-1	3.1.1-70	A 0102
73	Piping < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
74	Piping < 4 inches	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
75	Piping <4 inches RV flange leakage	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	IV.E-2	3.1.1-86	A 0109
76	Piping <4 inches RV flange leakage	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
77	Piping <4 inches RV flange leakage	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
78	Piping <4 inches RV flange leakage	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-5	3.1.1-23	E
79	Piping <4 inches RV flange leakage	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.A2-5	3.1.1-23	E
80	Piping <4 inches RV flange leakage	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
81	Piping <4 inches RV flange leakage	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
82	Piping <4 inches Incore monitoring	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
83	Piping <4 inches Incore monitoring	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
84	Piping <4 inches Incore monitoring	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.A2-1	3.1.1-23	E
85	Piping <4 inches Incore monitoring	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Small Bore Class 1 Piping Inspection	IV.A2-1	3.1.1-23	E
86	Piping <4 inches Incore monitoring	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
87	Piping <4 inches Incore monitoring	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
88	Piping < 4 inches	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0109
89	Piping < 4 inches	Structural integrity	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	VII.E1-16	3.3.1-02	C
90	Piping < 4 inches	Structural integrity	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	VII.E1-20	3.3.1-90	C
91	Piping < 4 inches	Structural integrity	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
92	Piping < 4 inches	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
93	Piping >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
94	Piping >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	A 0102

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
95	Piping >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-2	3.1.1-68	A
96	Piping >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-2	3.1.1-68	A
97	Piping >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
98	Piping >= 4 inches	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
99	Pressurizer Heater Belt Forgings	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
100	Pressurizer Heater Belt Forgings	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-18	3.1.1-67	A 0102
101	Pressurizer Heater Belt Forgings	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-19	3.1.1-64	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
102	Pressurizer Heater Belt Forgings	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-19	3.1.1-64	A
103	Pressurizer Heater Belt Forgings	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
104	Pressurizer Heater Belt Forgings	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A
105	Pressurizer Heater Bundle Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A 0108
106	Pressurizer Heater Bundle Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-18	3.1.1-67	A 0102 0108
107	Pressurizer Heater Bundle Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-20	3.1.1-68	A 0108
108	Pressurizer Heater Bundle Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-20	3.1.1-68	A 0108

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
109	Pressurizer Heater Bundle Assembly	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A 0108
110	Pressurizer Heater Bundle Cover Plate	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A 0101
111	Pressurizer Manway Cover	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A 0101
112	Pressurizer Manway Forging	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	C
113	Pressurizer Manway Forging	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-18	3.1.1-67	A 0102
114	Pressurizer Manway Forging	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-19	3.1.1-64	A
115	Pressurizer Manway Forging	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-19	3.1.1-64	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
116	Pressurizer Manway Forging	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
117	Pressurizer Manway Forging	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A
118	Pressurizer Manway Insert	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A 0108
119	Pressurizer Manway Insert	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-18	3.1.1-67	A 0102 0108
120	Pressurizer Manway Insert	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-19	3.1.1-64	A 0108
121	Pressurizer Manway Insert	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-19	3.1.1-64	A 0108
122	Pressurizer Manway Insert	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A 0108

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
123	Pressurizer Relief Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
124	Pressurizer Relief Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Inservice Inspection	IV.C2-1	3.1.1-70	C 0102
125	Pressurizer Relief Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	PWR Water Chemistry	IV.C2-1	3.1.1-70	C 0102
126	Pressurizer Relief Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C2-1	3.1.1-70	C 0102
127	Pressurizer Relief Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
128	Pressurizer Relief Nozzle Safe End	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
129	Pressurizer Relief, Spray, and Surge Nozzle	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
130	Pressurizer Relief, Spray, and Surge Nozzle	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-18	3.1.1-67	A 0102
131	Pressurizer Relief, Spray, and Surge Nozzle	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-19	3.1.1-64	A
132	Pressurizer Relief, Spray, and Surge Nozzle	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-19	3.1.1-64	A
133	Pressurizer Relief, Spray, and Surge Nozzle	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
134	Pressurizer Relief, Spray, and Surge Nozzle	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
135	Pressurizer Relief, Spray, and Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
136	Pressurizer Relief, Spray, and Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103
137	Pressurizer Relief, Spray, and Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Inservice Inspection	IV.C2-24	3.1.1-31	A
138	Pressurizer Relief, Spray, and Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.C2-24	3.1.1-31	A 0110
139	Pressurizer Relief, Spray, and Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.C2-24	3.1.1-31	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
140	Pressurizer Relief, Spray, and Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
141	Pressurizer Relief, Spray, and Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A 0103
142	Pressurizer Shell and Heads	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
143	Pressurizer Shell and Heads	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-18	3.1.1-67	A 0102
144	Pressurizer Shell and Heads	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-19	3.1.1-64	A
145	Pressurizer Shell and Heads	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-19	3.1.1-64	A
146	Pressurizer Shell and Heads	Pressure boundary	Steel w. SS Cladding	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
147	Pressurizer Shell and Heads	Pressure boundary	Steel w. SS Cladding	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A
148	Pressurizer Spray Nozzle Safe End	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
149	Pressurizer Spray Nozzle Safe End	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103
150	Pressurizer Spray Nozzle Safe End	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Inservice Inspection	IV.C2-24	3.1.1-31	C
151	Pressurizer Spray Nozzle Safe End	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.C2-24	3.1.1-31	C 0110
152	Pressurizer Spray Nozzle Safe End	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.C2-24	3.1.1-31	C
153	Pressurizer Spray Nozzle Safe End	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
154	Pressurizer Spray Nozzle Safe End	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A 0103
155	Pressurizer Spray Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
156	Pressurizer Spray Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103
157	Pressurizer Spray Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Inservice Inspection	IV.C2-24	3.1.1-31	A
158	Pressurizer Spray Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.C2-24	3.1.1-31	A 0110
159	Pressurizer Spray Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.C2-24	3.1.1-31	A
160	Pressurizer Spray Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
161	Pressurizer Spray Nozzle Weld	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A 0103
162	Pressurizer Support Plate Assembly	Support	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A 0101
163	Pressurizer Support Plate Assembly	Support	Steel	Air with borated water leakage (External)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-16	3.1.1-61	A 0102 0111
164	Pressurizer Support Plate Assembly	Support	Steel	Air with borated water leakage (External)	Cracking - Fatigue	TLAA	IV.C2-10	3.1.1-07	A 0111
165	Pressurizer Surge and Spray Nozzle Thermal Sleeve	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
166	Pressurizer Surge and Spray Nozzle Thermal Sleeve	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-18	3.1.1-67	A 0102
167	Pressurizer Surge and Spray Nozzle Thermal Sleeve	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-19	3.1.1-64	A
168	Pressurizer Surge and Spray Nozzle Thermal Sleeve	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-19	3.1.1-64	A
169	Pressurizer Surge and Spray Nozzle Thermal Sleeve	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
170	Pressurizer Surge and Spray Nozzle Thermal Sleeve	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
171	Pressurizer Surge Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
172	Pressurizer Surge Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-18	3.1.1-67	A 0102
173	Pressurizer Surge Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-19	3.1.1-64	A
174	Pressurizer Surge Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-19	3.1.1-64	A
175	Pressurizer Surge Nozzle Safe End	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
176	Pressurizer Surge Nozzle Safe End	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
177	Pressurizer Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
178	Pressurizer Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103
179	Pressurizer Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Inservice Inspection	IV.C2-24	3.1.1-31	A
180	Pressurizer Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.C2-24	3.1.1-31	A 0110
181	Pressurizer Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.C2-24	3.1.1-31	A
182	Pressurizer Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
183	Pressurizer Surge Nozzle Weld	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A 0103
184	Pressurizer Vent, Sampling, Level Sensing, and Thermowell Nozzle and Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
185	Pressurizer Vent, Sampling, Level Sensing, and Thermowell Nozzle and Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
186	Pressurizer Vent, Sampling, Level Sensing, and Thermowell Nozzle and Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Inservice Inspection	IV.C2-24	3.1.1-31	A
187	Pressurizer Vent, Sampling, Level Sensing, and Thermowell Nozzle and Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.C2-24	3.1.1-31	A 0110
188	Pressurizer Vent, Sampling, Level Sensing, and Thermowell Nozzle and Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.C2-24	3.1.1-31	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
189	Pressurizer Vent, Sampling, Level Sensing, and Thermowell Nozzle and Weld	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
190	Pressurizer Vent, Sampling, Level Sensing, and Thermowell Nozzle and Weld	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A 0103
191	RC Pump Case and Cover	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
192	RC Pump Case and Cover	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
193	RC Pump Case and Cover	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-5	3.1.1-68	A
194	RC Pump Case and Cover	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-5	3.1.1-68	A
195	RC Pump Case and Cover	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
196	RC Pump Case and Cover	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant > 250°C (> 482°F) (Internal)	Reduction in fracture toughness	Inservice Inspection	IV.C2-6	3.1.1-55	A
197	RC Pump Case and Cover	Pressure boundary	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
198	RC Pump Driver Mount	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.C2-9	3.1.1-58	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
199	RC Pump Seal Cooling Heat Exchanger Tube (Inner)	Heat transfer	Nickel Alloy	Borated reactor coolant (Internal)	Reduction in heat transfer	PWR Water Chemistry	N/A	N/A	H
200	RC Pump Seal Cooling Heat Exchanger Tube (Inner)	Heat transfer	Nickel Alloy	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	V.A-13	3.2.1-30	B 0103
201	RC Pump Seal Cooling Heat Exchanger Tube (Inner)	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
202	RC Pump Seal Cooling Heat Exchanger Tube (Inner)	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103
203	RC Pump Seal Cooling Heat Exchanger Tube (Inner)	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.C2-13	3.1.1-31	E 0110 0112

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
204	RC Pump Seal Cooling Heat Exchanger Tube (Inner)	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.C2-13	3.1.1-31	C 0112
205	RC Pump Seal Cooling Heat Exchanger Tube (Inner)	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
206	RC Pump Seal Cooling Heat Exchanger Tube (Inner)	Pressure boundary	Nickel Alloy	Closed cycle cooling water (External)	Loss of Material	Closed Cooling Water Chemistry	V.A-7	3.2.1-28	B 0103
207	RC Pump Seal Cooling Heat Exchanger Tube (Outer)	Heat transfer	Nickel Alloy	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	V.A-13	3.2.1-30	B 0103
208	RC Pump Seal Cooling Heat Exchanger Tube (Outer)	Pressure boundary	Nickel Alloy	Closed cycle cooling water (Internal)	Loss of Material	Closed Cooling Water Chemistry	V.A-7	3.2.1-28	B 0103

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
209	RC Pump Seal Cooling Heat Exchanger Tube (Outer)	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A 0103
210	Tank (DB-T156-1 & DB-T156-2)	Pressure boundary	Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis	VII.G-27	3.3.1-16	A
211	Tank (DB-T156-1 & DB-T156-2)	Pressure boundary	Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection	VII.G-27	3.3.1-16	A
212	Tank (DB-T156-1 & DB-T156-2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
213	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0109
214	Tubing	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
215	Tubing	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Inservice Inspection	IV.C2-1	3.1.1-70	C 0102

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
216	Tubing	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	PWR Water Chemistry	IV.C2-1	3.1.1-70	C 0102
217	Tubing	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C2-1	3.1.1-70	C 0102
218	Tubing	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
219	Tubing	Pressure boundary	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis	V.D1-24	3.2.1-06	A
220	Tubing	Pressure boundary	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection	V.D1-24	3.2.1-06	A
221	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
222	Tubing	Structural integrity	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	VII.E1-16	3.3.1-02	C

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
223	Tubing	Structural integrity	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	VII.E1-20	3.3.1-90	C
224	Tubing	Structural integrity	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
225	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
226	Valve Body	Pressure boundary	Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis	VII.G-26	3.3.1-15	A
227	Valve Body	Pressure boundary	Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection	VII.G-26	3.3.1-15	A
228	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
229	Valve Body < 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
230	Valve Body < 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Inservice Inspection	IV.C2-1	3.1.1-70	A 0102
231	Valve Body < 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	PWR Water Chemistry	IV.C2-1	3.1.1-70	A 0102
232	Valve Body < 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C2-1	3.1.1-70	A 0102
233	Valve Body < 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
234	Valve Body < 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant > 250°C (> 482°F) (Internal)	Reduction in fracture toughness	Inservice Inspection	IV.C2-6	3.1.1-55	A
235	Valve Body < 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
236	Valve Body < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
237	Valve Body < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Inservice Inspection	IV.C2-1	3.1.1-70	A 0102
238	Valve Body < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	PWR Water Chemistry	IV.C2-1	3.1.1-70	A 0102
239	Valve Body < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth, SCC/IGA	Small Bore Class 1 Piping Inspection	IV.C2-1	3.1.1-70	A 0102
240	Valve Body < 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
241	Valve Body < 4 inches	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
242	Valve Body < 4 inches	Structural integrity	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	VII.E1-16	3.3.1-02	C

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
243	Valve Body < 4 inches	Structural integrity	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	VII.E1-20	3.3.1-90	C
244	Valve Body < 4 inches	Structural integrity	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
245	Valve Body < 4 inches	Structural integrity	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
246	Valve Body < 4 inches	Structural integrity	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	VII.E1-16	3.3.1-02	C
247	Valve Body < 4 inches	Structural integrity	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	VII.E1-20	3.3.1-90	C
248	Valve Body < 4 inches	Structural integrity	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
249	Valve Body < 4 inches	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
250	Valve Body >= 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
251	Valve Body >= 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
252	Valve Body >= 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-5	3.1.1-68	A
253	Valve Body >= 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-5	3.1.1-68	A
254	Valve Body >= 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
255	Valve Body >= 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Borated reactor coolant > 250°C (> 482°F) (Internal)	Reduction in fracture toughness	Inservice Inspection	IV.C2-6	3.1.1-55	A

Table 3.1.2-3 Aging Management Review Results – Reactor Coolant System and Reactor Coolant Pressure Boundary

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
256	Valve Body >= 4 inches	Pressure boundary	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A
257	Valve Body >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.C2-25	3.1.1-08	A
258	Valve Body >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
259	Valve Body >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.C2-5	3.1.1-68	A
260	Valve Body >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.C2-5	3.1.1-68	A
261	Valve Body >= 4 inches	Pressure boundary	Stainless Steel	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	A
262	Valve Body >= 4 inches	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	A

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking - Fatigue	TLAA	IV.C2-10	3.1.1-07	A
2	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking - SCC	Bolting Integrity	IV.C2-7	3.1.1-52	B
3	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of Material	Bolting Integrity	V.E-6	3.2.1-22	B
4	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A
5	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of Preload	Bolting Integrity	IV.D2-6	3.1.1-52	B

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
6	Primary Side; Drain Nozzle	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.D2-3	3.1.1-10	A
7	Primary Side; Drain Nozzle	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103
8	Primary Side; Drain Nozzle	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Inservice Inspection	IV.D2-2	3.1.1-31	A
9	Primary Side; Drain Nozzle	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.D2-2	3.1.1-31	A 0110
10	Primary Side; Drain Nozzle	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.D2-2	3.1.1-31	A
11	Primary Side; Drain Nozzle	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	C
12	Primary Side; Drain Nozzle	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	C 0103

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
13	Primary Side; Manway and Inspection Opening Cover and Backing Plate	Pressure boundary	Steel w. SS backing	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.D2-3	3.1.1-10	A
14	Primary Side; Manway and Inspection Opening Cover and Backing Plate	Pressure boundary	Steel w. SS backing	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
15	Primary Side; Manway and Inspection Opening Cover and Backing Plate	Pressure boundary	Steel w. SS backing	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.D2-4	3.1.1-35	C
16	Primary Side; Manway and Inspection Opening Cover and Backing Plate	Pressure boundary	Steel w. SS backing	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.D2-4	3.1.1-35	C

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
17	Primary Side; Manway and Inspection Opening Cover and Backing Plate	Pressure boundary	Steel w. SS backing	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	C
18	Primary Side; Manway and Inspection Opening Cover and Backing Plate	Pressure boundary	Steel w. SS backing	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A
19	Primary Side; Nozzle Dam Retaining Ring	Support	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.D2-3	3.1.1-10	A 0101
20	Primary Side; Nozzle Dam Retaining Ring	Support	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0101 0102 0103
21	Primary Side; Nozzle Dam Retaining Ring	Support	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Inservice Inspection	IV.D2-2	3.1.1-31	A 0101

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Primary Side; Nozzle Dam Retaining Ring	Support	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.D2-2	3.1.1-31	A 0101 0110
23	Primary Side; Nozzle Dam Retaining Ring	Support	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.D2-2	3.1.1-31	A 0101
24	Primary Side; Nozzle Dam Retaining Ring	Support	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	C 0101
25	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.D2-15	3.1.1-06	A
26	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102 0103
27	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.D2-14	3.1.1-73	A
28	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Steam Generator Tube Integrity	IV.D2-14	3.1.1-73	A

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
29	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	C
30	Primary Side; Tube and Sleeve	Heat transfer	Nickel Alloy	Borated reactor coolant (Internal)	Reduction in Heat Transfer	PWR Water Chemistry	N/A	N/A	H
31	Primary Side; Tube and Sleeve	Heat transfer	Nickel Alloy	Borated reactor coolant (Internal)	Reduction in Heat Transfer	Steam Generator Tube Integrity	N/A	N/A	H
32	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Treated water (External)	Cracking - SCC/IGA	PWR Water Chemistry	IV.D2-16	3.1.1-72	A
33	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Treated water (External)	Cracking - SCC/IGA	Steam Generator Tube Integrity	IV.D2-16	3.1.1-72	A
34	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Treated water (External)	Cracking - SCC/IGA	PWR Water Chemistry	IV.D2-17	3.1.1-72	A
35	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Treated water (External)	Cracking - SCC/IGA	Steam Generator Tube Integrity	IV.D2-17	3.1.1-72	A

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
36	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Treated water (External)	Denting	PWR Water Chemistry	IV.D2-13	3.1.1-75	A
37	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Treated water (External)	Denting	Steam Generator Tube Integrity	IV.D2-13	3.1.1-75	A
38	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Treated water (External)	Loss of Material	PWR Water Chemistry	IV.D2-18	3.1.1-72	A
39	Primary Side; Tube and Sleeve	Pressure boundary	Nickel Alloy	Treated water (External)	Loss of Material	Steam Generator Tube Integrity	IV.D2-18	3.1.1-72	A
40	Primary Side; Tube and Sleeve	Heat Transfer	Nickel Alloy	Treated water (External)	Reduction in Heat Transfer	PWR Water Chemistry	N/A	N/A	H
41	Primary Side; Tube and Sleeve	Heat Transfer	Nickel Alloy	Treated water (External)	Reduction in Heat Transfer	Steam Generator Tube Integrity	N/A	N/A	H
42	Primary Side; Tube Plug	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.D2-15	3.1.1-06	C 0101

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
43	Primary Side; Tube Plug	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0101 0102 0103
44	Primary Side; Tube Plug	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.D2-12	3.1.1-73	A 0101
45	Primary Side; Tube Plug	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Steam Generator Tube Integrity	IV.D2-12	3.1.1-73	A 0101
46	Primary Side; Tube Plug	Pressure boundary	Nickel Alloy	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	C 0101
47	Primary Side; Upper and Lower Head, Inlet and Outlet Nozzle	Pressure boundary	Steel w. SS cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.D2-3	3.1.1-10	A
48	Primary Side; Upper and Lower Head, Inlet and Outlet Nozzle	Pressure boundary	Steel w. SS cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
49	Primary Side; Upper and Lower Head, Inlet and Outlet Nozzle	Pressure boundary	Steel w. SS cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.D2-4	3.1.1-35	A
50	Primary Side; Upper and Lower Head, Inlet and Outlet Nozzle	Pressure boundary	Steel w. SS cladding	Borated reactor coolant (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.D2-4	3.1.1-35	A
51	Primary Side; Upper and Lower Head, Inlet and Outlet Nozzle	Pressure boundary	Steel w. SS cladding	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	C
52	Primary Side; Upper and Lower Head, Inlet and Outlet Nozzle	Pressure boundary	Steel w. SS cladding	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A
53	Primary Side; Upper and Lower Tubesheet	Pressure boundary	Steel w. Nickel Alloy Cladding	Borated reactor coolant (Internal)	Cracking - Fatigue	TLAA	IV.D2-3	3.1.1-10	A

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
54	Primary Side; Upper and Lower Tubesheet	Pressure boundary	Steel w. Nickel Alloy Cladding	Borated reactor coolant (Internal)	Cracking - Flaw Growth	Inservice Inspection	IV.C2-26	3.1.1-62	C 0102
55	Primary Side; Upper and Lower Tubesheet	Pressure boundary	Steel w. Nickel Alloy Cladding	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Inservice Inspection	IV.D2-4	3.1.1-35	A
56	Primary Side; Upper and Lower Tubesheet	Pressure boundary	Steel w. Nickel Alloy Cladding	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	Nickel-Alloy Management	IV.D2-4	3.1.1-35	A 0110
57	Primary Side; Upper and Lower Tubesheet	Pressure boundary	Steel w. Nickel Alloy Cladding	Borated reactor coolant (Internal)	Cracking - PWSCC, SCC/IGA	PWR Water Chemistry	IV.D2-4	3.1.1-35	A
58	Primary Side; Upper and Lower Tubesheet	Pressure boundary	Steel w. Nickel Alloy Cladding	Borated reactor coolant (Internal)	Loss of Material	PWR Water Chemistry	IV.C2-15	3.1.1-83	C
59	Primary Side; Upper and Lower Tubesheet	Pressure boundary	Steel w. Nickel Alloy Cladding	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
60	Primary Side; Upper and Lower Tubesheet	Pressure boundary	Steel w. Nickel Alloy Cladding	Treated water (External)	Loss of Material	One-Time Inspection	IV.D2-8	3.1.1-12	C
61	Primary Side; Upper and Lower Tubesheet	Pressure boundary	Steel w. Nickel Alloy Cladding	Treated water (External)	Loss of Material	PWR Water Chemistry	IV.D2-8	3.1.1-12	C
62	Secondary Side; AFW Header, Riser, Weldneck, and Blind Flange	Pressure boundary	Steel	Treated water (Internal)	Cracking - Fatigue	TLAA	IV.D2-10	3.1.1-07	C
63	Secondary Side; AFW Header, Riser, Weldneck, and Blind Flange	Pressure boundary	Steel	Treated water (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
64	Secondary Side; AFW Header, Riser, Weldneck, and Blind Flange	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	One-Time Inspection	IV.D2-8	3.1.1-12	C

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
65	Secondary Side; AFW Header, Riser, Weldneck, and Blind Flange	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	PWR Water Chemistry	IV.D2-8	3.1.1-12	C
66	Secondary Side; AFW Header, Riser, Weldneck, and Blind Flange	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A
67	Secondary Side; AFW Thermal Sleeve, AFW Header Transition Section	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - Fatigue	TLAA	IV.D2-15	3.1.1-06	C
68	Secondary Side; AFW Thermal Sleeve, AFW Header Transition Section	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
69	Secondary Side; AFW Thermal Sleeve, AFW Header Transition Section	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.D2-9	3.1.1-84	C
70	Secondary Side; AFW Thermal Sleeve, AFW Header Transition Section	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.D2-9	3.1.1-84	C
71	Secondary Side; AFW Thermal Sleeve, AFW Header Transition Section	Pressure boundary	Nickel Alloy	Treated water (Internal)	Loss of Material	Inservice Inspection	VIII.B1-1	3.4.1-37	A

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Secondary Side; AFW Thermal Sleeve, AFW Header Transition Section	Pressure boundary	Nickel Alloy	Treated water (Internal)	Loss of Material	PWR Water Chemistry	VIII.B1-1	3.4.1-37	A
73	Secondary Side; AFW Header Transition Section	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	C 0103
74	Secondary Side; Baffle (Shroud), Closure Ring, Support Ring, and Base Ring	Support	Steel	Treated water (External)	Cracking - Fatigue	TLAA	IV.D2-10	3.1.1-07	C 0101
75	Secondary Side; Baffle (Shroud), Closure Ring, Support Ring, and Base Ring	Support	Steel	Treated water (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0101

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
76	Secondary Side; Baffle (Shroud), Closure Ring, Support Ring, and Base Ring	Support	Steel	Treated water (External)	Loss of Material	One-Time Inspection	IV.D2-8	3.1.1-12	C 0101
77	Secondary Side; Baffle (Shroud), Closure Ring, Support Ring, and Base Ring	Support	Steel	Treated water (External)	Loss of Material	PWR Water Chemistry	IV.D2-8	3.1.1-12	C 0101
78	Secondary Side; Manway and Handhole Cover	Pressure boundary	Steel	Treated water (Internal)	Cracking - Fatigue	TLAA	IV.D2-10	3.1.1-07	A
79	Secondary Side; Manway and Handhole Cover	Pressure boundary	Steel	Treated water (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
80	Secondary Side; Manway and Handhole Cover	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	One-Time Inspection	IV.D2-8	3.1.1-12	C

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
81	Secondary Side; Manway and Handhole Cover	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	PWR Water Chemistry	IV.D2-8	3.1.1-12	C
82	Secondary Side; Manway and Handhole Cover	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A
83	Secondary Side; MFW Header Support Plate and Gusset	Support	Steel	Air with borated water leakage (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
84	Secondary Side; MFW Header Support Plate and Gusset	Support	Steel	Air with borated water leakage (External)	Cracking - Fatigue	TLAA	IV.C2-10	3.1.1-07	A
85	Secondary Side; MFW Header Support Plate and Gusset	Support	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
86	Secondary Side; MFW Header	Pressure boundary	Steel	Treated water (Internal)	Cracking - Fatigue	TLAA	IV.D2-10	3.1.1-07	C
87	Secondary Side; MFW Header	Pressure boundary	Steel	Treated water (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
88	Secondary Side; MFW Header	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	Flow-Accelerated Corrosion (FAC)	IV.D2-7	3.1.1-59	C
89	Secondary Side; MFW Header	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	One-Time Inspection	IV.D2-8	3.1.1-12	C
90	Secondary Side; MFW Header	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	PWR Water Chemistry	IV.D2-8	3.1.1-12	C
91	Secondary Side; MFW Header	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A
92	Secondary Side; MFW Spray Head	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - Fatigue	TLAA	IV.D2-15	3.1.1-06	C 0101

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
93	Secondary Side; MFW Spray Head	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0101
94	Secondary Side; MFW Spray Head	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.D2-9	3.1.1-84	C 0101
95	Secondary Side; MFW Spray Head	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.D2-9	3.1.1-84	C 0101
96	Secondary Side; MFW Spray Head	Pressure boundary	Nickel Alloy	Treated water (Internal)	Loss of Material	Inservice Inspection	VIII.B1-1	3.4.1-37	A 0101
97	Secondary Side; MFW Spray Head	Pressure boundary	Nickel Alloy	Treated water (Internal)	Loss of Material	PWR Water Chemistry	VIII.B1-1	3.4.1-37	A 0101
98	Secondary Side; Nozzle	Pressure boundary	Steel	Treated water (Internal)	Cracking - Fatigue	TLAA	IV.D2-10	3.1.1-07	A
99	Secondary Side; Nozzle	Pressure boundary	Steel	Treated water (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
100	Secondary Side; Nozzle	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	One-Time Inspection	IV.D2-8	3.1.1-12	C
101	Secondary Side; Nozzle	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	PWR Water Chemistry	IV.D2-8	3.1.1-12	C

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
102	Secondary Side; Nozzle	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A
103	Secondary Side; Nozzle	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - Fatigue	TLAA	IV.D2-15	3.1.1-06	C
104	Secondary Side; Nozzle	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
105	Secondary Side; Nozzle	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - SCC/IGA	Inservice Inspection	IV.D2-9	3.1.1-84	A
106	Secondary Side; Nozzle	Pressure boundary	Nickel Alloy	Treated water (Internal)	Cracking - SCC/IGA	PWR Water Chemistry	IV.D2-9	3.1.1-84	A
107	Secondary Side; Nozzle	Pressure boundary	Nickel Alloy	Treated water (Internal)	Loss of Material	Inservice Inspection	VIII.B1-1	3.4.1-37	A
108	Secondary Side; Nozzle	Pressure boundary	Nickel Alloy	Treated water (Internal)	Loss of Material	PWR Water Chemistry	VIII.B1-1	3.4.1-37	A
109	Secondary Side; Nozzle	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	IV.E-3	3.1.1-86	C 0103
110	Secondary Side; Pipe Cap	Pressure boundary	Steel	Treated water (Internal)	Cracking - Fatigue	TLAA	IV.D2-10	3.1.1-07	C

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
111	Secondary Side; Pipe Cap	Pressure boundary	Steel	Treated water (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
112	Secondary Side; Pipe Cap	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	One-Time Inspection	IV.D2-8	3.1.1-12	C
113	Secondary Side; Pipe Cap	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	PWR Water Chemistry	IV.D2-8	3.1.1-12	C
114	Secondary Side; Pipe Cap	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A
115	Secondary Side; Shell	Pressure boundary	Steel	Treated water (Internal)	Cracking - Fatigue	TLAA	IV.D2-10	3.1.1-07	C
116	Secondary Side; Shell	Pressure boundary	Steel	Treated water (Internal)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H
117	Secondary Side; Shell	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	One-Time Inspection	IV.D2-8	3.1.1-12	A
118	Secondary Side; Shell	Pressure boundary	Steel	Treated water (Internal)	Loss of Material	PWR Water Chemistry	IV.D2-8	3.1.1-12	A
119	Secondary Side; Shell	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
120	Secondary Side; Tube Support Plate	Support	Steel	Treated water (External)	Cracking - Fatigue	TLAA	IV.D2-10	3.1.1-07	C 0101
121	Secondary Side; Tube Support Plate	Support	Steel	Treated water (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0101
122	Secondary Side; Tube Support Plate	Support	Steel	Treated water (External)	Ligament Cracking	PWR Water Chemistry	IV.D2-11	3.1.1-76	A 0101
123	Secondary Side; Tube Support Plate	Support	Steel	Treated water (External)	Ligament Cracking	Steam Generator Tube Integrity	IV.D2-11	3.1.1-76	A 0101
124	Secondary Side; Tube Support Plate	Support	Steel	Treated water (External)	Loss of Material	PWR Water Chemistry	IV.D2-11	3.1.1-76	A 0101
125	Secondary Side; Tube Support Rod and Spacer	Support	Steel	Treated water (External)	Cracking - Fatigue	TLAA	IV.D2-10	3.1.1-07	C 0101
126	Secondary Side; Tube Support Rod and Spacer	Support	Steel	Treated water (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0101

Table 3.1.2-4 Aging Management Review Results – Steam Generators

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
127	Secondary Side; Tube Support Rod and Spacer	Support	Steel	Treated water (External)	Loss of Material	One-Time Inspection	IV.D2-8	3.1.1-12	C 0101
128	Secondary Side; Tube Support Rod and Spacer	Support	Steel	Treated water (External)	Loss of Material	PWR Water Chemistry	IV.D2-8	3.1.1-12	C 0101
129	Support Skirt	Support	Steel	Air with borated water leakage (External)	Cracking - Fatigue	TLAA	IV.C2-10	3.1.1-07	A 0101
130	Support Skirt	Support	Steel	Air with borated water leakage (External)	Cracking - Flaw Growth	Inservice Inspection	N/A	N/A	H 0101
131	Support Skirt	Support	Steel	Air with borated water leakage (External)	Loss of Material	Boric Acid Corrosion	IV.D2-1	3.1.1-58	A 0101

Generic Notes:	
A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0101	These components have only one environment.
0102	Cracking due to flaw growth is considered to be same as or similar to cracking due to cyclic or thermal and mechanical loading. For reactor vessel internals the aging management program is the PWR Reactor Vessel Internals Program.
0103	For the aging effects in these line items, nickel alloy is equivalent to stainless steel; therefore the stainless steel components were used as a match.
0104	Not used.
0105	Cracking due to underclad cracking (UCC), identified in NUREG-1801 as crack growth due to cyclic loading, is an applicable aging effect for stainless steel clad SA-508 Class 2 steel components.
0106	Not used.
0107	Not used.
0108	Heater sheaths, sleeves, diaphragm plates, etc. are internal to the Pressurizer and are exposed only to borated reactor coolant.
0109	This environment is the same as the NUREG-1801 environment except that it is an internal environment rather than an external environment.
0110	The Nickel Alloy Management Program satisfies the NUREG-1801 requirement to provide a commitment in the FSAR supplement to submit a plant-specific AMP to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.
0111	The NUREG-1801 environment for these items is "System Temperature up to 340°C (644°F)" or “Air with metal temperature up to 288°C (550°F)”. The environments of "Air with steam or water leakage" and “Air with borated water leakage” include the effects of the system temperature on these components, and thus this environment is considered to match the NUREG-1801 environment.
0112	Inservice Inspection (ISI) is not appropriate to the inner heat exchanger tube. The tube is inaccessible and no inspections are performed.

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3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES SYSTEMS

3.2.1 INTRODUCTION

Section 3.2 provides the results of the aging management reviews (AMRs) for those components identified in Section 2.3.2, Engineered Safety Features Systems, as subject to AMR. The systems or portions of systems are described in the indicated sections of the application.

- Containment Air Cooling and Recirculation System (Section 2.3.2.1)
- Containment Spray System (Section 2.3.2.2)
- Core Flooding System (Section 2.3.2.3)
- Decay Heat Removal and Low Pressure Injection System (Section 2.3.2.4)
- High Pressure Injection System (Section 2.3.2.5)

Table 3.2.1, Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.2.2.2.

3.2.2 RESULTS

The following tables summarize the results of the AMR for the Engineered Safety Features (ESF) Systems.

Table 3.2.2-1 Aging Management Review Results – Containment Air Cooling and Recirculation System

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Table 3.2.2-3 Aging Management Review Results – Core Flooding System

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

3.2.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the aging effects requiring management, and the aging management programs (AMPs) used to manage these aging effects are provided for each of the above systems in the following sections.

3.2.2.1.1 Containment Air Cooling and Recirculation System

Materials

The materials of construction for subject mechanical components of the Containment Air Cooling and Recirculation System are:

- Copper alloy
- Elastomer
- Stainless steel
- Steel

Environments

Subject mechanical components of the Containment Air Cooling and Recirculation System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Condensation
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Air Cooling and Recirculation System:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Containment Air Cooling and Recirculation System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- One-Time Inspection
- Open-Cycle Cooling Water Program

3.2.2.1.2 Containment Spray System

Materials

The materials of construction for subject mechanical components of the Containment Spray System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Containment Spray System are exposed to the following normal operating environments:

- Air
- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Moist air
- Treated borated water
- Treated borated water > 60ºC (> 140ºF)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Spray System

- Cracking
- Loss of material

- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Containment Spray System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- One-Time Inspection
- PWR Water Chemistry Program

3.2.2.1.3 Core Flooding System

Materials

The materials of construction for subject mechanical components of the Core Flooding System are:

- Nickel alloy
- Stainless steel
- Steel

Environments

Subject mechanical components of the Core Flooding System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Gas
- Moist Air
- Treated borated water
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Core Flooding System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Core Flooding System

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- One-Time Inspection
- PWR Water Chemistry Program

3.2.2.1.4 Decay Heat Removal and Low Pressure Injection System

Materials

The materials of construction for subject mechanical components of the Decay Heat Removal and Low Pressure Injection System are:

- Aluminum
- Cast austenitic stainless steel
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Decay Heat Removal and Low Pressure Injection System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Air with borated water leakage

- Air with steam or water leakage
- Closed cycle cooling water
- Lubricating oil
- Moist air
- Steam
- Treated borated water
- Treated borated water > 60ºC (> 140ºF)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Decay Heat Removal and Low Pressure Injection System:

- Cracking
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Decay Heat Removal and Low Pressure Injection System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- One-Time Inspection
- PWR Water Chemistry Program
- Selective Leaching Inspection

3.2.2.1.5 High Pressure Injection System

Materials

The materials of construction for subject mechanical components of the High Pressure Injection System are:

- Cast austenitic stainless steel
- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the High Pressure Injection System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Air with borated water leakage
- Air with steam or water leakage
- Closed cycle cooling water
- Lubricating oil
- Treated borated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the High Pressure Injection System:

- Cracking
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the High Pressure Injection System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- One-Time Inspection
- PWR Water Chemistry Program
- Selective Leaching Inspection

3.2.2.2 Aging Management Review Results for Which Further Evaluation is Recommended by NUREG-1801

For the ESF Systems, those items requiring further evaluation are addressed in the following sections.

3.2.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis, as defined in 10 CFR 54.3. Time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluations of the fatigue time-limited aging analyses are addressed in Section 4.

3.2.2.2.2 Loss of Material Due to Cladding Breach

Loss of material due to cladding breach could occur for pressurized water reactor (PWR) steel pump casings with stainless steel cladding exposed to treated borated water. At Davis-Besse, there are no steel pump casings with stainless steel cladding exposed to treated borated water in the ESF Systems that are subject to aging management review; therefore, this item is not applicable to Davis-Besse.

3.2.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

3.2.2.2.3.1 Stainless Steel Piping, Piping Components, and Piping Elements – Treated Water

Loss of material due to pitting and crevice corrosion could occur for internal surfaces of stainless steel containment isolation piping, piping components, and piping elements exposed to treated water. At Davis-Besse, loss of material due to pitting and crevice corrosion for stainless steel containment isolation piping, piping components, and piping elements exposed to treated water in the ESF Systems is managed by the PWR Water

Chemistry Program. The PWR Water Chemistry Program manages loss of material through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material.

3.2.2.2.3.2 Stainless Steel Piping, Piping Components, and Piping Elements – Soil

Loss of material from pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil. At Davis-Besse, the ESF Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to soil and subject to aging management review; therefore, this item is not applicable to Davis-Besse.

3.2.2.2.3.3 Stainless Steel and Aluminum BWR Piping, Piping Components, and Piping Elements – Treated Water

Loss of material for boiling water reactor (BWR) piping and components is applicable to BWR plants only.

3.2.2.2.3.4 Stainless Steel and Copper Alloy Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material from pitting and crevice corrosion could occur for stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. At Davis-Besse, loss of material for stainless steel piping and components in the reactor coolant pump oil collection system, and for copper alloy heat exchanger components in the ESF Systems, that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material.

3.2.2.2.3.5 Partially Encased Stainless Steel Tanks – Raw Water

Loss of material from pitting and crevice corrosion could occur for partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. At Davis-Besse, the ESF Systems do not contain partially encased stainless steel tanks that are subject to aging management review; therefore, this item is not applicable to Davis-Besse.

3.2.2.2.3.6 Stainless Steel Piping, Piping Components, Piping Elements, and Tanks – Internal Condensation

Loss of material from pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. Moist air is enveloped by the NUREG-1801 Chapter IX definition of condensation. At

Davis-Besse, loss of material for stainless steel piping, piping components, piping elements, and tanks that are exposed internally to moist air will be detected and characterized by the One-Time Inspection.

3.2.2.2.4 Reduction of Heat Transfer due to Fouling

3.2.2.2.4.1 Steel, Stainless Steel, and Copper Alloy Heat Exchanger Tubes – Lubricating Oil

Reduction of heat transfer due to fouling could occur for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. At Davis-Besse, reduction in heat transfer due to fouling for gray cast iron (steel) and copper alloy heat exchanger components in the ESF Systems, and for stainless steel and copper alloy heat exchanger components in the Auxiliary Systems, that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages reduction in heat transfer through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage reduction in heat transfer.

3.2.2.2.4.2 Stainless Steel Heat Exchanger Tubes – Treated Water

Reduction of heat transfer due to fouling could occur for stainless steel heat exchanger tubes exposed to treated water. At Davis-Besse, reduction in heat transfer due to fouling for stainless steel heat exchanger tubes in the ESF Systems that are exposed to treated water is managed by the PWR Water Chemistry Program. The PWR Water Chemistry Program manages reduction in heat transfer through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage reduction in heat transfer.

3.2.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

Hardening and loss of strength due to elastomer degradation in seals and components associated with BWR Standby Gas Treatment System ductwork and filters are applicable to BWR plants only.

3.2.2.2.6 Loss of Material Due to Erosion

Loss of material due to erosion could occur in the stainless steel high pressure safety injection pump miniflow recirculation orifice exposed to treated borated water. At Davis-Besse, the safety-related high pressure injection pump is not used for normal charging and is normally in standby. Normal charging is provided by the nonsafety-related makeup pump. Loss of material due to erosion in the makeup pump miniflow recirculation orifices, and for the high pressure injection pump miniflow recirculation orifice, that are exposed to treated borated water is managed by the PWR Water Chemistry Program through periodic monitoring and control of contaminants.

The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material.

3.2.2.2.7 Loss of Material due to General Corrosion, and Fouling

Loss of material due to general corrosion and fouling for BWR steel drywell and suppression chamber components is applicable to BWR plants only.

3.2.2.2.8 Loss of Material due to General, Pitting, and Crevice Corrosion

3.2.2.2.8.1 Steel BWR Piping, Piping Components, and Piping Elements - Treated Water

Loss of material due to general, pitting and crevice corrosion for BWR steel piping and components exposed to treated water is applicable to BWR plants only.

3.2.2.2.8.2 Steel Piping, Piping Components, and Piping Elements – Treated Water

Loss of material due to general, pitting, and crevice corrosion could occur for the internal surfaces of steel containment isolation piping, piping components, and piping elements exposed to treated water. At Davis-Besse, the ESF Systems do not contain steel containment isolation piping, piping components, or piping elements that are exposed to treated water and subject to aging management review; therefore, this item is not applicable to Davis-Besse.

3.2.2.2.8.3 Steel Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to general, pitting and crevice corrosion could occur for steel piping, piping components, and piping elements exposed to lubricating oil. At Davis-Besse, loss of material due to general, pitting, and crevice corrosion for steel (including gray cast iron) piping, piping components, and piping elements in the ESF Systems that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material.

This item is also applied to steel (including gray cast iron) heat exchanger components and steel tanks, and to loss of material due to selective leaching for gray cast iron components that are exposed to lubricating oil.

3.2.2.2.9 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)

Loss of material due to general, pitting, crevice, and MIC could occur for steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. At Davis-Besse, the ESF Systems do not contain steel (with or without coating or wrapping) piping, piping components, or piping elements that are buried in soil and subject to aging management review; therefore, this item is not applicable to Davis-Besse.

3.2.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B, Section B.1.3, for a discussion of FirstEnergy Nuclear Operating Company quality assurance procedures and administrative controls for aging management programs.

3.2.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the Engineered Safety Features Systems components. The section of the application that contains the time-limited aging analyses review results is indicated in parentheses.

- Metal Fatigue (Section 4.3, Metal Fatigue)

3.2.3 CONCLUSIONS

The Engineered Safety Features Systems components and commodities subject to AMR have been identified in accordance with 10 CFR 54.21. The aging management programs selected to manage the effects of aging for the mechanical components and commodities are identified in the following tables and Section 3.2.2.1. A description of the aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging associated with the Engineered Safety Features Systems components and commodities will be managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis for the period of extended operation.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-01	Steel and stainless steel piping, piping components, and piping elements in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a time limited aging analysis (TLAA). Further evaluation is documented in Section 3.2.2.2.1.
3.2.1-02	Steel with stainless steel cladding pump casing exposed to treated borated water	Loss of material/ cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC Information Notice 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes, verify that plant-specific program addresses cladding breach	Not applicable. The ESF Systems do not contain steel pump casings with stainless steel cladding that are exposed to treated borated water and subject to aging management review. Further evaluation is documented in Section 3.2.2.2.2.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-03	Stainless steel containment isolation piping and components internal surfaces exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion in stainless steel containment isolation piping, piping components, and piping elements that are exposed to treated water is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. Further evaluation is documented in Section 3.2.2.2.3.1.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-04	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant-specific	Not applicable. The ESF Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to soil and subject to aging management review. Further evaluation is documented in Section 3.2.2.2.3.2.
3.2.1-05	BWR only				

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-06	Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel piping, piping components, and piping elements that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. The ESF Systems do not contain copper alloy piping, piping components, or piping elements that are exposed to lubricating oil and subject to aging management review. However, this item is applied to copper alloy heat exchanger components. Further evaluation is documented in Section 3.2.2.2.3.4.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-07	Partially encased stainless steel tanks with breached moisture barrier exposed to raw water	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated for pitting and crevice corrosion of tank bottoms because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes, plant-specific	Not applicable. The ESF Systems do not contain partially encased stainless steel tanks that are subject to aging management review. Further evaluation is documented in Section 3.2.2.2.3.5.
3.2.1-08	Stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant-specific	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion in stainless steel piping, piping components, piping elements, and tanks that are exposed to moist air (internal) will be detected and characterized by the One-Time Inspection. Further evaluation is documented in Section 3.2.2.2.3.6.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-09	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Reduction in heat transfer due to fouling for stainless steel and copper alloy heat exchanger tubes, and for gray cast iron (steel) cooler housings that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage reduction in heat transfer. Further evaluation is documented in Section 3.2.2.2.4.1.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-10	Stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Reduction in heat transfer due to fouling for stainless steel heat exchanger tubes that are exposed to treated water is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage reduction in heat transfer. Further evaluation is documented in Section 3.2.2.2.4.2.
3.2.1-11	BWR only				

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-12	Stainless steel high-pressure safety injection (charging) pump miniflow orifice exposed to treated borated water	Loss of material due to erosion	A plant-specific aging management program is to be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging.	Yes, plant specific	Not applicable. At Davis-Besse, the high pressure injection pump is not used for normal charging. Normal charging is provided by the makeup pump. For loss of material due to erosion in the high pressure injection and makeup pump miniflow recirculation orifices, refer to Item Number 3.2.1-49. Further evaluation is documented in Section 3.2.2.2.6.
3.2.1-13	BWR only				
3.2.1-14	BWR only				
3.2.1-15	Steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. The ESF Systems do not contain steel containment isolation piping, piping components, or piping elements that are exposed to treated water and subject to aging management review. Further evaluation is documented in Section 3.2.2.2.8.2.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-16	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion in steel (including gray cast iron) piping, piping components, and piping elements that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. This item is also applied to steel (including gray cast iron) heat exchanger components and steel tanks, and to loss of material due to selective leaching for gray cast iron components that are exposed to lubricating oil. Further evaluation is documented in Section 3.2.2.2.8.3.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-17	Steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Not applicable. The ESF Systems do not contain steel (with or without coating or wrapping) piping, piping components, or piping elements that are buried in soil and subject to aging management review. Further evaluation is documented in Section 3.2.2.2.9.
3.2.1-18	BWR only				
3.2.1-19	BWR only				
3.2.1-20	BWR only				
3.2.1-21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Cracking in high-strength steel bolting that is exposed to air with steam or water leakage is managed by the Bolting Integrity Program.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-22	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Loss of material in steel bolting that is exposed to air with steam or water leakage is managed by the Bolting Integrity Program.
3.2.1-23	Steel bolting and closure bolting exposed to air – outdoor (external) or air – indoor uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Loss of material in steel bolting that is exposed to air-indoor uncontrolled (external) is managed by the Bolting Integrity Program. The ESF Systems do not contain steel bolting that is exposed to air-outdoor (external) and subject to aging management review.
3.2.1-24	Steel closure bolting exposed to air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Loss of preload for steel bolting that is exposed to air-indoor uncontrolled (external) is managed by the Bolting Integrity Program.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-25	Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water >60 °C (>140 °F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Not applicable. The ESF Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to closed cycle cooling water > 60ºC (> 140ºF) and subject to aging management review.
3.2.1-26	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable. The ESF Systems do not contain steel piping, piping components, or piping elements that are exposed to closed cycle cooling water and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-27	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Loss of material in steel (including gray cast iron) heat exchanger components that are exposed to closed cycle cooling water is managed by the Closed Cooling Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage loss of material.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-28	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Loss of material for stainless steel heat exchanger components that are exposed to closed cycle cooling water is managed by the Closed Cooling Water Chemistry Program. This item is also applied to nickel alloy heat exchanger components that are exposed to closed cycle cooling water. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage loss of material. The ESF Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to closed-cycle cooling water and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-29	Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Loss of material in copper alloy heat exchanger components that are exposed to closed cycle cooling water is managed by the Closed Cooling Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage loss of material. The ESF Systems do not contain copper alloy piping, piping components, or piping elements that are exposed to closed-cycle cooling water and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-30	Stainless steel and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Reduction in heat transfer for stainless steel and copper alloy heat exchanger tubes that are exposed to closed cycle cooling water is managed by the Closed Cooling Water Chemistry Program. This item is also applied to nickel alloy heat exchanger tubes that are exposed to closed cycle cooling water. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage reduction in heat transfer.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-31	External surfaces of steel components including ducting, piping, ducting closure bolting, and containment isolation piping external surfaces exposed to air - indoor uncontrolled (external); condensation (external) and air - outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. Loss of material for external surfaces of steel (including gray cast iron) components, except for bolting, that are exposed to air-indoor uncontrolled (external) is managed by the External Surfaces Monitoring Program. For bolting, see Item Number 3.2.1-23. This item is also applied to internal surfaces of steel piping components and tanks that are exposed to an air-indoor uncontrolled (internal) where it has been demonstrated that the internal environment is the same as the external environment. The ESF Systems do not contain steel components that are exposed to condensation (external) or air-outdoor (external) and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-32	Steel piping and ducting components and internal surfaces exposed to air – indoor uncontrolled (Internal)	Loss of material due to general corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable. Loss of material for the internal surfaces of steel components that are exposed to air-indoor uncontrolled (Internal) is managed by the External Surfaces Monitoring Program where it has been demonstrated that the internal environment is the same as the external environment (see Item Number 3.2.1-31).
3.2.1-33	Steel encapsulation components exposed to air-indoor uncontrolled (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable. The ESF Systems do not contain steel encapsulation components that are subject to aging management review.
3.2.1-34	Steel piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable. The ESF Systems do not contain steel piping, piping components, or piping elements that are exposed to condensation (internal) and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-35	Steel containment isolation piping and components internal surfaces exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. The ESF Systems do not contain steel containment isolation piping and components that are exposed to raw water (internal) and subject to aging management review.
3.2.1-36	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. The ESF Systems do not contain steel heat exchanger components that are exposed to raw water and subject to aging management review.
3.2.1-37	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable. The ESF Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to raw water and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-38	Stainless steel containment isolation piping and components internal surfaces exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. The ESF Systems do not contain stainless steel containment isolation piping and components that are exposed to raw water (internal) and subject to aging management review.
3.2.1-39	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. The ESF Systems do not contain stainless steel heat exchanger components that are exposed to raw water and subject to aging management review.
3.2.1-40	Steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable. The ESF Systems do not contain steel or stainless steel heat exchanger tubes that are exposed to raw water and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-41	Copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. The ESF Systems contain copper alloy > 15% Zn heat exchanger tubes that are exposed to closed cycle cooling water and subject to aging management review. However, the material is admiralty brass, which is an inhibited copper alloy, and is, therefore, not susceptible to selective leaching. The ESF Systems do not contain copper alloy > 15% Zn piping, piping components, or piping elements that are exposed to closed cycle cooling water and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-42	Gray cast iron piping, piping components, piping elements exposed to closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The ESF Systems do not contain gray cast iron piping, piping components, or piping elements that are exposed to closed cycle cooling water and subject to aging management review. This item is, however, applied to gray cast iron heat exchanger components that are exposed to closed cycle cooling water. Loss of material due to selective leaching in gray cast iron heat exchanger components that are exposed to closed cycle cooling water is detected and characterized by the Selective Leaching Inspection.
3.2.1-43	Gray cast iron piping, piping components, and piping elements exposed to soil	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. The ESF Systems do not contain gray cast iron piping, piping components, or piping elements that are exposed to soil and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-44	Gray cast iron motor cooler exposed to treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. The ESF Systems do not contain gray cast iron motor coolers that are exposed to treated water and subject to aging management review.
3.2.1-45	Aluminum, copper alloy >15% Zn, and steel external surfaces, bolting, and piping, piping components, and piping elements exposed to air with borated water leakage	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	No	Consistent with NUREG-1801. Loss of material for external surfaces of aluminum and steel (including gray cast iron) bolting, piping, piping components, and piping elements, heat exchangers and tanks that are exposed to air with borated water leakage is managed by the Boric Acid Corrosion Program. The ESF Systems do not contain copper alloy > 15% Zn components with external surfaces exposed to air with borated water leakage and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-46	Steel encapsulation components exposed to air with borated water leakage (internal)	Loss of material due to general, pitting, crevice and boric acid corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable. The ESF Systems do not contain steel encapsulation components and subject to aging management review.
3.2.1-47	Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated borated water >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable. The ESF Systems do not contain cast austenitic stainless steel piping, piping components, or piping elements that are exposed to treated borated water > 250°C (> 482°F) and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-48	Stainless steel or stainless-steel-clad steel piping, piping components, piping elements, and tanks (including safety injection tanks/accumulators) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry	No	Consistent with NUREG-1801. Cracking in stainless steel piping, piping components, and piping elements that are exposed to treated borated water > 60ºC (> 140ºF) is managed by the PWR Water Chemistry Program. This item is also applied to stainless steel heat exchanger components that are exposed to treated borated water > 60ºC (> 140ºF). In addition, the One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage cracking.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-49	Stainless steel piping, piping components, piping elements, and tanks exposed to treated borated water	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Consistent with NUREG-1801. Loss of material for stainless steel piping, piping components, piping elements, and tanks that are exposed to treated borated water is managed by the PWR Water Chemistry Program. This item is also applied to stainless steel heat exchanger components and separators that are exposed to treated borated water. In addition, the One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material.
3.2.1-50	Aluminum piping, piping components, and piping elements exposed to air- indoor uncontrolled (internal/external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management were identified for any aluminum piping, piping components, or piping elements that are exposed to air-indoor uncontrolled (internal or external).

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-51	Galvanized steel ducting exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. In the Davis-Besse aging management review process, no credit is taken for coatings, including the zinc coating of galvanized steel, to prevent the effects of aging on the base metal. Therefore, galvanized steel ducting is evaluated simply as steel. In addition, all air-indoor environments were conservatively evaluated as uncontrolled environments. Refer to Item Number 3.2.1-56.
3.2.1-52	Glass piping elements exposed to air – indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water	None	None	NA - No AEM or AMP	Not applicable. The ESF Systems do not contain glass piping elements that are subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-53	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management were identified for any stainless steel, copper alloy, or nickel alloy piping, piping components, or piping elements that are exposed to air-indoor uncontrolled (external). This item is also applied to stainless steel and copper alloy heat exchanger components, and to stainless steel tanks, that are exposed to an air-indoor uncontrolled (external). This item is also applied to internal surfaces of stainless steel and copper alloy piping components, and to stainless steel tanks, that are exposed to an air-indoor uncontrolled (internal) where it has been demonstrated that the internal environment is the same as the external environment.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-54	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. The ESF Systems do not contain steel piping, piping components, or piping elements that are exposed to air-indoor controlled (external) and subject to aging management review. All air-indoor environments were conservatively evaluated as uncontrolled environments.
3.2.1-55	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Not applicable. The ESF Systems do not contain steel or stainless steel piping, piping components, or piping elements that are embedded in concrete and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-56	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management were identified for any stainless steel piping, piping components, or piping elements that are exposed to gas. This item is also applied to stainless steel tanks that are exposed to gas. The ESF Systems do not contain steel or copper alloy piping, piping components, or piping elements that are exposed to gas and subject to aging management review.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-57	Stainless steel and copper alloy <15% Zn piping, piping components, and piping elements exposed to air with borated water leakage	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management were identified for any stainless steel piping, piping components, or piping elements that are exposed to air with borated water leakage. This item is also applied to stainless steel bolting, heat exchanger components, and tanks that are exposed to air with borated water leakage. The ESF Systems do not contain copper alloy <15% Zn piping, piping components, or piping elements that are exposed to air with borated water leakage and subject to aging management review.

Table 3.2.2-1 Aging Management Review Results – Containment Air Cooling and Recirculation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
6	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B

Table 3.2.2-1 Aging Management Review Results – Containment Air Cooling and Recirculation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
8	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
9	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
10	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0201
11	Damper Housing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
12	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
13	Drain Pan	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
14	Drain Pan	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.2.2-1 Aging Management Review Results – Containment Air Cooling and Recirculation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0201
16	Duct	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
17	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
18	Fan Housing - Containment air cooler fans (DB-C1-1, -2 & -3)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0201
19	Fan Housing - Containment air cooler fans (DB-C1-1, -2 & -3)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
20	Fan Housing - Containment air cooler fans (DB-C1-1, -2 & -3)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
21	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E

Table 3.2.2-1 Aging Management Review Results – Containment Air Cooling and Recirculation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
23	Heat Exchanger (cooling coil casing) - Containment air cooling coils (DB-E37-1, -2 & -3)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C
24	Heat Exchanger (cooling coil casing) - Containment air cooling coils (DB-E37-1, -2 & -3)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
25	Heat Exchanger (cooling coil casing) - Containment air cooling coils (DB-E37-1, -2 & -3)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.2.2-1 Aging Management Review Results – Containment Air Cooling and Recirculation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
26	Heat Exchanger (cooling coil fins) - Containment air cooling coils (DB-E37-1, -2 & -3)	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	G
27	Heat Exchanger (cooling coil tubes) - Containment air cooling coils (DB-E37-1, -2 & -3)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B
28	Heat Exchanger (cooling coil tubes) - Containment air cooling coils (DB-E37-1, -2 & -3)	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	G

Table 3.2.2-1 Aging Management Review Results – Containment Air Cooling and Recirculation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
29	Heat Exchanger (cooling coil tubes) - Containment air cooling coils (DB-E37-1, -2 & -3)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B
30	Heat Exchanger (cooling coil tubes) - Containment air cooling coils (DB-E37-1, -2 & -3)	Pressure boundary	Copper Alloy	Condensation (External)	Loss of material	One-Time Inspection	VII.F1-16	3.3.1-25	E
31	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0201
32	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
33	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
34	Piping	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E

Table 3.2.2-1 Aging Management Review Results – Containment Air Cooling and Recirculation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
35	Register	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0201
36	Register	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
37	Register	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
38	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0201
39	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
40	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
6	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
8	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.E-2	3.2.1-45	A
10	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	V.E-6	3.2.1-22	B
11	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
12	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	V.E-5	3.2.1-24	B
13	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208
14	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
16	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
17	Orifice	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208
18	Orifice	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A
19	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0201
20	Piping	Pressure boundary	Stainless Steel	Moist air (Internal)	Cracking	One-Time Inspection	N/A	N/A	H 0202
21	Piping	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.A-26	3.2.1-08	E 0202 0210
22	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208
23	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.A-28	3.2.1-48	E 0208
25	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.A-28	3.2.1-48	A
26	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0204 0208
27	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A 0204
28	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
29	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
30	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0201

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
31	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208
32	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A
33	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
34	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
35	Piping	Structural integrity	Steel	Air (Internal)	Loss of material	One-Time Inspection	N/A	N/A	G 0203
36	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.A-4	3.2.1-45	A
37	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.A-1	3.2.1-31	A
38	Pump Casing - Containment spray pumps (DB-P56-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Pump Casing - Containment spray pumps (DB-P56-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A
40	Pump Casing - Containment spray pumps (DB-P56-1 & 2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
41	Pump Casing - Containment spray pumps (DB-P56-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
42	Separator	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208
43	Separator	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A
44	Separator	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
45	Separator	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
46	Spray Nozzle	Spray	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0201
47	Spray Nozzle	Spray	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
48	Spray Nozzle	Spray	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
49	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208
50	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A
51	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
52	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208
54	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A
55	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
56	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
57	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208
58	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A
59	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
60	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-2 Aging Management Review Results – Containment Spray System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
61	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.A-27	3.2.1-49	E 0208
62	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.A-27	3.2.1-49	A
63	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
64	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-3 Aging Management Review Results – Core Flooding System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.E-2	3.2.1-45	A
6	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	V.E-3	3.2.1-21	B

Table 3.2.2-3 Aging Management Review Results – Core Flooding System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	V.E-6	3.2.1-22	B
8	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
9	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	V.E-5	3.2.1-24	B
10	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
11	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
12	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
13	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F

Table 3.2.2-3 Aging Management Review Results – Core Flooding System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Nozzle - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Nickel Alloy	Gas (Internal)	None	None	N/A	N/A	G
15	Nozzle - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Nickel Alloy	Treated borated water (Internal)	Loss of material	One-Time Inspection	N/A	N/A	G 0208
16	Nozzle - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Nickel Alloy	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	N/A	N/A	G
17	Nozzle - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Nickel Alloy	Air with borated water leakage (External)	None	None	N/A	N/A	G
18	Nozzle - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Nickel Alloy	Air-indoor uncontrolled (External)	None	None	V.F-11	3.2.1-53	A
19	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
20	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
21	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A

Table 3.2.2-3 Aging Management Review Results – Core Flooding System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
23	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0201
24	Piping	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	V.F-15	3.2.1-56	A
25	Piping	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0202 0210
26	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
27	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
28	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	V.C-4	3.2.1-03	C
29	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	V.C-4	3.2.1-03	C
30	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A

Table 3.2.2-3 Aging Management Review Results – Core Flooding System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
31	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
32	Piping	Structural integrity	Stainless Steel	Gas (Internal)	None	None	V.F-15	3.2.1-56	A
33	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
34	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
35	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	V.C-4	3.2.1-03	C
36	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	V.C-4	3.2.1-03	C
37	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
38	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-3 Aging Management Review Results – Core Flooding System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Tank - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	V.F-15	3.2.1-56	C
40	Tank - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
41	Tank - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
42	Tank - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
43	Tank - Core flood tanks (DB-T9-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
44	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	V.F-15	3.2.1-56	A
45	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
46	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A

Table 3.2.2-3 Aging Management Review Results – Core Flooding System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
47	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
48	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
49	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	V.F-15	3.2.1-56	A
50	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
51	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
52	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	V.C-4	3.2.1-03	C
53	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	V.C-4	3.2.1-03	C
54	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A

Table 3.2.2-3 Aging Management Review Results – Core Flooding System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
55	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
56	Valve Body	Structural integrity	Stainless Steel	Gas (Internal)	None	None	V.F-15	3.2.1-56	A
57	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
58	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
59	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
60	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
2	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
6	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
7	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Structural integrity	Stainless Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
10	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
11	Heat Exchanger (channel) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
12	Heat Exchanger (channel) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	C
13	Heat Exchanger (channel) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Heat Exchanger (channel) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	C 0204
15	Heat Exchanger (channel) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
16	Heat Exchanger (channel) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
17	Heat Exchanger (channel) - BWST heater (DB-E34)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
18	Heat Exchanger (channel) - BWST heater (DB-E34)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	C

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
19	Heat Exchanger (channel) - BWST heater (DB-E34)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
20	Heat Exchanger (channel) - BWST heater (DB-E34)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	C
21	Heat Exchanger (shell) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	V.D1-6	3.2.1-27	B
22	Heat Exchanger (shell) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	V.D1-6	3.2.1-27	E 0207
23	Heat Exchanger (shell) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
24	Heat Exchanger (shell) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
25	Heat Exchanger (shell) - BWST heater (DB-E34)	Structural integrity	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-8	3.4.1-37	E 0208
26	Heat Exchanger (shell) - BWST heater (DB-E34)	Structural integrity	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-8	3.4.1-37	C
27	Heat Exchanger (shell) - BWST heater (DB-E34)	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
28	Heat Exchanger (shell) - BWST heater (DB-E34)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
29	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Heat transfer	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Reduction in heat transfer	One-Time Inspection	V.D2-13	3.2.1-10	A 0205

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
30	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Heat transfer	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Reduction in heat transfer	PWR Water Chemistry	V.D2-13	3.2.1-10	A 0205
31	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	V.D1-9	3.2.1-30	B
32	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	One-Time Inspection	V.D1-9	3.2.1-30	E 0207
33	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
34	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	C

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
35	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208
36	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	C 0204
37	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	V.D1-4	3.2.1-28	B
38	Heat Exchanger (tubes) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	V.D1-4	3.2.1-28	E 0207
39	Heat Exchanger (tubesheet) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
40	Heat Exchanger (tubesheet) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	C
41	Heat Exchanger (tubesheet) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208
42	Heat Exchanger (tubesheet) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	C 0204
43	Heat Exchanger (tubesheet) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	V.D1-4	3.2.1-28	B
44	Heat Exchanger (tubesheet) - DHR cooler (DB-E27-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	V.D1-4	3.2.1-28	E 0207

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
45	Heat Exchanger (housing) - DHR pump bearing oil cooler (DB-P42-1 & 2)	Heat transfer	Gray Cast Iron	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	N/A	N/A	H
46	Heat Exchanger (housing) - DHR pump bearing oil cooler (DB-P42-1 & 2)	Heat transfer	Gray Cast Iron	Closed cycle cooling water (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H 0207
47	Heat Exchanger (housing) - DHR pump bearing oil cooler (DB-P42-1 & 2)	Heat transfer	Gray Cast Iron	Lubricating oil (Internal)	Reduction in heat transfer	Lubricating Oil Analysis	V.D1-12	3.2.1-09	C
48	Heat Exchanger (housing) - DHR pump bearing oil cooler (DB-P42-1 & 2)	Heat transfer	Gray Cast Iron	Lubricating oil (Internal)	Reduction in heat transfer	One-Time Inspection	V.D1-12	3.2.1-09	C

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
49	Heat Exchanger (housing) - DHR pump bearing oil cooler (DB-P42-1 & 2)	Pressure boundary	Gray Cast Iron	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	V.D1-6	3.2.1-27	B
50	Heat Exchanger (housing) - DHR pump bearing oil cooler (DB-P42-1 & 2)	Pressure boundary	Gray Cast Iron	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	V.D1-6	3.2.1-27	E 0207
51	Heat Exchanger (housing) - DHR pump bearing oil cooler (DB-P42-1 & 2)	Pressure boundary	Gray Cast Iron	Closed cycle cooling water (External)	Loss of material	Selective Leaching Inspection	V.D1-20	3.2.1-42	C
52	Heat Exchanger (housing) - DHR pump bearing oil cooler (DB-P42-1 & 2)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	C 0209

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Heat Exchanger (housing) - DHR pump bearing oil cooler (DB-P42-1 & 2)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	C
54	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
55	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
56	Orifice	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
57	Orifice	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A
58	Orifice	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
59	Orifice	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204
60	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
61	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
62	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
63	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
64	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
65	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
66	Orifice	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
67	Orifice	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
68	Orifice	Throttling	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
69	Orifice	Throttling	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A
70	Orifice	Throttling	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208
71	Orifice	Throttling	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204
72	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0201
73	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
74	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
75	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
76	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A
77	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208
78	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204
79	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
80	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
81	Piping	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
82	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0201
83	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
84	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
85	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
86	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A
87	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
88	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204
89	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
90	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
91	Piping	Structural integrity	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
92	Pump Casing - DHR pump (DB-P42-1 & 2)	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
93	Pump Casing - DHR pump (DB-P42-1 & 2)	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A
94	Pump Casing - DHR pump (DB-P42-1 & 2)	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
95	Pump Casing - DHR pump (DB-P42-1 & 2)	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204
96	Pump Casing - DHR pump (DB-P42-1 & 2)	Pressure boundary	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
97	Pump Casing - DHR pump (DB-P42-1 & 2)	Pressure boundary	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
98	Pump Casing - Borated water recirculation pump (DB-P57_BW)	Structural integrity	Cast Austenitic Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
99	Pump Casing - Borated water recirculation pump (DB-P57_BW)	Structural integrity	Cast Austenitic Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
100	Pump Casing - Borated water recirculation pump (DB-P57_BW)	Structural integrity	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
101	Pump Casing - Borated water recirculation pump (DB-P57_BW)	Structural integrity	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
102	Pump Casing - Refueling canal drain pump (DB-P204)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
103	Pump Casing - Refueling canal drain pump (DB-P204)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
104	Pump Casing - Refueling canal drain pump (DB-P204)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
105	Pump Casing - Refueling canal drain pump (DB-P204)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
106	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
107	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A
108	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208
109	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204
110	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
111	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
112	Tank - BWST (DB-T10)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	C 0201
113	Tank - BWST (DB-T10)	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0210 0211

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
114	Tank - BWST (DB-T10)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
115	Tank - BWST (DB-T10)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
116	Tank - BWST (DB-T10)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
117	Tank - BWST (DB-T10)	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
118	Tank - Incore instrument tank (DB-T92)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	C 0201
119	Tank - Incore instrument tank (DB-T92)	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0210 0211
120	Tank - Incore instrument tank (DB-T92)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
121	Tank - Incore instrument tank (DB-T92)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
122	Tank - Incore instrument tank (DB-T92)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
123	Tank - Incore instrument tank (DB-T92)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	C
124	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
125	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
126	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
127	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A
128	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
129	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204
130	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
131	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
132	Tubing	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
133	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
134	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
135	Tubing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
136	Tubing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A
137	Tubing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208
138	Tubing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204
139	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
140	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
141	Valve Body	Pressure boundary	Aluminum	Air-indoor uncontrolled (Internal)	None	None	V.F-2	3.2.1-50	A
142	Valve Body	Pressure boundary	Aluminum	Air-outdoor (External)	None	None	N/A	N/A	G

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
143	Valve Body	Pressure boundary	Aluminum	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D2-18	3.2.1-45	A
144	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
145	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
146	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
147	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A
148	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208
149	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
150	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
151	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
152	Valve Body	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
153	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
154	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
155	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	V.D1-31	3.2.1-48	E 0208
156	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	V.D1-31	3.2.1-48	A

Table 3.2.2-4 Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
157	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0204 0208
158	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A 0204
159	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
160	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Stainless Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
6	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.E-2	3.2.1-45	A
7	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	V.E-3	3.2.1-21	B

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	V.E-6	3.2.1-22	B
9	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	V.E-4	3.2.1-23	B
10	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	V.E-5	3.2.1-24	B
11	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	C
12	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
13	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
14	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Filter Housing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A
16	Filter Housing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	A
17	Filter Housing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
18	Filter Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
19	Flow Element	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
20	Flow Element	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
21	Flow Element	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
22	Flow Element	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
23	Heat Exchanger (bonnets) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	V.D1-6	3.2.1-27	B
24	Heat Exchanger (bonnets) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	V.D1-6	3.2.1-27	E 0207
25	Heat Exchanger (bonnets) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	V.D1-20	3.2.1-42	C

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
26	Heat Exchanger (bonnets) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
27	Heat Exchanger (bonnets) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
28	Heat Exchanger (shell) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	C

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
29	Heat Exchanger (shell) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	C
30	Heat Exchanger (shell) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
31	Heat Exchanger (shell) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Heat Exchanger (tubes) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	V.A-11	3.2.1-30	B
33	Heat Exchanger (tubes) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	One-Time Inspection	V.A-11	3.2.1-30	E 0207
34	Heat Exchanger (tubes) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	V.D1-8	3.2.1-09	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
35	Heat Exchanger (tubes) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (External)	Reduction in heat transfer	One-Time Inspection	V.D1-8	3.2.1-09	A
36	Heat Exchanger (tubes) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	V.D1-2	3.2.1-29	B 0206
37	Heat Exchanger (tubes) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	V.D1-2	3.2.1-29	E 0206 0207

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
38	Heat Exchanger (tubes) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	V.D1-18	3.2.1-06	C 0206
39	Heat Exchanger (tubes) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (External)	Loss of material	One-Time Inspection	V.D1-18	3.2.1-06	C 0206
40	Heat Exchanger (tubesheet) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	V.D1-6	3.2.1-27	B

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
41	Heat Exchanger (tubesheet) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	V.D1-6	3.2.1-27	E 0207
42	Heat Exchanger (tubesheet) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	C
43	Heat Exchanger (tubesheet) - HPI pump lube oil heat exchanger (DB-E198-1 & DB-E198-2)	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	C
44	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801, Volume 2 Item**	**Table 1 Item**	**Notes**
45	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
46	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
47	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
48	Orifice	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A
49	Orifice	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	A
50	Orifice	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
51	Orifice	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
52	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
54	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
55	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
56	Orifice	Throttling	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A
57	Orifice	Throttling	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	A
58	Orifice	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
59	Orifice	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
60	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0201
61	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
62	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
63	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
64	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
65	Piping	Pressure boundary	Stainless Steel	Air-outdoor (External)	None	None	N/A	N/A	G
66	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A 0201
67	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A
68	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	A
69	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
70	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
71	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	V.F-12	3.2.1-53	A 0201
72	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
73	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
74	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
75	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
76	Pump Casing - HPI pump (DB-P58-1 & DB-P58-2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
77	Pump Casing - HPI pump (DB-P58-1 & DB-P58-2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
78	Pump Casing - HPI pump (DB-P58-1 & DB-P58-2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
79	Pump Casing - HPI pump (DB-P58-1 & DB-P58-2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
80	Pump Casing - HPI pump AC lube oil pumps DB-P197-1 & DB-P198-1)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A 0209
81	Pump Casing - HPI pump AC lube oil pumps DB-P197-1 & DB-P198-1)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	A
82	Pump Casing - HPI pump AC lube oil pumps DB-P197-1 & DB-P198-1)	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
83	Pump Casing - HPI pump AC lube oil pumps DB-P197-1 & DB-P198-1)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
84	Pump Casing - HPI pump DC lube oil pump (DB-P197-2 & DB-P198-2)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A 0209
85	Pump Casing - HPI pump DC lube oil pump (DB-P197-2 & DB-P198-2)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	A
86	Pump Casing - HPI pump DC lube oil pump (DB-P197-2 & DB-P198-2)	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
87	Pump Casing - HPI pump DC lube oil pump (DB-P197-2 & DB-P198-2)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
88	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
89	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
90	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
91	Separator	Pressure boundary	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
92	Tank - HPI pump lube oil head tank (DB-T198-1 & DB-T198-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	C
93	Tank - HPI pump lube oil head tank (DB-T198-1 & DB-T198-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	C

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
94	Tank - HPI pump lube oil head tank (DB-T198-1 & DB-T198-2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
95	Tank - HPI pump lube oil head tank (DB-T198-1 & DB-T198-2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
96	Tank - HPI pump lube oil reservoir (DB-T199-1 & DB-T199-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	C
97	Tank - HPI pump lube oil reservoir (DB-T199-1 & DB-T199-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	C
98	Tank - HPI pump lube oil head tank (DB-T198-1 & DB-T198-2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A 0201

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
99	Tank - HPI pump lube oil reservoir (DB-T199-1 & DB-T199-2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A 0201
100	Tank - HPI pump lube oil reservoir (DB-T199-1 & DB-T199-2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
101	Tank - HPI pump lube oil reservoir (DB-T199-1 & DB-T199-2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
102	Thrust Bearing Housing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	C
103	Thrust Bearing Housing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	C
104	Thrust Bearing Housing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
105	Thrust Bearing Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
106	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A
107	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	A
108	Tubing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A
109	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
110	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
111	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
112	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
113	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
114	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
115	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
116	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
117	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
118	Valve Body	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A 0209
119	Valve Body	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	A
120	Valve Body	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
121	Valve Body	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
122	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
123	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
124	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
125	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A
126	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A
127	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	V.D1-28	3.2.1-16	A
128	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	V.D1-1	3.2.1-45	A

Table 3.2.2-5 Aging Management Review Results – High Pressure Injection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
129	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	V.E-7	3.2.1-31	A
130	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	V.D1-30	3.2.1-49	E 0208
131	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	V.D1-30	3.2.1-49	A
132	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	V.F-13	3.2.1-57	A
133	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	V.F-12	3.2.1-53	A

Generic Notes:	
A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0201	This environment is the same as the NUREG-1801 environment except that it is an internal rather than an external environment.
0202	The One-Time Inspection will confirm, for components subject to a “Moist air (Internal)” environment, the absence of aging effects or that aging is slow acting so as to not affect the subject component's intended function during the period of extended operation.
0203	The One-Time Inspection will confirm, for components subject to an “Air (Internal)” environment, the absence of aging effects or that aging is slow acting so as to not affect the subject component's intended function during the period of extended operation.
0204	Aging effect not in NUREG-1801 for this particular environment. However, loss of material is not dependent on temperature in the treated borated water environment. Therefore, this is considered to be a match.
0205	Aging effect not in NUREG-1801 for this particular environment. However, reduction in heat transfer due to fouling is not dependent on temperature, nor on whether the treated water environment is borated or not. Therefore, this is considered to be a match.
0206	The component material is admiralty brass and, therefore, loss of material due to selective leaching is not an applicable aging mechanism.
0207	The One-Time Inspection will provide verification of Closed Cooling Water Chemistry Program effectiveness.
0208	The One-Time Inspection will provide verification of PWR Water Chemistry Program effectiveness.
0209	The Lubricating Oil Analysis Program also manages loss of material due to selective leaching for susceptible materials by ensuring that water contamination is minimized.
0210	The “Moist air (Internal)” environment is enveloped by the NUREG-1801 Chapter IX definition of “Condensation (internal/external)”.
0211	The One-Time Inspection will confirm, for components subject to a “Moist air (Internal)” environment at the air-water interface, the absence of aging effects or that aging is slow acting so as to not affect the subject component's intended function during the period of extended operation.

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1 INTRODUCTION

Section 3.3 provides the results of the aging management reviews (AMRs) for those components identified in Section 2.3.3, Auxiliary Systems, as subject to AMR. The systems or portions of systems are described in the indicated sections.

- Auxiliary Building Heating, Ventilation and Air Conditioning (HVAC) Systems (Section 2.3.3.1)
- Auxiliary Building Chilled Water System (Section 2.3.3.2)
- Auxiliary Steam and Station Heating System (Section 2.3.3.3)
- Boron Recovery System (Section 2.3.3.4)
- Chemical Addition System (Section 2.3.3.5)
- Circulating Water System (Section 2.3.3.6)
- Component Cooling Water System (Section 2.3.3.7)
- Containment Hydrogen Control System (Section 2.3.3.8)
- Containment Purge System (Section 2.3.3.9)
- Containment Vacuum Relief System (Section 2.3.3.10)
- Demineralized Water Storage System (Section 2.3.3.11)
- Emergency Diesel Generators System (Section 2.3.3.12)
- Emergency Ventilation System (Section 2.3.3.13)
- Fire Protection System (Section 2.3.3.14)
- Fuel Oil System (Section 2.3.3.15)
- Gaseous Radwaste System (Section 2.3.3.16)
- Instrument Air System (Section 2.3.3.17)
- Makeup and Purification System (Section 2.3.3.18)
- Makeup Water Treatment System (Section 2.3.3.19)
- Miscellaneous Building HVAC System (Section 2.3.3.20)
- Miscellaneous Liquid Radwaste System (Section 2.3.3.21)
- Nitrogen Gas System (Section 2.3.3.22)
- Process and Area Radiation Monitoring System (Section 2.3.3.23)

- Reactor Coolant Vent and Drain System (Section 2.3.3.24)
- Sampling System (Section 2.3.3.25)
- Service Water System (Section 2.3.3.26)
- Spent Fuel Pool Cooling and Cleanup System (Section 2.3.3.27)
- Spent Resin Transfer System (Section 2.3.3.28)
- Station Air System (Section 2.3.3.29)
- Station Blackout Diesel Generator System (Section 2.3.3.30)
- Station Plumbing, Drains, and Sumps System (Section 2.3.3.31)
- Turbine Plant Cooling Water System (Section 2.3.3.32)

Table 3.3.1, Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.3.2.2.

3.3.2 RESULTS

The following tables summarize the results of the AMR for Auxiliary Systems:

Table 3.3.2-1	Aging Management Review Results – Auxiliary Building HVAC System
Table 3.3.2-2	Aging Management Review Results – Auxiliary Building Chilled Water System
Table 3.3.2-3	Aging Management Review Results – Auxiliary Steam and Station Heating Systems
Table 3.3.2-4	Aging Management Review Results – Boron Recovery System
Table 3.3.2-5	Aging Management Review Results – Chemical Addition System
Table 3.3.2-6	Aging Management Review Results – Circulating Water System
Table 3.3.2-7	Aging Management Review Results – Component Cooling Water System
Table 3.3.2-8	Aging Management Review Results – Containment Hydrogen Control System
Table 3.3.2-9	Aging Management Review Results – Containment Purge System

Table 3.3.2-29 Aging Management Review Results – Station Air System

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Table 3.3.2-32 Aging Management Review Results – Turbine Plant Cooling Water System

3.3.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the aging effects requiring management, and the aging management programs (AMPs) used to manage these aging effects are provided for each of the above systems in the following sections.

3.3.2.1.1 Auxiliary Building HVAC Systems

Materials

The materials of construction for subject mechanical components of the Auxiliary Building HVAC Systems are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Glass
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Auxiliary Building HVAC Systems are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor

- Air with borated water leakage
- Air with steam or water leakage
- Condensation
- Gas
- Lubricating oil
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Auxiliary Building HVAC Systems:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Auxiliary Building HVAC Systems:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Collection, Drainage, and Treatment Components Inspection Program
- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- One-Time Inspection
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection

3.3.2.1.2 Auxiliary Building Chilled Water System

Materials

The materials of construction for subject mechanical components of the Auxiliary Building Chilled Water System are:

- Copper alloy
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Auxiliary Building Chilled Water System are exposed to the following normal operating environments:

- Air with borated water leakage
- Air-indoor uncontrolled
- Closed cycle cooling water
- Condensation
- Moist air

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Auxiliary Building Chilled Water System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Auxiliary Building Chilled Water System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program

- One-Time Inspection
- Selective Leaching Inspection

3.3.2.1.3 Auxiliary Steam and Station Heating System

Materials

The materials of construction for subject mechanical components of the Auxiliary Steam and Station Heating System are:

- Copper alloy
- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Auxiliary Steam and Station Heating System are exposed to the following normal operating environments:

- Air
- Air with borated water leakage
- Air with steam or water leakage
- Air-indoor uncontrolled
- Closed cycle cooling water > 60ºC (> 140ºF)
- Condensation
- Moist air
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Auxiliary Steam and Station Heating System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Auxiliary Steam and Station Heating System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program
- One-Time Inspection
- PWR Water Chemistry Program
- Selective Leaching Inspection

3.3.2.1.4 Boron Recovery System

Materials

The material of construction for subject mechanical components of the Boron Recovery System is:

- Stainless steel

Environments

Subject mechanical components of the Boron Recovery System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Closed cycle cooling water
- Gas
- Moist air
- Treated borated water
- Treated borated water > 60ºC (> 140ºF)
- Treated water
- Treated water > 60ºC (> 140ºF)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Boron Recovery System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Boron Recovery System:

- Bolting Integrity Program
- Closed Cooling Water Chemistry Program
- One-Time Inspection
- PWR Water Chemistry Program

3.3.2.1.5 Chemical Addition System

The material of construction for subject mechanical components of the Chemical Addition System is:

- Stainless steel

Environments

Subject mechanical components of the Chemical Addition System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Moist air
- Treated borated water
- Treated borated water > 60ºC (> 140ºF)
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Chemical Addition System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Chemical Addition System:

- Bolting Integrity Program
- One-Time Inspection
- PWR Water Chemistry Program

3.3.2.1.6 Circulating Water System

Materials

The materials of construction for subject mechanical components of the Circulating Water System are:

- Elastomer
- Steel

Environments

Subject mechanical components of the Circulating Water System are exposed to the following normal operating environments:

- Air with steam or water leakage
- Air-indoor uncontrolled
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Circulating Water System:

- Cracking
- Hardening and loss of strength

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Circulating Water System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- One-Time Inspection
- Open-Cycle Cooling Water Program

3.3.2.1.7 Component Cooling Water System

Materials

The materials of construction for the subject mechanical components of the Component Cooling Water System are:

- Copper alloy
- Stainless steel
- Steel

Environments

The subject mechanical components of the Component Cooling Water System are exposed to the following normal plant operating environments:

- Air-Indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Closed cycle cooling water
- Closed cycle cooling water > 60ºC (> 140ºF)
- Gas
- Moist air
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Component Cooling Water System:

- Cracking
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Component Cooling Water System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- One-Time Inspection
- Open-Cycle Cooling Water Program

3.3.2.1.8 Containment Hydrogen Control System

Materials

The materials of construction for subject mechanical components of the Containment Hydrogen Control System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Containment Hydrogen Control System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Closed cycle cooling water

- Condensation
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Hydrogen Control System:

- Cracking
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Containment Hydrogen Control System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- One-Time Inspection
- Open-Cycle Cooling Water Program

3.3.2.1.9 Containment Purge System

Materials

The materials of construction for subject mechanical components of the Containment Purge System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Containment Purge System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Purge System:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Containment Purge System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program

3.3.2.1.10 Containment Vacuum Relief System

Materials

The material of construction for subject mechanical components of the Containment Vacuum Relief System is:

- Steel

Environments

Subject mechanical components of the Containment Vacuum Relief System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Containment Vacuum Relief System:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Containment Vacuum Relief System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program

3.3.2.1.11 Demineralized Water Storage System

Materials

The materials of construction for the subject mechanical components of the Demineralized Water Storage System are:

- Stainless steel
- Steel

Environments

The subject mechanical components of the Demineralized Water Storage System are exposed to the following normal plant operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Moist air
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Demineralized Water Storage System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Demineralized Water Storage System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program

- One-Time Inspection
- PWR Water Chemistry Program

3.3.2.1.12 Emergency Diesel Generators System

Materials

The materials of construction for subject mechanical components of the Emergency Diesel Generators System are:

- Aluminum
- Copper alloy > 15% Zn
- Elastomer
- Stainless steel
- Steel

Environments

Subject mechanical components of the Emergency Diesel Generators System are exposed to the following normal operating environments:

- Air
- Air-indoor uncontrolled
- Air-outdoor
- Air with steam or water leakage
- Closed cycle cooling water
- Condensation
- Diesel exhaust
- Fuel oil
- Lubricating oil
- Moist air
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Emergency Diesel Generators System:

- Cracking

- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Emergency Diesel Generators System:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Fuel Oil Chemistry Program
- Lubricating Oil Analysis Program
- One-Time Inspection
- Selective Leaching Inspection

3.3.2.1.13 Emergency Ventilation System

Materials

The materials of construction for subject mechanical components of the Emergency Ventilation System are:

- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Glass
- Steel

Environments

Subject mechanical components of the Emergency Ventilation System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Emergency Ventilation System:

- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Emergency Ventilation System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program

3.3.2.1.14 Fire Protection System

Materials

The materials of construction for subject mechanical components of the Fire Protection System are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Fire Protection System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Air with borated water leakage

- Air with steam or water leakage
- Concrete
- Diesel exhaust
- Fuel oil
- Lubricating oil
- Moist air
- Raw water
- Soil
- Steam

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Fire Protection System:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Fire Protection System:

- Aboveground Steel Tanks Inspection Program
- Bolting Integrity Program
- Boric Acid Corrosion Program
- Buried Piping and Tanks Inspection Program
- Collection, Drainage, and Treatment Components Inspection Program
- External Surfaces Monitoring Program
- Fire Water Program
- Fuel Oil Chemistry Program
- Lubricating Oil Analysis Program

- One-Time Inspection
- PWR Water Chemistry Program
- Selective Leaching Inspection

3.3.2.1.15 Fuel Oil System

Materials

The materials of construction for subject mechanical components of the Fuel Oil System are:

- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Fuel Oil System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Fuel oil
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Fuel Oil System:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Fuel Oil System:

- Aboveground Steel Tanks Inspection
- Bolting Integrity Program
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring Program
- Fuel Oil Chemistry Program
- One-Time Inspection

3.3.2.1.16 Gaseous Radwaste System

Materials

The materials of construction for subject mechanical components of the Gaseous Radwaste System are:

- Gray cast iron
- Stainless steel

Environments

Subject mechanical components of the Gaseous Radwaste System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Closed cycle cooling water
- Condensation
- Gas

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Gaseous Radwaste System:

- Cracking
- Loss of material

- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Gaseous Radwaste System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- Collection, Drainage, and Treatment Components Inspection Program
- External Surfaces Monitoring Program
- One-Time Inspection
- Selective Leaching Inspection

3.3.2.1.17 Instrument Air System

Materials

The materials of construction for subject mechanical components of the Instrument Air System are:

- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Instrument Air System are exposed to the following normal operating environments:

- Air
- Air-indoor uncontrolled
- Air with borated water leakage
- Condensation
- Dried air

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Instrument Air System:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Instrument Air System

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- One Time Inspection
- Selective Leaching Inspection

3.3.2.1.18 Makeup and Purification System

Materials

The materials of construction for subject mechanical components of the Makeup and Purification System are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Makeup and Purification System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage

- Closed cycle cooling water
- Dried air
- Gas
- Lubricating oil
- Raw water
- Treated borated water
- Treated borated water > 60ºC (> 140ºF)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Makeup and Purification System:

- Cracking
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Makeup and Purification System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- Collection, Drainage, and Treatment Components Inspection Program
- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- One-Time Inspection
- PWR Water Chemistry Program

3.3.2.1.19 Makeup Water Treatment System

Materials

The materials of construction for subject mechanical components of the Makeup Water Treatment System are:

- Copper alloy
- Copper alloy > 15% Zn
- Steel

Environments

Subject mechanical components of the Makeup Water Treatment System are exposed to the following normal operating environments:

- Air with borated water leakage
- Air with steam or water leakage
- Air-indoor uncontrolled
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Makeup Water Treatment System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Makeup Water Treatment System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Collection, Drainage, and Treatment Components Inspection Program
- External Surfaces Monitoring Program
- Selective Leaching Inspection

3.3.2.1.20 Miscellaneous Building HVAC System

Materials

The material of construction for subject mechanical components of the Miscellaneous Building HVAC System is:

- Steel

Environments

Subject mechanical components of the Miscellaneous Building HVAC System are exposed to the following normal operating environment:

- Air-indoor uncontrolled

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Miscellaneous Building HVAC System:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Miscellaneous Building HVAC System:

- Bolting Integrity Program
- External Surfaces Monitoring Program

3.3.2.1.21 Miscellaneous Liquid Radwaste System

Materials

The materials of construction for subject mechanical components of the Miscellaneous Liquid Radwaste System are:

- Copper Alloy > 15% Zn
- Elastomer
- Gray cast iron
- Stainless steel

Environments

Subject mechanical components of the Miscellaneous Liquid Radwaste System are exposed to the following normal operating environments:

- Air with borated water leakage
- Air with steam or water leakage
- Air-indoor uncontrolled
- Gas

- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Miscellaneous Liquid Radwaste System:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Miscellaneous Liquid Radwaste System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Collection, Drainage, and Treatment Components Inspection Program
- External Surfaces Monitoring Program
- One-Time Inspection
- Selective Leaching Inspection

3.3.2.1.22 Nitrogen Gas System

Materials

The materials of construction for subject mechanical components of the Nitrogen Gas System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Nitrogen Gas System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Gas

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Nitrogen Gas System:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Nitrogen Gas System

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program

3.3.2.1.23 Process and Area Radiation Monitoring System

Materials

The materials of construction for subject mechanical components of the Process and Area Radiation Monitoring System are:

- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Process and Area Radiation Monitoring System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Condensation

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Process and Area Radiation Monitoring System:

- Cracking

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Process and Area Radiation Monitoring System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- One-Time Inspection

3.3.2.1.24 Reactor Coolant Vent and Drain System

Materials

The materials of construction for subject mechanical components of the Reactor Coolant Vent and Drain System are:

- Cast austenitic stainless steel
- Stainless steel
- Steel

Environments

Subject mechanical components of the Reactor Coolant Vent and Drain System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Closed cycle cooling water
- Gas
- Raw water
- Treated borated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Reactor Coolant Vent and Drain System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Reactor Coolant Vent and Drain System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- Collection, Drainage, and Treatment Components Inspection Program
- External Surfaces Monitoring Program
- One-Time Inspection
- PWR Water Chemistry Program

3.3.2.1.25 Sampling System

Materials

The materials of construction for the subject mechanical components of the Sampling System are:

- Stainless steel
- Steel

Environments

The subject mechanical components of the Sampling System are exposed to the following normal plant operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Closed cycle cooling water
- Closed cycle cooling water > 60ºC (> 140ºF)
- Gas
- Treated borated water

- Treated borated water > 60ºC (> 140ºF)
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Sampling System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Sampling System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- One-Time Inspection
- PWR Water Chemistry Program

3.3.2.1.26 Service Water System

Materials

The materials of construction for subject mechanical components of the Service Water System are:

- Copper alloy
- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Service Water System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air-outdoor
- Air with borated water leakage
- Air with steam or water leakage
- Concrete
- Condensation
- Dried air
- Gas
- Moist air
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Service Water System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Service Water System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Buried Piping and Tanks Inspection Program
- External Surfaces Monitoring Program
- One-Time Inspection
- Open-Cycle Cooling Water Program
- Selective Leaching Inspection

3.3.2.1.27 Spent Fuel Pool Cooling and Cleanup System

Materials

The materials of construction for subject mechanical components of the Spent Fuel Pool Cooling and Cleanup System are:

- Stainless steel
- Steel

Environments

Subject mechanical components of the Spent Fuel Pool Cooling and Cleanup System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Closed cycle cooling water
- Moist air
- Raw water
- Treated borated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Spent Fuel Pool Cooling and Cleanup System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Spent Fuel Pool Cooling and Cleanup System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- Collection, Drainage, and Treatment Components Inspection Program

- External Surfaces Monitoring Program
- One-Time Inspection
- PWR Water Chemistry Program

3.3.2.1.28 Spent Resin Transfer System

Materials

The materials of construction for subject mechanical components of the Spent Resin Transfer System are:

- Elastomer
- Stainless steel

Environments

Subject mechanical components of the Spent Resin Transfer System are exposed to the following normal operating environments:

- Air with borated water leakage
- Air with steam or water leakage
- Air-indoor uncontrolled
- Treated water > 60ºC (> 140ºF)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Spent Resin Transfer System:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Spent Resin Transfer System:

- Bolting Integrity Program
- External Surfaces Monitoring Program
- One-Time Inspection

- PWR Water Chemistry Program

3.3.2.1.29 Station Air System

Materials

The materials of construction for subject mechanical components of the Station Air System are:

- Copper Alloy > 15% Zn
- Steel

Environments

Subject mechanical components of the Station Air System are exposed to the following normal operating environments:

- Air
- Air-indoor uncontrolled
- Air with borated water leakage
- Condensation

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Station Air System

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Station Air System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- One-Time Inspection
- Selective Leaching Inspection

3.3.2.1.30 Station Blackout Diesel Generator System

Materials

The materials of construction for subject mechanical components of the Station Blackout Diesel Generator System are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Stainless steel
- Steel

Environments

Subject mechanical components of the Station Blackout Diesel Generator System are exposed to the following normal operating environments:

- Air
- Air-indoor uncontrolled
- Air-outdoor
- Air with steam or water leakage
- Closed cycle cooling water
- Condensation
- Diesel exhaust
- Fuel oil
- Lubricating oil
- Moist air

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Station Blackout Diesel Generator System:

- Cracking
- Hardening and loss of strength
- Loss of material

- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Station Blackout Diesel Generator System:

- Bolting Integrity Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- Fuel Oil Chemistry Program
- Lubricating Oil Analysis Program
- One-Time Inspection
- Selective Leaching Inspection

3.3.2.1.31 Station Plumbing, Drains, and Sumps System

Materials

The materials of construction for the subject mechanical components of the Station Plumbing, Drains, and Sumps System are:

- Gray cast iron
- Stainless steel
- Steel

Environments

The subject mechanical components of the Station Plumbing, Drains, and Sumps System are exposed to the following normal plant operating environments:

- Air-Indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Concrete
- Condensation
- Moist air
- Raw water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Station Plumbing, Drains, and Sumps System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Station Plumbing, Drains, and Sumps System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Collection, Drainage, and Treatment Components Inspection Program
- External Surfaces Monitoring Program
- One-Time Inspection
- Selective Leaching Inspection

3.3.2.1.32 Turbine Plant Cooling Water System

Materials

The materials of construction for subject mechanical components of the Turbine Plant Cooling Water System are:

- Gray cast iron
- Steel

Environments

Subject mechanical components of the Turbine Plant Cooling Water System are exposed to the following normal operating environments:

- Air with steam or water leakage
- Air-indoor uncontrolled
- Closed cycle cooling water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Turbine Plant Cooling Water System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Turbine Plant Cooling Water System:

- Bolting Integrity Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- One-Time Inspection

3.3.2.2 Aging Management Review Results for Which Further Evaluation is Recommended by NUREG-1801

For the Auxiliary Systems, those items requiring further evaluation are addressed in the following sections.

3.3.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis as defined in 10 CFR 54.3. Time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluations of the fatigue time-limited aging analyses are addressed in Section 4.

3.3.2.2.2 Reduction of Heat Transfer due to Fouling

Reduction of heat transfer due to fouling could occur for stainless steel heat exchanger tubes exposed to treated water. At Davis-Besse, the Auxiliary Systems do not contain stainless steel heat exchanger tubes that are exposed to treated water and subject to aging management review; therefore, this item is not applicable to Davis-Besse.

3.3.2.2.3 Cracking due to Stress Corrosion Cracking

3.3.2.2.3.1 Stainless Steel Piping, Piping Components, and Piping Elements – Sodium Pentaborate Solution Greater Than 60°C (> 140°F)

Cracking of boiling water reactor (BWR) standby liquid control system piping, piping components, and piping elements is applicable to BWR plants only.

3.3.2.2.3.2 Stainless Steel and Stainless Steel Clad Heat Exchanger Components – Treated Water Greater Than 60°C (> 140°F)

Cracking due to stress corrosion cracking could occur in stainless steel and stainless steel clad heat exchanger components exposed to treated water greater than 60°C (> 140°F). At Davis-Besse, the Auxiliary Systems do not contain stainless steel or stainless steel clad heat exchanger components that are exposed to treated water greater than 60°C (> 140°F) and subject to aging management review; therefore, this item is not applicable to Davis-Besse.

3.3.2.2.3.3 Stainless Steel Piping, Piping Components, and Piping Elements – Diesel Exhaust

Cracking due to stress corrosion cracking could occur in stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust. At Davis-Besse, the flexible connections and tubing of the diesel exhaust systems are stainless steel, while the diesel exhaust piping, and other piping components and piping elements are steel. Cracking due to stress corrosion cracking for stainless steel diesel engine exhaust piping components, though it is not expected to occur, will be detected and characterized by the One-Time Inspection.

3.3.2.2.4 Cracking due to Stress Corrosion Cracking and Cyclic Loading

3.3.2.2.4.1 Stainless Steel PWR Nonregenerative Heat Exchanger Components – Treated Borated Water Greater Than 60°C (> 140°F)

Cracking due to stress corrosion cracking and cyclic loading could occur in stainless steel pressurized water reactor (PWR) nonregenerative heat exchanger components exposed to treated borated water greater than 60°C (> 140°F) in the chemical and volume control system. At Davis-Besse, the seal return coolers in the Makeup and Purification System consist of stainless steel heat exchanger components exposed to treated borated water greater than 60°C (> 140°F). Cracking due to stress corrosion cracking (SCC) in stainless steel heat exchanger components that are exposed to treated borated water greater than 60°C (>140°F) is managed by the PWR Water Chemistry Program. The PWR Water Chemistry Program manages cracking through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage cracking. The One-Time Inspection is selected in lieu of eddy current testing of tubes. Temperature and radioactivity monitoring of shell side water is performed by installed instrumentation. Cracking due to cyclic loading is not identified as an aging effect requiring management for the stainless steel heat exchanger components that are exposed to treated borated water greater than 60°C (>140°F).

3.3.2.2.4.2 Stainless Steel PWR Regenerative Heat Exchanger Components – Treated Borated Water Greater Than 60°C (> 140°F)

Cracking due to stress corrosion cracking and cyclic loading could occur in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 60°C (> 140°F). At Davis-Besse, the Auxiliary Systems do not contain stainless steel regenerative heat exchanger components that are exposed to treated borated water greater than 60°C (>140°F) and subject to aging management review; therefore, this item is not applicable to Davis-Besse.

3.3.2.2.4.3 Stainless Steel PWR High Pressure Pump Casings – Treated Borated Water Greater Than 60°C (> 140°F)

Cracking due to stress corrosion cracking and cyclic loading could occur for the stainless steel pump casing for the PWR high-pressure pumps in the chemical and volume control system. At Davis-Besse, cracking due to stress corrosion cracking and cyclic loading is not identified as an aging effect requiring management for the stainless steel pump casing for the high-pressure pumps in the Makeup and Purification (chemical and volume control) System; therefore, this item is not applicable to Davis-Besse.

3.3.2.2.4.4 High-Strength Steel Closure Bolting

Cracking due to stress corrosion cracking could occur for high-strength steel bolting exposed to steam or water leakage. At Davis-Besse, cracking due to stress corrosion cracking in high-strength steel bolting that is exposed to air with steam or water leakage is managed by the Bolting Integrity Program.

3.3.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

3.3.2.2.5.1 Elastomer Seals and Components – Air-Indoor Uncontrolled

Hardening and loss of strength due to elastomer degradation could occur in elastomer seals and components of heating and ventilation systems exposed to air-indoor uncontrolled (internal or external). At Davis-Besse, hardening and loss of strength due to elastomer degradation in elastomer seals and components in the Auxiliary Systems that are exposed to air-indoor uncontrolled (internal and external) are managed by the External Surfaces Monitoring Program.

3.3.2.2.5.2 Elastomer Linings – Treated Water or Treated Borated Water

Hardening and loss of strength due to elastomer degradation could occur in elastomer linings of the filters, valves, and ion exchangers in spent fuel pool cooling and cleanup systems (BWR and PWR) exposed to treated water or to treated borated water. At Davis-Besse, there are no elastomer linings in the Spent Fuel Pool Cooling and Cleanup System that are exposed to treated water or to treated borated water and are subject to aging management review. However, the Spent Resin Transfer System contains elastomer components (not linings) exposed to the treated water greater than 60°C (> 140°F) environment that are susceptible to hardening and loss of strength. Hardening and loss of strength for these elastomer components will be detected and characterized by the One-Time Inspection.

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion

Reduction of neutron-absorbing capacity and loss of material due to general corrosion could occur in the neutron-absorbing sheets of BWR and PWR spent fuel storage racks exposed to treated water or to treated borated water. At Davis-Besse, loss of material due to general corrosion in the neutron-absorbing sheets of spent fuel storage racks that are exposed to treated borated water will be managed by the Boral® Monitoring Program and the PWR Water Chemistry Program. Reduction of neutron-absorbing capacity is not identified as an aging effect requiring management; however, FirstEnergy Nuclear Operating Company commits to a plant-specific aging management program for Davis-Besse, the Boral® Monitoring Program, to address this issue (see Section 2.1.3).

3.3.2.2.7 Loss of Material due to General, Pitting, and Crevice Corrosion

3.3.2.2.7.1 Steel Piping, Piping Components, Piping Elements, and Tanks – Lubricating Oil

Loss of material due to general, pitting, and crevice corrosion could occur in steel piping, piping components, and piping elements; including the tubing, valves, and tanks in the reactor coolant pump oil collection system, exposed to lubricating oil (as part of the fire protection system). At Davis-Besse, loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, piping elements, and tanks that are exposed to lubricating oil, including components in the reactor coolant pump oil collection system, is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material.

3.3.2.2.7.2 Steel Piping, Piping Components, and Piping Elements – Treated Water

Loss of material due to general, pitting, and crevice corrosion could occur in steel piping, piping components, and piping elements in the BWR reactor water cleanup and shutdown cooling systems exposed to treated water. This item, applicable to BWR plants, is also appropriate for some treated (unborated) water systems in PWRs with the same material, environment, and aging effects. At Davis-Besse, loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements that are exposed to treated water is managed by the PWR Water Chemistry Program. The PWR Water Chemistry Program manages loss of material through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material.

3.3.2.2.7.3 Steel and Stainless Steel Piping, Piping Components, and Piping Elements – Diesel Exhaust

Loss of material due to general (steel only), pitting, and crevice corrosion could occur for steel and stainless steel diesel exhaust piping, piping components, and piping elements exposed to diesel exhaust. At Davis-Besse, loss of material due to general (steel only), pitting, and crevice corrosion for steel and stainless steel diesel exhaust piping, piping components, and piping elements that are exposed to diesel exhaust will be detected and characterized by the One-Time Inspection.

3.3.2.2.8 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

Loss of material due to general, pitting, crevice corrosion, and microbiologically-influenced corrosion could occur for steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. At Davis-Besse, loss of material due to general, pitting, and crevice corrosion, and microbiologically-influenced corrosion for steel (including gray cast iron) piping, piping components, and piping elements, and steel emergency diesel generator fuel oil storage tanks buried in soil is managed by the Buried Piping and Tanks Inspection Program.

3.3.2.2.9 Loss of Material due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion, and Fouling

3.3.2.2.9.1 Steel Piping, Piping Components, Piping Elements, and Tanks – Fuel Oil

Loss of material due to general, pitting, crevice, microbiologically-influenced corrosion, and fouling could occur for steel piping, piping components, piping elements, and tanks exposed to fuel oil. Loss of material due to general, pitting, and crevice corrosion and microbiologically-influenced corrosion for Davis-Besse steel piping, piping components, piping elements, and tanks that are exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The Fuel Oil Chemistry Program manages loss of material through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the Fuel Oil Chemistry Program to manage loss of material.

3.3.2.2.9.2 Steel Heat Exchanger Components – Lubricating Oil

Loss of material due to general, pitting, crevice, microbiologically-influenced corrosion, and fouling could occur for steel heat exchanger components exposed to lubricating oil. At Davis-Besse, loss of material due to general, pitting, and crevice corrosion for steel heat exchanger components that are exposed to lubricating oil is managed by the

Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material.

3.3.2.2.10 Loss of Material due to Pitting and Crevice Corrosion

3.3.2.2.10.1 Steel Piping with Elastomer Lining or Stainless Steel Cladding – Treated Water or Treated Borated Water

Loss of material due to pitting and crevice corrosion could occur in BWR and PWR steel piping with elastomer lining or stainless steel cladding that is exposed to treated water and treated borated water if the cladding or lining is degraded. At Davis-Besse, elastomer linings are not credited for protection of metallic components. The base metals are evaluated for aging as if exposed to the fluid environment. Elastomer linings, if present, do not perform an intended function. Therefore, no elastomer linings are identified as requiring aging management review. The Auxiliary Systems do not contain steel piping with stainless steel cladding that is exposed to treated water or treated borated water and subject to aging management review.

3.3.2.2.10.2 Stainless Steel and Aluminum Piping, Piping Components, Piping Elements, and Stainless Steel and Steel with Stainless Steel Cladding Heat Exchanger Components – Treated Water

Loss of material due to pitting and crevice corrosion could occur for stainless steel and aluminum piping, piping components, and piping elements, and for stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water. Loss of material due to pitting and crevice corrosion for Davis-Besse stainless steel piping, piping components, and piping elements that are exposed to treated water is managed by the PWR Water Chemistry Program. The PWR Water Chemistry Program manages loss of material through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. This item is also applied to stainless steel tanks that are exposed to treated water.

The Davis-Besse Auxiliary Systems do not contain stainless steel or steel with stainless steel cladding heat exchanger components; or aluminum piping, piping components or piping elements that are exposed to treated water and subject to aging management review.

3.3.2.2.10.3 Copper Alloy Piping, Piping Components, and Piping Elements – Condensation

Loss of material due to pitting and crevice corrosion could occur for copper alloy heating, ventilation, and air conditioning piping; piping components and piping elements exposed to condensation (external). At Davis-Besse, loss of material due to pitting and crevice corrosion for copper alloy piping, piping components, and piping elements that are exposed to condensation (external) is managed by the External Surfaces Monitoring Program. Loss of material for copper alloy bolting that is exposed to a condensation (external) environment is managed by the Bolting Integrity Program. For copper alloy heat exchanger components that are exposed to a condensation (external) environment, the One-Time Inspection will detect and characterize loss of material.

3.3.2.2.10.4 Copper Alloy Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components, and piping elements exposed to lubricating oil. Loss of material due to pitting and crevice corrosion for Davis-Besse copper alloy piping, piping components, and piping elements with a zinc content greater than 15% that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. Loss of material for copper alloy heat exchanger components with a zinc content greater than 15% that are exposed to lubricating oil is also managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material.

3.3.2.2.10.5 Aluminum Piping, Piping Components, and Piping Elements and Stainless Steel Ducting and Components – Condensation

Loss of material due to pitting and crevice corrosion could occur for heating, ventilation, and air conditioning aluminum piping; piping components and piping elements, and stainless steel ducting and components exposed to condensation. Loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements that are exposed to external condensation at Davis-Besse is managed by the External Surfaces Monitoring Program. The One-Time Inspection will detect and characterize loss of material due to pitting and crevice corrosion for stainless steel heat exchanger components that are exposed to external condensation; and for stainless steel piping, piping components, piping elements, and tanks (including demisters, drain pans, and moisture separators) that are exposed to internal condensation. The Bolting Integrity Program will manage loss of material due to pitting and crevice corrosion for stainless steel bolting that is exposed to external condensation.

3.3.2.2.10.6 Copper Alloy Piping, Piping Components, and Piping Elements – Internal Condensation

Loss of material due to pitting and crevice corrosion could occur for copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. The Davis-Besse Fire Protection System contains no piping, piping components, or piping elements exposed to internal condensation. However, loss of material due to pitting and crevice corrosion for other copper alloy piping, piping components, and piping elements exposed to internal condensation, although not expected to occur, will be detected and characterized by the One-Time Inspection.

3.3.2.2.10.7 Stainless Steel Piping, Piping Components, and Piping Elements – Soil

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil. The Davis-Besse Auxiliary Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to soil and subject to aging management review.

3.3.2.2.10.8 Stainless Steel Piping, Piping Components, and Piping Elements – Sodium Pentaborate Solution

Loss of material for BWR standby liquid control system piping, piping components, and piping elements is applicable to BWR plants only.

3.3.2.2.11 Loss of Material due to Pitting, Crevice, and Galvanic Corrosion

Loss of material due to pitting, crevice, and galvanic corrosion could occur for copper alloy piping, piping components, and piping elements exposed to treated water. At Davis-Besse there are no copper alloy piping, piping components, or piping elements in the Auxiliary Systems that are exposed to treated water.

3.3.2.2.12 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

3.3.2.2.12.1 Stainless Steel, Aluminum, and Copper Alloy Piping, Piping Components, and Piping Elements – Fuel Oil

Loss of material due to pitting, crevice, and microbiologically-influenced corrosion could occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to fuel oil. Loss of material due to pitting and crevice corrosion and microbiologically-influenced corrosion for Davis-Besse stainless steel and copper alloy piping, piping components, and piping elements that are exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The Fuel Oil Chemistry Program manages loss of material through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the Fuel Oil Chemistry Program to manage loss of material. The Davis-Besse Auxiliary Systems do not contain aluminum piping, piping components, or piping elements that are exposed to fuel oil and subject to aging management review.

3.3.2.2.12.2 Stainless Steel Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to pitting, crevice, and microbiologically-influenced corrosion could occur in stainless steel piping, piping components, and piping elements exposed to lubricating oil. At Davis-Besse loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements, and heat exchanger components that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material.

3.3.2.2.13 Loss of Material due to Wear

Loss of material due to wear could occur in elastomer seals and components exposed to air indoor uncontrolled (internal or external). Wear of elastomer seals and components exposed to air is not identified as an aging effect requiring management at Davis-Besse. Loss of material due to wear is the result of relative motion between two surfaces in contact. However, wear occurs during the performance of an active function; as a result of improper design, application, or operation; or to a very small degree with insignificant consequences. Therefore, loss of material due to wear is not an aging effect requiring management for elastomers exposed to air-indoor uncontrolled.

3.3.2.2.14 Loss of Material due to Cladding Breach

Loss of material due to cladding breach could occur for PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. The Davis-Besse Auxiliary Systems do not contain stainless steel clad pump casings that are exposed to treated borated water and subject to aging management review.

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B, Section B.1.3, for a discussion of FirstEnergy Nuclear Operating Company quality assurance procedures and administrative controls for aging management programs.

3.3.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the components of the Auxiliary Systems. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Metal Fatigue (Section 4.3, Metal Fatigue)

3.3.3 CONCLUSIONS

The Auxiliary System components and commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. Descriptions of the aging management programs are provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Auxiliary System components and commodities will be maintained consistent with the current licensing basis, and that spatial interactions will not result in the loss of any safety-related intended functions, during the period of extended operation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-01	Steel cranes - structural girders exposed to air – indoor uncontrolled (external)	Cumulative fatigue damage	TLAA to be evaluated for structural girders of cranes. See the Standard Review Plan, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue is a time-limited aging analysis (TLAA). Further evaluation is documented in Section 3.3.2.2.1.
3.3.1-02	Steel and stainless steel piping, piping components, piping elements, and heat exchanger components exposed to air – indoor uncontrolled, treated borated water or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. Further evaluation is documented in Section 3.3.2.2.1.
3.3.1-03	Stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. The Auxiliary Systems do not contain stainless steel heat exchanger tubes that are exposed to treated water and subject to aging management review. Further evaluation is documented in Section 3.3.2.2.2.
3.3.1-04	BWR only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-05	Stainless steel and stainless clad steel heat exchanger components exposed to treated water >60 °C (>140 °F)	Cracking due to stress corrosion cracking	A plant specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. The Auxiliary Systems do not contain stainless steel or stainless clad steel heat exchanger components that are exposed to treated water greater than 60°C (> 140°F) and subject to aging management review. Further evaluation is documented in Section 3.3.2.2.3.2.
3.3.1-06	Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Cracking due to stress corrosion cracking	A plant specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Cracking in stainless steel diesel engine exhaust piping, piping components, and piping elements that are exposed to diesel exhaust, though it is not expected to occur, will be detected and chanracterized by the One-Time Inspection. Further evaluation is documented in Section 3.3.2.2.3.3.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-07	Stainless steel non-regenerative heat exchanger components exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes, plant specific	Consistent with NUREG-1801. Cracking due to SCC for stainless steel heat exchanger components in the Auxiliary Systems that are exposed to treated borated water > 60°C (> 140°F) is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage cracking. Temperature and radioactivity monitoring of shell side water is performed by installed instrumentation. Cracking due to cyclic loading is not identified as an aging effect requiring management for the stainless steel heat exchanger components that are exposed to treated borated water > 60°C (> 140°F). Further evaluation is documented in Section 3.3.2.2.4.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-08	Stainless steel regenerative heat exchanger components exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. The Auxiliary Systems do not contain stainless steel regenerative heat exchanger components that are exposed to treated borated water > 60°C (> 140°F) and subject to aging management review. Further evaluation is documented in Section 3.3.2.2.4.2.
3.3.1-09	Stainless steel high-pressure pump casing in PWR chemical and volume control system	Cracking due to stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. Cracking due to SCC and cyclic loading is not identified as an aging effect requiring management for the stainless steel high-pressure pump casings in the Makeup and Purification (chemical and volume control) System. Further evaluation is documented in Section 3.3.2.2.4.3.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-10	High-strength steel closure bolting exposed to air with steam or water leakage.	Cracking due to stress corrosion cracking, cyclic loading	Bolting Integrity The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes, if the bolts are not replaced during maintenance	Not applicable. Cracking due to SCC in high-strength steel bolting that is exposed to air with steam or water leakage is managed by the Bolting Integrity Program. Refer to Item Number 3.3.1-41. Further evaluation is documented in Section 3.3.2.2.4.4.
3.3.1-11	Elastomer seals and components exposed to air – indoor uncontrolled (internal/external)	Hardening and loss of strength due to elastomer degradation	A plant specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Hardening and loss of strength in elastomer seals and components in the Auxiliary Systems that are exposed to air-indoor uncontrolled (internal and external) are managed by the External Surfaces Monitoring Program. Further evaluation is documented in Section 3.3.2.2.5.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-12	Elastomer lining exposed to treated water or treated borated water	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. There are no elastomer linings in the Spent Fuel Pool Cooling and Cleanup System that are exposed to treated water or to treated borated water and subject to aging management review. However, this item is applied to elastomer components (not linings) in the Spent Resin Transfer System that are exposed to the treated water > 60°C (> 140°F) environment that are susceptible to hardening and loss of strength. Hardening and loss of strength in these elastomer components will be detected and characterized by the One-Time Inspection. Further evaluation is documented in Section 3.3.2.2.5.2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-13	Boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water	Reduction of neutron-absorbing capacity and loss of material due to general corrosion	A plant specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Loss of material in the spent fuel rack neutron absorbers will be managed by the Boral® Monitoring Program and the PWR Water Chemistry Program. However, reduction of neutron-absorbing capacity is not identified as an aging effect requiring management. Further evaluation is documented in Section 3.3.2.2.6.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-14	Steel piping, piping component, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel piping, piping component, and piping elements that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. This item is also applied to steel tanks, and bearing and gear housings, in the Auxiliary Systems that are exposed to lubricating oil. Further evaluation is documented in Section 3.3.2.2.7.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-15	Steel reactor coolant pump oil collection system piping, tubing, and valve bodies exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel reactor coolant pump oil collection system piping and valve bodies that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. Further evaluation is documented in Section 3.3.2.2.7.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-16	Steel reactor coolant pump oil collection system tank exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection to evaluate the thickness of the lower portion of the tank	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel reactor coolant pump oil collection system tanks that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. Further evaluation is documented in Section 3.3.2.2.7.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-17	Steel piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. This item, applicable to BWR plants, is also appropriate for some treated (unborated) water systems in PWRs with the same material, environment, and aging effects. At Davis-Besse, loss of material in steel piping, piping components, and piping elements that are exposed to treated water is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. Further evaluation is documented in Section 3.3.2.2.7.2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-18	Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Loss of material/ general (steel only), pitting and crevice corrosion	A plant specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Loss of material in stainless steel and steel diesel engine exhaust piping, piping components, and piping elements that are exposed to diesel exhaust will be detected and characterized by the One-Time Inspection. Further evaluation is documented in Section 3.3.2.2.7.3.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-19	Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Surveillance Or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Not applicable. The Buried Piping and Tanks Surveillance is not credited to provide aging management. Consistent with NUREG-1801. Loss of material in steel (including gray cast iron) piping, piping components, and piping elements that are exposed to soil is managed by the Buried Piping and Tanks Inspection Program. This item is also applied to steel tanks that are exposed to soil. Further evaluation is documented in Section 3.3.2.2.8.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-20	Steel piping, piping components, piping elements, and tanks exposed to fuel oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801, with exceptions. Loss of material in steel piping, piping components, piping elements, and tanks that are exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the Fuel Oil Chemistry Program to manage loss of material. Further evaluation is documented in Section 3.3.2.2.9.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-21	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel heat exchanger components in the Auxiliary Systems that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. Further evaluation is documented in Section 3.3.2.2.9.2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-22	Steel with elastomer lining or stainless steel cladding piping, piping components, and piping elements exposed to treated water and treated borated water	Loss of material due to pitting and crevice corrosion (only for steel after lining/cladding degradation)	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. At Davis-Besse, elastomer linings are not credited for protection of metallic components and do not perform an intended function. The Auxiliary Systems do not contain steel piping, piping components, or piping elements with stainless steel cladding that are exposed to treated water or treated borated water and subject to aging management review. Further evaluation is documented in Section 3.3.2.2.10.1.
3.3.1-23	BWR only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-24	Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel piping, piping components, and piping elements that are exposed to treated water (including treated water > 60°C (> 140°F)) is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. This item is also applied to stainless steel tanks that are exposed to treated water (including treated water > 60°C (> 140°F)). The Auxiliary Systems do not contain aluminum piping, piping components, or piping elements that are exposed to treated water and subject to aging management review. Further evaluation is documented in Section 3.3.2.2.10.2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-25	Copper alloy HVAC piping, piping components, piping elements exposed to condensation (external)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Except as noted below, loss of material in copper alloy piping, piping components, and piping elements that are exposed to condensation (external) is managed by the External Surfaces Monitoring Program. For copper alloy bolting that is exposed to condensation (external), the Bolting Integrity Program manages loss of material. For copper alloy heat exchanger components that are exposed to condensation (external), the One-Time Inspection will detect and characterize loss of material. Further evaluation is documented in Section 3.3.2.2.10.3.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-26	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in copper alloy piping, piping components, and piping elements exposed to lubricating oil is managed by the Lubricating Oil Analysis Program if the zinc content is greater than 15%. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. This item is also applied to copper alloy heat exchanger components with zinc content greater than 15% that are exposed to lubricating oil. Loss of material due to pitting and crevice corrosion was not identified as an aging effect requiring management for copper alloy piping, piping components, and piping elements with a zinc content less than 15% that are exposed to lubricating oil. Further evaluation is documented in Section 3.3.2.2.10.4.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-27	Stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Except as noted, loss of material in stainless steel piping, piping components, and piping elements that are exposed to condensation (external) is managed by the External Surfaces Monitoring Program. For stainless steel heat exchanger components that are exposed to external condensation, and for stainless steel piping, piping components, piping elements, and tanks (including demisters, drain pans, and moisture separators) that are exposed to internal condensation, the One-Time Inspection will detect and characterize loss of material. Loss of material in stainless steel bolting that is exposed to external condensation is managed by the Bolting Integrity Program. Further evaluation is documented in Section 3.3.2.2.10.5.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-28	Copper alloy fire protection piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. The Davis-Besse Fire Protection System does not contain piping, piping components, or piping elements that are exposed to internal condensation and subject to aging management review. However, the One-Time Inspection will detect and characterize loss of material due to pitting and crevice corrosion for other copper alloy piping, piping components, and piping elements that are exposed to internal condensation. Further evaluation is documented in Section 3.3.2.2.10.6.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-29	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. The Auxiliary Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to soil and subject to aging management review. Further evaluation is documented in Section 3.3.2.2.10.7.
3.3.1-30	BWR only				
3.3.1-31	BWR only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-32	Stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801, with exceptions. Loss of material in stainless steel and copper alloy piping, piping components, and piping elements that are exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the Fuel Oil Chemistry Program to manage loss of material. Further evaluation is documented in Section 3.3.2.2.12.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-33	Stainless steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel piping, piping components, and piping elements that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. This item is also applied to stainless steel heat exchanger components that are exposed to lubricating oil. Further evaluation is documented in Section 3.3.2.2.12.2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-34	Elastomer seals and components exposed to air – indoor uncontrolled (internal or external)	Loss of material due to wear	A plant specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. Loss of material due to wear was not identified as an aging effect requiring management for elastomer seals and components in Auxiliary Systems that are exposed to air-indoor uncontrolled. Further evaluation is documented in Section 3.3.2.2.13.
3.3.1-35	Steel with stainless steel cladding pump casing exposed to treated borated water	Loss of material/ cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC Information Notice 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes, verify plant-specific program addresses cladding breach	Not applicable. The Auxiliary Systems do not contain steel with stainless steel clad pump casings that are exposed to treated borated water and subject to aging management review. Further evaluation is documented in Section 3.3.2.2.14.
3.3.1-36	BWR only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-37	Stainless steel piping, piping components, and piping elements exposed to treated water >60 °C (>140 °F)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	BWR Reactor Water Cleanup System	No	Consistent with NUREG-1801, but a different aging management program is assigned. Cracking in stainless steel piping, piping components, and piping elements that are exposed to treated water > 60°C (> 140°F) is managed by the PWR Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage cracking. This item is also applied to stainless steel tanks that are exposed to treated water > 60°C (> 140°F).
3.3.1-38	BWR only				
3.3.1-39	BWR only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-40	Steel tanks in diesel fuel oil system exposed to air - outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Consistent with NUREG-1801. Loss of material in the steel fire water storage tank in Fire Protection System and the steel diesel oil storage tank in the Fuel Oil System that are exposed to air - outdoor (external) are managed by the Aboveground Steel Tanks Inspection Program.
3.3.1-41	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Cracking in high-strength steel bolting that is exposed to air with steam or water leakage is managed by the Bolting Integrity Program.
3.3.1-42	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Loss of material in steel bolting that is exposed to air with steam or water leakage is managed by the Bolting Integrity Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-43	Steel bolting and closure bolting exposed to air – indoor uncontrolled (external) or air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Loss of material in steel bolting that is exposed to air-indoor uncontrolled (external) or air-outdoor (external) is managed by the Bolting Integrity Program.
3.3.1-44	Steel compressed air system closure bolting exposed to condensation	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Loss of material in steel bolting that is exposed to condensation is managed by the Bolting Integrity Program.
3.3.1-45	Steel closure bolting exposed to air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Loss of preload in steel bolting that is exposed to air-indoor uncontrolled (external) is managed by the Bolting Integrity Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-46	Stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water >60 °C (>140 °F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Cracking in stainless steel piping, piping components, piping elements, and heat exchanger components that are exposed to closed cycle cooling water > 60°C (> 140°F) is managed by the Closed Cooling Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage cracking. There are no stainless clad steel piping, piping components, piping elements, or heat exchanger components that are exposed to closed cycle cooling water > 60°C (> 140°F) and subject to aging management review.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-47	Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Loss of material in steel piping, piping components, piping elements, and tanks that are exposed to closed cycle cooling water is managed by the Closed Cooling Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage loss of material. Steel heat exchanger components that are exposed to closed cycle cooling water are addressed by Item Number 3.3.1-48.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-48	Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Loss of material in steel heat exchanger components that are exposed to closed cycle cooling water is managed by the Closed Cooling Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage loss of material. Steel piping, piping components, piping elements, and tanks that are exposed to closed cycle cooling water are addressed by Item Number 3.3.1-47.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-49	Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water	Loss of material due to microbiologically influenced corrosion	Closed-Cycle Cooling Water System	No	Not applicable. Loss of material due to microbiologically influenced corrosion is not identified as an aging effect requiring management for stainless steel heat exchanger components that are exposed to closed cycle cooling water. In addition, there are no steel with stainless steel cladding heat exchanger components that are exposed to closed cycle cooling water and subject to aging management review.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-50	Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Loss of material in stainless steel piping, piping components, and piping elements that are exposed to closed cycle cooling water is managed by the Closed Cooling Water Chemistry Program. This item is also applied to stainless steel heat exchanger components and compressor casings that are exposed to closed cycle cooling water. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage loss of material.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-51	Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Loss of material in copper alloy piping, piping components, piping elements, and heat exchanger components that are exposed to closed cycle cooling water is managed by the Closed Cooling Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage loss of material.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-52	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Reduction in heat transfer for steel, stainless steel, and copper alloy heat exchanger tubes that are exposed to closed cycle cooling water is managed by the Closed Cooling Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the Closed Cooling Water Chemistry Program to manage reduction in heat transfer.
3.3.1-53	Steel compressed air system piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	No	Consistent with NUREG-1801, but a different aging management program is assigned. Loss of material in steel piping, piping components, and piping elements that are exposed to condensation (internal) is detected and characterized by the One-Time Inspection.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-54	Stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	Consistent with NUREG-1801, but a different aging management program is assigned. Loss of material in stainless steel piping, piping components, and piping elements that are exposed to condensation (internal) in the Waste Gas System will be detected and characterized by the Collection, Drainage, and Treatment Components Inspection. This item is also applied to the stainless steel waste gas surge tank that is exposed to condensation (internal). Loss of material in stainless steel tubing in the Instrument Air System that is exposed to condensation (internal) will be detected and characterized by the One-Time Inspection. [continued]

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-54 [cont'd]	Stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	For piping, piping components, and piping elements in the Auxiliary Steam and Station Heating System, where the condensation (internal) environment originates from the Main Steam System, loss of material is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material.
3.3.1-55	Steel ducting closure bolting exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Not applicable. Loss of material for steel bolting exposed to air-indoor uncontrolled (external) is managed by the Bolting Integrity Program and addressed in Item Number 3.3.1-43.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-56	Steel HVAC ducting and components external surfaces exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. Loss of material in steel ducting and components external surfaces that are exposed to air-indoor uncontrolled (external) is managed by the External Surfaces Monitoring Program. This item is also applied to steel ducting and components internal surfaces that are exposed to air-indoor uncontrolled (internal) where it was determined that the internal environment is the same as the external environment.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-57	Steel piping and components external surfaces exposed to air – indoor uncontrolled (External)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. Loss of material in steel piping and components external surfaces that are exposed to air-indoor uncontrolled (external) is managed by the External Surfaces Monitoring Program. This item is also applied to steel piping and components internal surfaces that are exposed to air-indoor uncontrolled (internal) where it was determined that the internal environment is the same as the external environment.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-58	Steel external surfaces exposed to air – indoor uncontrolled (external), air - outdoor (external), and condensation (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. Loss of material in steel (including gray cast iron) external surfaces that are exposed to air-indoor uncontrolled (external), air-outdoor (external), and condensation (external) is managed by the External Surfaces Monitoring Program. This item is also applied to steel internal surfaces that are exposed to air-indoor uncontrolled (internal) or air-outdoor (internal) where it was determined that the internal environment is the same as the external environment.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-59	Steel heat exchanger components exposed to air – indoor uncontrolled (external) or air – outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. Loss of material in steel heat exchanger components that are exposed to air-indoor uncontrolled (external) is managed by the External Surfaces Monitoring Program. For steel heat exchanger components that are exposed to air-outdoor (external), refer to Item Number 3.3.1-58. This item is also applied to internal surfaces of steel heat exchanger components where it was determined that the internal environment is the same as the external environment.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-60	Steel piping, piping components, and piping elements exposed to air – outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. Loss of material in steel tanks that are exposed to air-outdoor (external) is managed by the External Surfaces Monitoring Program. This item is also applied to internal surfaces of steel tanks where it was determined that the internal environment is the same as the external environment. Steel piping, piping components, and piping elements exposed to air-outdoor (external) are addressed by Item Number 3.3.1-58.
3.3.1-61	Elastomer fire barrier penetration seals exposed to air – outdoor or air – indoor uncontrolled	Increased hardness, shrinkage and loss of strength due to weathering	Fire Protection	No	Consistent with NUREG-1801, but a different aging management program is assigned. Hardening and loss of strength for elastomer flexible connections that are exposed to air-outdoor are managed by the External Surfaces Monitoring Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-62	Aluminum piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion	Fire Protection	No	Not applicable. There are no aluminum piping, piping components, and piping elements that are exposed to raw water and subject to aging management review.
3.3.1-63	Steel fire rated doors exposed to air – outdoor or air – indoor uncontrolled	Loss of material due to Wear	Fire Protection	No	Consistent with NUREG-1801, with exceptions. Loss of material in carbon steel and galvanized steel fire doors that are exposed to air-indoor and air-outdoor is managed by the Fire Protection Program.
3.3.1-64	Steel piping, piping components, and piping elements exposed to fuel oil	Loss of material due to general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	No	Not applicable. Steel piping, piping components, and piping elements that are exposed to fuel oil are addressed by Item Number 3.3.1-20.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-65	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – indoor uncontrolled	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	Not applicable. Cracking and spalling were not identified as aging effects requiring management for reinforced concrete structural fire barriers – walls, ceilings and floors – that are exposed to air-indoor uncontrolled.
3.3.1-66	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – outdoor	Concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	Not applicable. Cracking and spalling were not identified as aging effects requiring management for reinforced concrete structural fire barriers – walls, ceilings and floors – that are exposed to air-outdoor.
3.3.1-67	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – outdoor or air – indoor uncontrolled	Loss of material due to corrosion of embedded steel	Fire Protection and Structures Monitoring Program	No	Not applicable. For loss of material due to corrosion of embedded steel for reinforced concrete structural fire barriers – walls, ceilings and floors – that are exposed to air-outdoor or air-indoor uncontrolled, refer to Item Number 3.5.1-23.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-68	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. Except as noted below, loss of material in steel piping, piping components, and piping elements that are exposed to raw water in the Fire Water System is managed by the Fire Water Program. This item is also applied to heat exchanger components and tanks that are exposed to raw water in the Fire Protection System. For steel (including gray cast iron) piping, piping components, and piping elements that are exposed to raw water in the Fire Protection System (Diesel) and in the Station Plumbing, Drains, and Sumps System, loss of material will be detected and characterized by the Collection, Drainage, and Treatment Components Inspection Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-69	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. Except as noted below, loss of material in stainless steel piping, piping components, and piping elements that are exposed to raw water in the Fire Water System is managed by the Fire Water Program. For stainless steel piping, piping components, and piping elements that are exposed to raw water in the Fire Protection System (Diesel), loss of material will be detected and characterized by the Collection, Drainage, and Treatment Components Inspection Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-70	Copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. Except as noted below, loss of material in copper alloy piping, piping components, and piping elements that are exposed to raw water in the Fire Water System is managed by the Fire Water Program. For copper alloy piping, piping components, and piping elements, and heat exchanger components that are exposed to raw water in the Fire Protection System (Diesel), loss of material will be detected and characterized by the Collection, Drainage, and Treatment Components Inspection Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-71	Steel piping, piping components, and piping elements exposed to moist air or condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Consistent with NUREG-1801, but a different aging management program is assigned. Loss of material in steel piping, piping components, piping elements, and tanks that are exposed to air (internal) and moist air (internal) will be detected and characterized by the One-Time Inspection.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-72	Steel HVAC ducting and components internal surfaces exposed to condensation (Internal)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Consistent with NUREG-1801, but a different aging management program is assigned. Although there is no steel ducting that is exposed to condensation (internal), loss of material in steel piping, piping components, and piping elements that are exposed to condensation (internal) will be detected and characterized by the One-Time Inspection, except as noted below. For piping, piping components, and piping elements and tanks in the Auxiliary Steam and Station Heating System, where the condensation (internal) environment originates from the Main Steam System, loss of material is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-73	Steel crane structural girders in load handling system exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Consistent with NUREG-1801. Loss of material in carbon steel crane bridges, trolleys, rails, and girders that are exposed to air-indoor is managed by the Cranes and Hoists Inspection Program.
3.3.1-74	Steel cranes – rails exposed to air – indoor uncontrolled (external)	Loss of material due to wear	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Not applicable. Loss of material due to wear is not identified as an aging effect requiring management for carbon steel crane bridges, trolleys, rails, and girders that are exposed to air-indoor uncontrolled (external).
3.3.1-75	Elastomer seals and components exposed to raw water	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, but a different aging management program is assigned. Hardening and loss of strength for elastomer components that are exposed to raw water will be detected and characterized by the One-Time Inspection.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-76	Steel piping, piping components, and piping elements (without lining/coating or with degraded lining/coating) exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, loss of material in steel (including gray cast iron) piping, piping components, and piping elements that are exposed to raw water is managed by the Open-Cycle Cooling Water Program. For steel (including gray cast iron) piping, piping components, piping elements, and bolting that are exposed to raw water that is not from an open-cycle cooling water system, loss of material will be detected and characterized by the Collection, Drainage, and Treatment Components Inspection Program.
3.3.1-77	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Loss of material in steel heat exchanger components that are exposed to raw water is managed by the Open-Cycle Cooling Water Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-78	Stainless steel, nickel alloy, and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, but a different aging management program is assigned. Loss of material in stainless steel and copper alloy piping, piping components, piping elements, and tanks that are exposed to raw water will be detected and characterized by the Collection, Drainage, and Treatment Components Inspection Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-79	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, loss of material in stainless steel piping, piping components, piping elements, fan housings, and heat exchanger components that are exposed to raw water is managed by the Open-Cycle Cooling Water Program. For stainless steel piping, piping components, piping elements that are exposed to raw water that is not from an open-cycle cooling water system, loss of material will be detected and characterized by the Collection, Drainage, and Treatment Components Inspection.
3.3.1-80	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable. For stainless steel and copper alloy piping, piping components, and piping elements that are exposed to raw water, refer to Item Number 3.3.1-78 or Item Number 3.3.1-79.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-81	Copper alloy piping, piping components, and piping elements, exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, but a different aging management program is assigned. Loss of material in copper alloy piping, piping components, and piping elements that are exposed to raw water will be detected and characterized by the Collection, Drainage, and Treatment Components Inspection Program.
3.3.1-82	Copper alloy heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Loss of material in copper alloy heat exchanger components that are exposed to raw water is managed by the Open-Cycle Cooling Water Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-83	Stainless steel and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with exceptions. Except as noted below, reduction in heat transfer for stainless steel and copper alloy heat exchanger tubes that are exposed to raw water is managed by the Open-Cycle Cooling Water Program. For stainless steel and copper alloy heat exchanger tubes that are exposed to raw water in the Fire Protection System, reduction in heat transfer will be detected and characterized by the Collection, Drainage, and Treatment Components Inspection Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-84	Copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to raw water, treated water or closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. Loss of material due to selective leaching in copper alloy > 15% Zn piping, piping components, piping elements, and heat exchanger components that are exposed to raw water or to closed cycle cooling water will be detected and characterized by the Selective Leaching Inspection.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-85	Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water or closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. Loss of material due to selective leaching in gray cast iron piping, piping components, and piping elements that are exposed to soil, raw water, and closed cycle cooling water will be detected and characterized by the Selective Leaching Inspection. This item is also applied to gray cast iron heat exchanger components that are exposed to closed cycle cooling water. This item is also applied to gray cast iron piping, piping components, and piping elements that are exposed to condensation (internal), where the condensation environment is evaluated as equivalent to a raw water environment.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-86	Structural steel (new fuel storage rack assembly) exposed to air – indoor uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring Program	No	Not applicable. There is no structural steel (new fuel storage rack assembly) that is exposed to air-indoor uncontrolled (external) and subject to aging management review. New fuel storage racks are stainless steel. Refer to Item Number 3.5.1-59.
3.3.1-87	Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated borated water	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable. There are no Boraflex spent fuel storage racks neutron-absorbing sheets that are exposed to treated borated water and subject to aging management review. Davis-Besse spent fuel rack neutron absorbers are fabricated of Boral®.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-88	Aluminum and copper alloy >15% Zn piping, piping components, and piping elements exposed to air with borated water leakage	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	No	Consistent with NUREG-1801. Loss of material due to boric acid wastage in aluminum and copper alloy > 15% Zn piping, piping components, and piping elements that are exposed to air with borated water leakage is managed by the Boric Acid Corrosion Program. This item is also applied to copper alloy > 15% Zn heat exchanger components, and to aluminum and copper alloy > 15% Zn tanks, that are exposed to air with borated water leakage.
3.3.1-89	Steel bolting and external surfaces exposed to air with borated water leakage	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	No	Consistent with NUREG-1801. Loss of material due to boric acid wastage in steel bolting and external surfaces (including gray cast iron) that are exposed to air with borated water leakage is managed by the Boric Acid Corrosion Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-90	Stainless steel and steel with stainless steel cladding piping, piping components, piping elements, tanks, and fuel storage racks exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry	No	Consistent with NUREG-1801. Cracking in stainless steel piping, piping components, piping elements, and tanks that are exposed to treated borated water > 60°C (> 140°F) is managed by the PWR Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage cracking. This item is also applied to stainless steel piping, piping components, and piping elements in the non-Class 1 portions of the Reactor Coolant System and Reactor Coolant Pressure Boundary that are exposed to borated reactor coolant.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-91	Stainless steel and steel with stainless steel cladding piping, piping components, and piping elements exposed to treated borated water	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Consistent with NUREG-1801. Loss of material in stainless steel piping, piping components, and piping elements that are exposed to treated borated water (including treated borated water > 60°C (> 140°F)) is managed by the PWR Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. This item is also applied to stainless steel piping, piping components, and piping elements in the non-Class 1 portions of the Reactor Coolant System and Reactor Coolant Pressure Boundary that are exposed to borated reactor coolant. [continued]

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-91 [cont'd]	Stainless steel and steel with stainless steel cladding piping, piping components, and piping elements exposed to treated borated water	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	This item is also applied to stainless steel heat exchanger components and tanks that are exposed to treated borated water.
3.3.1-92	Galvanized steel piping, piping components, and piping elements exposed to air – indoor uncontrolled	None	None	NA - No AEM or AMP	Not applicable. The Davis-Besse AMR process did not take credit for the zinc coating of galvanized steel to prevent the effects of aging on the base metal. Therefore, galvanized steel was evaluated as steel.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-93	Glass piping elements exposed to air, air – indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. Althought there are no glass piping elements that are exposed to air-indoor controlled (external), fuel oil, lubricating oil, raw water, treated water, or treated borated water, and subject to aging management review, this item is applied to glass filter housing viewports that are exposed to air-indoor uncontrolled (external). No aging effects requiring management are identified. This item is also applied to glass filter housing viewports that are exposed to air-indoor uncontrolled (internal) where it was determined that the internal environment is the same as the external environment.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-94	Stainless steel and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management are identified for stainless steel piping, piping components, and piping elements that are exposed to air-indoor uncontrolled (external). This item is also applied to stainless steel compressor casings, drain pans, heat exchangers, and tanks that are exposed to air-indoor uncontrolled (external). This item is also applied to stainless steel components internal surfaces exposed to air-indoor uncontrolled (internal) where it was determined that the internal environment was the same as the external environment.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-95	Steel and aluminum piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There are no steel or aluminum piping, piping components, or piping elements that are exposed to air-indoor controlled (external) and subject to aging management review. All air-indoor environments were conservatively evaluated as uncontrolled environments.
3.3.1-96	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management are identified for steel and stainless steel piping, piping components, and piping elements that are exposed to concrete (external).

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-97	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management are identified for steel, stainless steel, and copper alloy piping, piping components, and piping elements that are exposed to gas. This item is also applied to steel and copper alloy heat exchanger components and compressors, and stainless steel tanks and compressor casings, that are exposed to gas. There are no aluminum piping, piping components, or piping elements that are exposed to gas and subject to aging management review.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-98	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management are identified for steel (including gray cast iron), stainless steel, and copper alloy piping, piping components, and piping elements that are exposed to dried air. This item is also applied to steel tanks that are exposed to dried air.
3.3.1-99	Stainless steel and copper alloy <15% Zn piping, piping components, and piping elements exposed to air with borated water leakage	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management are identified for stainless steel and copper alloy (< 15% Zn) piping, piping components, and piping elements that are exposed to air with borated water leakage. This item is also applied to stainless steel and copper alloy (< 15% Zn) bolting, compressor casings, heat exchanger components, and tanks that are exposed to air with borated water leakage.

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
2	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
3	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
5	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
6	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
7	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	H

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
9	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
10	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
11	Compressor – CREVS air conditioning unit compressor (DB-MS3311 & DB-MS3321)	Pressure boundary	Gray Cast Iron	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
12	Compressor – CREVS air conditioning unit compressor (DB-MS3311 & DB-MS3321)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
13	Condenser Unit Housing – CREVS air-cooled condensing unit (DB-S61-1 & 2)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
14	Condenser Unit Housing – CREVS air-cooled condensing unit (DB-S61-1 & 2)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0301
15	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301
16	Damper Housing	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0301
17	Damper Housing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
18	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
19	Damper Housing	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
20	Damper Housing	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0301
21	Damper Housing	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
22	Damper Housing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
23	Drain Pan	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E 0306
24	Drain Pan	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
25	Drain Pan	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
26	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301
27	Duct	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
28	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
29	Duct	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301
30	Duct	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
31	Duct	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
32	Fan Housing – Auxiliary Feed Pump Room ventilation fans (DB-C73-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301
33	Fan Housing – Auxiliary Feed Pump Room ventilation fans (DB-C73-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
34	Fan Housing – Battery Room ventilation fans (DB-C78-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
35	Fan Housing – Battery Room ventilation fans (DB-C78-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
36	Fan Housing – CREVS fans (DB-C21-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301
37	Fan Housing – CREVS fans (DB-C21-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
38	Fan Housing – Diesel Generator Room ventilation fans (DB-C25-1, 2, 3, & 4)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301
39	Fan Housing – Diesel Generator Room ventilation fans (DB-C25-1, 2, 3, & 4)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
40	Fan Housing – ECCS Room fans (DB-C31-1, 2, 3, 4, & 5)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301
41	Fan Housing – ECCS Room fans (DB-C31-1, 2, 3, 4, & 5)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
42	Fan Housing – ECCS Room fans (DB-C31-1, 2, 3, 4, & 5)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
43	Fan Housing – Low Voltage Switchgear Room ventilation fans (DB-C71-1 & DB-C133)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
44	Fan Housing – Low Voltage Switchgear Room ventilation fans (DB-C71-1 & DB-C133)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
45	Filter Housing – CREVS water-cooled condenser skid (DB-S33-1 & 2)	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
46	Filter Housing – CREVS water-cooled condenser skid (DB-S33-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
47	Filter Housing – CREVS filters (DB-F22-1 & 2)	Pressure boundary	Glass	Air-indoor uncontrolled (Internal)	None	None	VII.J-8	3.3.1-93	C 0301

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
48	Filter Housing – CREVS filters (DB-F22-1 & 2)	Pressure boundary	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	C
49	Filter Housing – CREVS filters (DB-F22-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301
50	Filter Housing – CREVS filters (DB-F22-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
51	Filter Housing – Fuel Handling Building area exhaust filter (DB-F24)	Pressure boundary	Glass	Air-indoor uncontrolled (Internal)	None	None	VII.J-8	3.3.1-93	C 0301
52	Filter Housing – Fuel Handling Building area exhaust filter (DB-F24)	Pressure boundary	Glass	Air with borated water leakage (External)	None	None	N/A	N/A	G

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Filter Housing – Fuel Handling Building area exhaust filter (DB-F24)	Pressure boundary	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	C
54	Filter Housing – Fuel Handling Building area exhaust filter (DB-F24)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0301
55	Filter Housing – Fuel Handling Building area exhaust filter (DB-F24)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
56	Filter Housing – Fuel Handling Building area exhaust filter (DB-F24)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
57	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
58	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
59	Flexible Connection	Pressure boundary	Copper Alloy	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
60	Flexible Connection	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
61	Flexible Connection	Pressure boundary	Copper Alloy > 15% Zn	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
62	Flexible Connection	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
63	Heat Exchanger (channel) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
64	Heat Exchanger (channel) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-10	3.3.1-59	A
65	Heat Exchanger (cooling coil casing) – CREVS air-cooled condensing unit (DB-S61-1 & 2)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0301
66	Heat Exchanger (cooling coil casing) – CREVS air-cooled condensing unit (DB-S61-1 & 2)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
67	Heat Exchanger (cooling coil casing) – CREVS cooling coils (DB-E106-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-10	3.3.1-59	A 0301
68	Heat Exchanger (cooling coil casing) – CREVS cooling coils (DB-E106-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-10	3.3.1-59	A
69	Heat Exchanger (cooling coil casing) – ECCS Room coolers (DB-E42-1, 2, 4, & 5)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
70	Heat Exchanger (cooling coil casing) – ECCS Room coolers (DB-E42-1, 2, 4, & 5)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C
71	Heat Exchanger (cooling coil casing) – ECCS Room coolers (DB-E42-1, 2, 4, & 5)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
72	Heat Exchanger (cooling coil casing) – ECCS Room cooler (DB-E42-3)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-10	3.3.1-59	A 0301
73	Heat Exchanger (cooling coil casing) – ECCS Room cooler (DB-E42-3)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-10	3.3.1-59	A

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
74	Heat Exchanger (cooling coil casing) – ECCS Room cooler (DB-E42-3)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
75	Heat Exchanger (cooling coil fins) – CREVS air-cooled condensing unit cooling coils (DB-S61-1 & 2)	Heat transfer	Copper Alloy	Air-outdoor (External)	Reduction in heat transfer	External Surfaces Monitoring	N/A	N/A	G
76	Heat Exchanger (cooling coil fins) – CREVS cooling coils (DB-E106-1 & 2)	Heat transfer	Copper Alloy	Air-indoor uncontrolled (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	G

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
77	Heat Exchanger (cooling coil fins) – ECCS Room coolers (DB-E42-1, 2, 4, & 5)	Heat transfer	Aluminum	Condensation (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H
78	Heat Exchanger (cooling coil fins) – ECCS Room coolers (DB-E42-1, 2, 4, & 5)	Heat transfer	Aluminum	Condensation (External)	Loss of material	One-Time Inspection	N/A	N/A	H 0306 0331
79	Heat Exchanger (cooling coil fins) – ECCS Room cooler (DB-E42-3)	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H
80	Heat Exchanger (cooling coil fins) – ECCS Room cooler (DB-E42-3)	Heat transfer	Copper Alloy	Condensation (External)	Loss of material	One-Time Inspection	N/A	N/A	H 0306 0331

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
81	Heat Exchanger (cooling coil tubes) – CREVS air-cooled condensing unit (DB-S61-1 & 2)	Heat transfer	Copper Alloy	Air-outdoor (External)	Reduction in heat transfer	External Surfaces Monitoring	N/A	N/A	H
82	Heat Exchanger (cooling coil tubes) – CREVS air-cooled condensing unit (DB-S61-1 & 2)	Pressure boundary	Copper Alloy	Gas (Internal)	None	None	VII.J-4	3.3.1-97	C
83	Heat Exchanger (cooling coil tubes) – CREVS air-cooled condensing unit (DB-S61-1 & 2)	Pressure boundary	Copper Alloy	Air-outdoor (External)	None	None	N/A	N/A	G

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
84	Heat Exchanger (cooling coil tubes) – CREVS cooling coils (DB-E106-1 & 2)	Heat transfer	Copper Alloy	Air-indoor uncontrolled (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H
85	Heat Exchanger (cooling coil tubes) – CREVS cooling coils (DB-E106-1 & 2)	Pressure boundary	Copper Alloy	Gas (Internal)	None	None	VII.J-4	3.3.1-97	C
86	Heat Exchanger (cooling coil tubes) – CREVS cooling coils (DB-E106-1 & 2)	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	C

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
87	Heat Exchanger (cooling coil tubes) – ECCS Room coolers (DB-E42-1, 2, 4, & 5)	Heat transfer	Stainless Steel	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-7	3.3.1-83	B
88	Heat Exchanger (cooling coil tubes) – ECCS Room coolers (DB-E42-1, 2, 4, & 5)	Heat transfer	Stainless Steel	Condensation (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H
89	Heat Exchanger (cooling coil tubes) – ECCS Room coolers (DB-E42-1, 2, 4, & 5)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	D

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
90	Heat Exchanger (cooling coil tubes) – ECCS Room coolers (DB-E42-1, 2, 4, & 5)	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
91	Heat Exchanger (cooling coil tubes) ECCS Room coolers (DB-E42-3)	Heat transfer	Copper Alloy	Condensation (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H
92	Heat Exchanger (cooling coil tubes) ECCS Room cooler (DB-E42-3)	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B
93	Heat Exchanger (cooling coil tubes) ECCS Room cooler (DB-E42-3)	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
94	Heat Exchanger (cooling coil tubes) ECCS Room cooler (DB-E42-3)	Pressure boundary	Copper Alloy	Condensation (External)	Loss of material	One-Time Inspection	VII.F1-16	3.3.1-25	E
95	Heat Exchanger (shell) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-10	3.3.1-59	A
96	Heat Exchanger (shell) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
97	Heat Exchanger (tubes) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Heat transfer	Copper Alloy > 15% Zn	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-6	3.3.1-83	B

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
98	Heat Exchanger (tubes) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Heat transfer	Copper Alloy > 15% Zn	Gas (External)	None	None	VII.J-4	3.3.1-97	C
99	Heat Exchanger (tubes) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Open-Cycle Cooling Water	N/A	N/A	H
100	Heat Exchanger (tubes) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-3	3.3.1-82	B 0303

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
101	Heat Exchanger (tubes) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Gas (External)	None	None	VII.J-4	3.3.1-97	C
102	Heat Exchanger (tubesheet) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Pressure boundary	Steel	Gas (External)	None	None	VII.J-23	3.3.1-97	C
103	Heat Exchanger (tubesheet) – CREVS water-cooled condensing unit (DB-S33-1 & 2)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
104	Humidifier (tubing) – Control Room HVAC humidifiers (DB-S19-1 & 2)	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-2	3.3.1-78	E

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
105	Humidifier (tubing) – Control Room HVAC humidifiers (DB-S19-1 & 2)	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	C
106	Mechanical Sealant	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
107	Mechanical Sealant	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
108	Piping	Pressure boundary	Copper Alloy	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
109	Piping	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
110	Piping	Pressure boundary	Copper Alloy	Air-outdoor (External)	None	None	N/A	N/A	G
111	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0301
112	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System									
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
113	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
114	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
115	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
116	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
117	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	C 0301
118	Tubing	Pressure boundary	Copper Alloy	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
119	Tubing	Pressure boundary	Copper Alloy	Lubricating oil (Internal)	None	None	VII.C1-8	3.3.1-26	I 0302
120	Tubing	Pressure boundary	Copper Alloy	Air with borated water leakage (External)	None	None	V.II.J-5	3.3.1-99	A
121	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
122	Tubing	Pressure boundary	Copper Alloy	Air-outdoor (External)	None	None	N/A	N/A	G
123	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0301
124	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
125	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.C1-8	3.3.1-26	A 0304
126	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.C1-8	3.3.1-26	A
127	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
128	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
129	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-outdoor (External)	None	None	N/A	N/A	G
130	Tubing	Structural integrity	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0301

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
131	Tubing	Structural integrity	Copper Alloy	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
132	Tubing	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
133	Tubing	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
134	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0301
135	Tubing	Structural integrity	Copper Alloy > 15% Zn	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
136	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
137	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
138	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0301
139	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
140	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A 0305
141	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
142	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-outdoor (External)	None	None	N/A	N/A	G
143	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0301
144	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
145	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
146	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0301
147	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Gas (Internal)	None	None	VII.J-4	3.3.1-97	A
148	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-9	3.3.1-81	E

Table 3.3.2-1 Aging Management Review Results – Auxiliary Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
149	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
150	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	C
2	Bolting	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	Bolting Integrity	VII.F1-16	3.3.1-25	E
3	Bolting	Structural integrity	Copper Alloy	Condensation (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
4	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
5	Bolting	Structural integrity	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
6	Bolting	Structural integrity	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
7	Bolting	Structural integrity	Steel	Condensation (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
8	Flexible Connection	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Flexible Connection	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
10	Flexible Connection	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
11	Flexible Connection	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
12	Heat Exchanger (shell) – Control Room water chiller evaporator (DB-S12-1 & 2)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-11	3.3.1-48	B
13	Heat Exchanger (shell) – Control Room water chiller evaporator (DB-S12-1 & 2)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-11	3.3.1-48	E 0314

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Heat Exchanger (shell) – Control Room water chiller evaporator (DB-S12-1 & 2)	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
15	Heat Exchanger (tubing) – Access Control Area duct cooling coil (DB-E47)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B
16	Heat Exchanger (tubing) – Access Control Area duct cooling coil (DB-E47)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-8	3.3.1-51	E 0314

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
17	Heat Exchanger (tubing) – Access Control Area duct cooling coil (DB-E47)	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	C
18	Heat Exchanger (tubing) – Access Control Area duct cooling coil (DB-E47)	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	One-Time Inspection	VII.F1-16	3.3.1-25	E
19	Heat Exchanger (tubing) – Computer Room A/C unit (DB-S77)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B
20	Heat Exchanger (tubing) – Computer Room A/C unit (DB-S77)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-8	3.3.1-51	E 0314

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
21	Heat Exchanger (tubing) – Computer Room A/C unit (DB-S77)	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	One-Time Inspection	VII.F1-16	3.3.1-25	E
22	Heat Exchanger (tubing) – Control Room air handling cooling coil (DB-E44 & 45)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B
23	Heat Exchanger (tubing) – Control Room air handling cooling coil (DB-E44 & 45)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-8	3.3.1-51	E 0314

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	Heat Exchanger (tubing) – Control Room air handling cooling coil (DB-E44 & 45)	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	One-Time Inspection	VII.F1-16	3.3.1-25	E
25	Heat Exchanger (tubing) – Electric Penetration Room 402 cooling coil (DB-E78)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B
26	Heat Exchanger (tubing) – Electric Penetration Room 402 cooling coil (DB-E78)	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-8	3.3.1-51	E 0314

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
27	Heat Exchanger (tubing) – Electric Penetration Room 402 cooling coil (DB-E78)	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	C
28	Heat Exchanger (tubing) – Electric Penetration Room 402 cooling coil (DB-E78)	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	One-Time Inspection	VII.F1-16	3.3.1-25	E
29	Orifice	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
30	Orifice	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
31	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
32	Orifice	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
33	Piping	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-15	3.3.1-51	B
34	Piping	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-15	3.3.1-51	E 0314
35	Piping	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
36	Piping	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
37	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B
38	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0314
39	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
40	Piping	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
41	Pump Casing – Chilled water pump (DB-P92-1 & 2)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B
42	Pump Casing – Chilled water pump (DB-P92-1 & 2)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0314
43	Pump Casing – Chilled water pump (DB-P92-1 & 2)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	A
44	Pump Casing – Chilled water pump (DB-P92-1 & 2)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
45	Pump Casing – Chilled water pump (DB-P92-1 & 2)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	H
46	Strainer (body)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
47	Strainer (body)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0314
48	Strainer (body)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	A
49	Strainer (body)	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
50	Strainer (body)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
51	Strainer (body)	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	H
52	Tank – Air separator	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0309
53	Tank – Air separator	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B
54	Tank – Air separator	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0314
55	Tank – Air separator	Structural integrity	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
56	Tank – Air separator	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
57	Tank – Air separator	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
58	Tank – Chemical pot feeder (DB-T154)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0309
59	Tank – Chemical pot feeder (DB-T154)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B
60	Tank – Chemical pot feeder (DB-T154)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0314
61	Tank – Chemical pot feeder (DB-T154)	Structural integrity	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313
62	Tank – Chemical pot feeder (DB-T154)	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
63	Tank – Chemical pot feeder (DB-T154)	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
64	Tank – Expansion tank (DB-T88)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0309
65	Tank – Expansion tank (DB-T88)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B
66	Tank – Expansion tank (DB-T88)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0314
67	Tank – Expansion tank (DB-T88)	Structural integrity	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313
68	Tank – Expansion tank (DB-T88)	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
69	Tank – Expansion tank (DB-T88)	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
70	Tubing	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-15	3.3.1-51	B
71	Tubing	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-15	3.3.1-51	E 0314
72	Tubing	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
73	Tubing	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
74	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
75	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
76	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
77	Tubing	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
78	Valve Body	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-15	3.3.1-51	B
79	Valve Body	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-15	3.3.1-51	E 0314
80	Valve Body	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
81	Valve Body	Structural integrity	Copper Alloy	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
82	Valve Body	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B
83	Valve Body	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0314
84	Valve Body	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	A
85	Valve Body	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-2 Aging Management Review Results – Auxiliary Building Chilled Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
86	Valve Body	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
87	Valve Body	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	H

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	C
2	Bolting	Structural integrity	Copper Alloy	Air with steam or water leakage (External)	None	None	N/A	N/A	F
3	Bolting	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
4	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
5	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
7	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Heat Exchanger (tubing) – Containment purge air supply heating coil (DB-E38)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B 0310
9	Heat Exchanger (tubing) – Containment purge air supply heating coil (DB-E38)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-8	3.3.1-51	E 0310 0314
10	Heat Exchanger (tubing) – Containment purge air supply heating coil (DB-E38)	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	C

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
11	Heat Exchanger (tubing) – Control Room heating coil (DB-E46-1 & 2)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B 0310
12	Heat Exchanger (tubing) – Control Room heating coil (DB-E46-1 & 2)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-8	3.3.1-51	E 0310 0314
13	Heat Exchanger (tubing) – Control Room heating coil (DB-E46-1 & 2)	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	C
14	Heat Exchanger (tubing) – Fuel handling supply heating coil (DB-E40)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B 0310

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Heat Exchanger (tubing) – Fuel handling supply heating coil (DB-E40)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-8	3.3.1-51	E 0310 0314
16	Heat Exchanger (tubing) – Fuel handling supply heating coil (DB-E40)	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	C
17	Heat Exchanger (tubing) – Fuel handling supply heating coil (DB-E40)	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	C
18	Heat Exchanger (tubing) – Intake structure unit heater (DB-E50-1)	Structural integrity	Copper Alloy	Steam (Internal)	Loss of material	One-Time Inspection	N/A	N/A	G

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
19	Heat Exchanger (tubing) – Intake structure unit heater (DB-E50-1)	Structural integrity	Copper Alloy	Steam (Internal)	Loss of material	PWR Water Chemistry	N/A	N/A	G
20	Heat Exchanger (tubing) – Intake structure unit heater (DB-E50-1)	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	C
21	Heat Exchanger (tubing) – Main steam line area unit heater (DB-E87-1, 2, & 3)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B 0310
22	Heat Exchanger (tubing) – Main steam line area unit heater (DB-E87-1, 2, & 3)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-8	3.3.1-51	E 0310 0314

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
23	Heat Exchanger (tubing) – Main steam line area unit heater (DB-E87-1, 2, & 3)	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	C
24	Heat Exchanger (tubing) – Radwaste supply heating coil (DB-E39)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60°C (> 140°F) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-8	3.3.1-51	B 0310
25	Heat Exchanger (tubing) – Radwaste supply heating coil (DB-E39)	Structural integrity	Copper Alloy	Closed cycle cooling water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VII.F1-8	3.3.1-51	E 0310 0314
26	Heat Exchanger (tubing) – Radwaste supply heating coil (DB-E39)	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	C

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
27	Orifice	Structural integrity	Stainless Steel	Condensation (Internal)	Cracking	One-Time Inspection	N/A	N/A	H
28	Orifice	Structural integrity	Stainless Steel	Condensation (Internal)	Cracking	PWR Water Chemistry	N/A	N/A	H
29	Orifice	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-4	3.3.1-54	E
30	Orifice	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.D-4	3.3.1-54	E
31	Orifice	Structural integrity	Stainless Steel	Steam (Internal)	Cracking	One-Time Inspection	VIII.A-10	3.4.1-39	E 0315
32	Orifice	Structural integrity	Stainless Steel	Steam (Internal)	Cracking	PWR Water Chemistry	VIII.A-10	3.4.1-39	A
33	Orifice	Structural integrity	Stainless Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.A-12	3.4.1-37	E 0315
34	Orifice	Structural integrity	Stainless Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.A-12	3.4.1-37	A
35	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
36	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
37	Piping	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-15	3.3.1-51	B 0310
38	Piping	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-15	3.3.1-51	E 0310 0314
39	Piping	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
40	Piping	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
41	Piping	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B 0310
42	Piping	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0310 0314

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
43	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	G 0317
44	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
45	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
46	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.A-17	3.4.1-29	A
47	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.A-16	3.4.1-02	A
48	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.A-16	3.4.1-02	A
49	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
50	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
51	Pump Casing – 10 psig condensate pump (DB-P118-1 & 2)	Structural integrity	Steel	Condensation (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	G 0317
52	Pump Casing – 10 psig condensate pump (DB-P118-1 & 2)	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
53	Pump Casing – 10 psig condensate pump (DB-P118-1 & 2)	Structural integrity	Steel	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
54	Pump Casing – 10 psig condensate pump (DB-P118-1 & 2)	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
55	Pump Casing – 10 psig condensate pump (DB-P118-1 & 2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
56	Pump Casing – Degasifier package drain pump (DB-P178-1 & 2)	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
57	Pump Casing – Degasifier package drain pump (DB-P178-1 & 2)	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
58	Pump Casing – Degasifier package drain pump (DB-P178-1 & 2)	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	Selective Leaching Inspection	VII.F1-18	3.3.1-85	A 0308
59	Pump Casing – Degasifier package drain pump (DB-P178-1 & 2)	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
60	Pump Casing – Degasifier package drain pump (DB-P178-1 & 2)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
61	Pump Casing – Evaporator package condensate drain pump (DB-P275-1 & 2)	Structural integrity	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
62	Pump Casing – Evaporator package condensate drain pump (DB-P275-1 & 2)	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
63	Pump Casing – Evaporator package condensate drain pump (DB-P275-1 & 2)	Structural integrity	Steel	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
64	Pump Casing – Evaporator package condensate drain pump (DB-P275-1 & 2)	Structural integrity	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313
65	Pump Casing – Evaporator package condensate drain pump (DB-P275-1 & 2)	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
66	Pump Casing – Evaporator package condensate drain pump (DB-P275-1 & 2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
67	Pump Casing -Secondary hot water control room AHU pump (DB-P97 & 98)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B 0310
68	Pump Casing -Secondary hot water control room AHU pump (DB-P97 & 98)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0310 0314
69	Pump Casing -Secondary hot water control room AHU pump (DB-P97 & 98)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	A 0310

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
70	Pump Casing -Secondary hot water control room AHU pump (DB-P97 & 98)	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
71	Pump Casing -Secondary hot water control room AHU pump (DB-P97 & 98)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
72	Pump Casing – Secondary hot water fuel handling pump (DB-P95)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B 0310
73	Pump Casing – Secondary hot water fuel handling pump (DB-P95)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0310 0314

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
74	Pump Casing – Secondary hot water fuel handling pump (DB-P95)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	A 0310
75	Pump Casing – Secondary hot water fuel handling pump (DB-P95)	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
76	Pump Casing – Secondary hot water fuel handling pump (DB-P95)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
77	Pump Casing – Secondary hot water purge supply pump (DB-P93)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B 0310
78	Pump Casing – Secondary hot water purge supply pump (DB-P93)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0310 0314

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
79	Pump Casing – Secondary hot water purge supply pump (DB-P93)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	A 0310
80	Pump Casing – Secondary hot water purge supply pump (DB-P93)	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
81	Pump Casing – Secondary hot water purge supply pump (DB-P93)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
82	Pump Casing – Secondary hot water radwaste supply pump (DB-P94)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B 0310
83	Pump Casing – Secondary hot water radwaste supply pump (DB-P94)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0310 0314

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
84	Pump Casing – Secondary hot water radwaste supply pump (DB-P94)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	A 0310
85	Pump Casing – Secondary hot water radwaste supply pump (DB-P94)	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
86	Pump Casing – Secondary hot water radwaste supply pump (DB-P94)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
87	Strainer (body)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B 0310
88	Strainer (body)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0310 0314

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
89	Strainer (body)	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	A 0310
90	Strainer (body)	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
91	Strainer (body)	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
92	Strainer (body)	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	Selective Leaching Inspection	VII.F1-18	3.3.1-85	A 0308
93	Strainer (body)	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
94	Strainer (body)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
95	Tank – 10 psig condensate tank (DB-T95)	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0309

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
96	Tank – 10 psig condensate tank (DB-T95)	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
97	Tank – 10 psig condensate tank (DB-T95)	Structural integrity	Steel	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
98	Tank – 10 psig condensate tank (DB-T95)	Structural integrity	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313
99	Tank – 10 psig condensate tank (DB-T95)	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
100	Tank – 10 psig condensate tank (DB-T95)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
101	Tank – Degasifier package drain pump reservoir	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
102	Tank – Degasifier package drain pump reservoir	Structural integrity	Steel	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
103	Tank – Degasifier package drain pump reservoir	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
104	Tank – Degasifier package drain pump reservoir	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
105	Trap Body	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	G 0317
106	Trap Body	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
107	Trap Body	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
108	Trap Body	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	Selective Leaching Inspection	VII.F1-18	3.3.1-85	A 0308

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
109	Trap Body	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
110	Trap Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
111	Tubing	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-15	3.3.1-51	B 0310
112	Tubing	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-15	3.3.1-51	E 0310 0314
113	Tubing	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
114	Tubing	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
115	Tubing	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B 0310

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
116	Tubing	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0310 0314
117	Tubing	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
118	Tubing	Structural integrity	Steel	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
119	Tubing	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.A-17	3.4.1-29	A
120	Tubing	Structural integrity	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.A-16	3.4.1-02	A
121	Tubing	Structural integrity	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.A-16	3.4.1-02	A
122	Tubing	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
123	Tubing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
124	Valve Body	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-15	3.3.1-51	B 0310
125	Valve Body	Structural integrity	Copper Alloy	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-15	3.3.1-51	E 0310 0314
126	Valve Body	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
127	Valve Body	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
128	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (Internal)	Cracking	One-Time Inspection	N/A	N/A	G
129	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (Internal)	Cracking	PWR Water Chemistry	N/A	N/A	G
130	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (Internal)	Loss of material	One-Time Inspection	N/A	N/A	G
131	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Condensation (Internal)	Loss of material	PWR Water Chemistry	N/A	N/A	G

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
132	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
133	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
134	Valve Body	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B 0310
135	Valve Body	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0310 0314
136	Valve Body	Structural integrity	Gray Cast Iron	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	A 0310
137	Valve Body	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	G 0317
138	Valve Body	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
139	Valve Body	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
140	Valve Body	Structural integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	Selective Leaching Inspection	VII.F1-18	3.3.1-85	A 0308
141	Valve Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.A-17	3.4.1-29	A
142	Valve Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	One-Time Inspection	VIII.A-16	3.4.1-02	A
143	Valve Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.A-16	3.4.1-02	A
144	Valve Body	Structural integrity	Gray Cast Iron	Steam (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
145	Valve Body	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
146	Valve Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
147	Valve Body	Structural integrity	Stainless Steel	Condensation (Internal)	Cracking	One-Time Inspection	N/A	N/A	H

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
148	Valve Body	Structural integrity	Stainless Steel	Condensation (Internal)	Cracking	PWR Water Chemistry	N/A	N/A	H
149	Valve Body	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-4	3.3.1-54	E
150	Valve Body	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.D-4	3.3.1-54	E
151	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
152	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
153	Valve Body	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.F1-20	3.3.1-47	B 0310
154	Valve Body	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.F1-20	3.3.1-47	E 0310 0314
155	Valve Body	Structural integrity	Steel	Condensation (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	N/A	N/A	G 0317

Table 3.3.2-3 Aging Management Review Results – Auxiliary Steam and Station Heating Systems

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
156	Valve Body	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
157	Valve Body	Structural integrity	Steel	Condensation (Internal)	Loss of material	PWR Water Chemistry	VII.F1-3	3.3.1-72	E
158	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.A-17	3.4.1-29	A
159	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.A-16	3.4.1-02	A
160	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.A-16	3.4.1-02	A
161	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
162	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
6	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
8	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Filter Housing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
10	Filter Housing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
11	Filter Housing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
12	Filter Housing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
13	Filter Housing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Filter Housing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
15	Filter Housing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
16	Filter Housing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
17	Filter Housing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
18	Filter Housing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
19	Flexible Connection	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
20	Flexible Connection	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
21	Flexible Connection	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Flexible Connection	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
23	Heat Exchanger (channel) - Distillate coolers (DB-E200-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
24	Heat Exchanger (channel) - Distillate coolers (DB-E200-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
25	Heat Exchanger (channel) - Distillate coolers (DB-E200-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
26	Heat Exchanger (channel) - Distillate coolers (DB-E200-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
27	Heat Exchanger (channel) - Seal water coolers (DB-E199-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
28	Heat Exchanger (channel) - Seal water coolers (DB-E199-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
29	Heat Exchanger (channel) - Seal water coolers (DB-E199-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
30	Heat Exchanger (channel) - Seal water coolers (DB-E199-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
31	Heat Exchanger (shell) - Distillate coolers (DB-E200-1 & 2)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Heat Exchanger (shell) - Distillate coolers (DB-E200-1 & 2)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
33	Heat Exchanger (shell) - Distillate coolers (DB-E200-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
34	Heat Exchanger (shell) - Distillate coolers (DB-E200-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
35	Heat Exchanger (shell) - Seal water coolers (DB-E199-1 & 2)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
36	Heat Exchanger (shell) - Seal water coolers (DB-E199-1 & 2)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
37	Heat Exchanger (shell) - Seal water coolers (DB-E199-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
38	Heat Exchanger (shell) - Seal water coolers (DB-E199-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
39	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
40	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
41	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
42	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
43	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
44	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
45	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
46	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
47	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
48	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
49	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
50	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
51	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
52	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
53	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
54	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
55	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
56	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
57	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
58	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
59	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
60	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
61	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
62	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
63	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
64	Piping	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E3-16	3.3.1-37	E
65	Piping	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E3-16	3.3.1-37	E
66	Piping	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A 0311
67	Piping	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A 0311
68	Piping	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
69	Pump Casing - Bottoms circulation pumps (DB-P271-1, 2, 3 & 4)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
70	Pump Casing - Bottoms circulation pumps (DB-P271-1, 2, 3 & 4)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
71	Pump Casing - Bottoms circulation pumps (DB-P271-1, 2, 3 & 4)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
72	Pump Casing - Bottoms circulation pumps (DB-P271-1, 2, 3 & 4)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
73	Pump Casing - Clean waste booster pumps (DB-P179-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
74	Pump Casing - Clean waste booster pumps (DB-P179-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
75	Pump Casing - Clean waste booster pumps (DB-P179-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
76	Pump Casing - Clean waste booster pumps (DB-P179-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
77	Pump Casing - Clean waste monitor tank transfer pumps (DB-P50-1 & 2)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
78	Pump Casing - Clean waste monitor tank transfer pumps (DB-P50-1 & 2)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
79	Pump Casing - Clean waste monitor tank transfer pumps (DB-P50-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
80	Pump Casing - Clean waste monitor tank transfer pumps (DB-P50-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
81	Pump Casing - Clean waste receiver tank transfer pumps (DB-P49-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
82	Pump Casing - Clean waste receiver tank transfer pumps (DB-P49-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
83	Pump Casing - Clean waste receiver tank transfer pumps (DB-P49-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
84	Pump Casing - Clean waste receiver tank transfer pumps (DB-P49-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
85	Pump Casing - Concentrates pumps (DB-P272-1 & 3)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
86	Pump Casing - Concentrates pumps (DB-P272-1 & 3)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
87	Pump Casing - Concentrates pumps (DB-P272-1 & 3)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
88	Pump Casing - Concentrates pumps (DB-P272-1 & 3)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
89	Pump Casing - Concentrates transfer pump (DB-P47-2)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
90	Pump Casing - Concentrates transfer pump (DB-P47-2)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
91	Pump Casing - Concentrates transfer pump (DB-P47-2)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
92	Pump Casing - Concentrates transfer pump (DB-P47-2)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
93	Pump Casing - Concentrates transfer pump (DB-P47-2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
94	Pump Casing - Concentrates transfer pump (DB-P47-2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
95	Pump Casing - Concentrator vacuum pumps (DB-270-1, 2, 3 & 4)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
96	Pump Casing - Concentrator vacuum pumps (DB-270-1, 2, 3 & 4)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
97	Pump Casing - Concentrator vacuum pumps (DB-270-1, 2, 3 & 4)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
98	Pump Casing - Concentrator vacuum pumps (DB-270-1, 2, 3 & 4)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
99	Pump Casing - Concentrator vacuum pumps (DB-270-1, 2, 3 & 4)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
100	Pump Casing - Distillate pumps (DB-269-1 & 3)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
101	Pump Casing - Distillate pumps (DB-269-1 & 3)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
102	Pump Casing - Distillate pumps (DB-269-1 & 3)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
103	Pump Casing - Distillate pumps (DB-269-1 & 3)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
104	Rupture Disc	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
105	Rupture Disc	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
106	Rupture Disc	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
107	Rupture Disc	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
108	Rupture Disc	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
109	Rupture Disc	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
110	Rupture Disc	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
111	Rupture Disc	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
112	Rupture Disc	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
113	Separator	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
114	Separator	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
115	Separator	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
116	Separator	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
117	Strainer (body)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
118	Strainer (body)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
119	Strainer (body)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E3-16	3.3.1-37	E
120	Strainer (body)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E3-16	3.3.1-37	E
121	Strainer (body)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A 0311
122	Strainer (body)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A 0311
123	Strainer (body)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
124	Strainer (body)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
125	Tank - Boric acid concentrators (DB-T200-1 & 2)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
126	Tank - Boric acid concentrators (DB-T200-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
127	Tank - Boric acid concentrators (DB-T200-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
128	Tank - Boric acid concentrators (DB-T200-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
129	Tank - Boric acid concentrators (DB-T200-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
130	Tank - Boric acid concentrators condensate reservoirs	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
131	Tank - Boric acid concentrators condensate reservoirs	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	C
132	Tank - Boric acid concentrators condensate reservoirs	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	C
133	Tank - Boric acid concentrators condensate reservoirs	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
134	Tank - Clean waste monitor tanks (DB-T23-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
135	Tank - Clean waste monitor tanks (DB-T23-1 & 2)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
136	Tank - Clean waste monitor tanks (DB-T23-1 & 2)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	C
137	Tank - Clean waste monitor tanks (DB-T23-1 & 2)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	C

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
138	Tank - Clean waste monitor tanks (DB-T23-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
139	Tank - Clean waste polishing demineralizers (DB-T21-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
140	Tank - Clean waste polishing demineralizers (DB-T21-1 & 2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E3-16	3.3.1-37	E
141	Tank - Clean waste polishing demineralizers (DB-T21-1 & 2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E3-16	3.3.1-37	E
142	Tank - Clean waste polishing demineralizers (DB-T21-1 & 2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	C 0311

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
143	Tank - Clean waste polishing demineralizers (DB-T21-1 & 2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	C 0311
144	Tank - Clean waste polishing demineralizers (DB-T21-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
145	Tank - Clean waste receiver tanks (DB-T15-1 & 2)	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
146	Tank - Clean waste receiver tanks (DB-T15-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
147	Tank - Clean waste receiver tanks (DB-T15-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
148	Tank - Clean waste receiver tanks (DB-T15-1 & 2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
149	Tank - Clean waste receiver tanks (DB-T15-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
150	Tank - Concentrates demineralizer (DB-T55)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
151	Tank - Concentrates demineralizer (DB-T55)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	C
152	Tank - Concentrates demineralizer (DB-T55)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
153	Tank - Concentrates demineralizer (DB-T55)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C 0329
154	Tank - Concentrates demineralizer (DB-T55)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
155	Tank - Concentrates demineralizer (DB-T55)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
156	Tank - Concentrates storage tank (DB-T16)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
157	Tank - Concentrates storage tank (DB-T16)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
158	Tank - Concentrates storage tank (DB-T16)	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0312 0332
159	Tank - Concentrates storage tank (DB-T16)	Structural integrity	Stainless Steel	Moist air (Internal)	Cracking	One-Time Inspection	N/A	N/A	H 0312
160	Tank - Concentrates storage tank (DB-T16)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
161	Tank - Concentrates storage tank (DB-T16)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	C

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
162	Tank - Concentrates storage tank (DB-T16)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
163	Tank - Concentrates storage tank (DB-T16)	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C 0329
164	Tank - Deborating demineralizers (DB-T20-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
165	Tank - Deborating demineralizers (DB-T20-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
166	Tank - Deborating demineralizers (DB-T20-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
167	Tank - Deborating demineralizers (DB-T20-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
168	Tank - Primary demineralizers (DB-T19-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
169	Tank - Primary demineralizers (DB-T19-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
170	Tank - Primary demineralizers (DB-T19-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
171	Tank - Primary demineralizers (DB-T19-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
172	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
173	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
174	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
175	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
176	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
177	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
178	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
179	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
180	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
181	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
182	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
183	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
184	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
185	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
186	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
187	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
188	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
189	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
190	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
191	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
192	Valve Body	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A 0311
193	Valve Body	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A 0311
194	Valve Body	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E3-16	3.3.1-37	E
195	Valve Body	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E3-16	3.3.1-37	E
196	Valve Body	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
6	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
8	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
10	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
11	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
12	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
13	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
14	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
15	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
16	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
17	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
18	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
19	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
20	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
21	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
22	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
23	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
24	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
25	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
26	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
27	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
28	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
29	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
30	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
31	Pump Casing - Boric acid pumps (DB-P38-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Pump Casing - Boric acid pumps (DB-P38-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
33	Pump Casing - Boric acid pumps (DB-P38-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
34	Pump Casing - Boric acid pumps (DB-P38-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
35	Pump Casing - Boric acid pumps (DB-P38-1 & 2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
36	Pump Casing - Boric acid pumps (DB-P38-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
37	Pump Casing - Hydrazine pump (DB-P40)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
38	Pump Casing - Hydrazine pump (DB-P40)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Pump Casing - Hydrazine pump (DB-P40)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
40	Pump Casing - Hydrazine pump (DB-P40)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
41	Pump Casing - Lithium hydroxide pump (DB-P39)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
42	Pump Casing - Lithium hydroxide pump (DB-P39)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
43	Pump Casing - Lithium hydroxide pump (DB-P39)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
44	Pump Casing - Lithium hydroxide pump (DB-P39)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
45	Strainer (body)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
46	Strainer (body)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
47	Strainer (body)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
48	Strainer (body)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
49	Strainer (body)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
50	Strainer (body)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
51	Strainer (body)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
52	Strainer (body)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
53	Strainer (body)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
54	Strainer (body)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
55	Strainer (screen)	Filtration	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (External)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
56	Strainer (screen)	Filtration	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (External)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
57	Strainer (screen)	Filtration	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (External)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
58	Strainer (screen)	Filtration	Stainless Steel	Treated borated water > 60°C (> 140°F) (External)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
59	Tank - Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0312 0332
60	Tank - Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary	Stainless Steel	Moist air (Internal)	Cracking	One-Time Inspection	N/A	N/A	H 0312
61	Tank - Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60°C (> 140°F) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
62	Tank - Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60°C (> 140°F) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	C
63	Tank - Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
64	Tank - Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C 0329
65	Tank - Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
66	Tank - Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
67	Tank - Boric acid mix tank (DB-T6)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
68	Tank - Boric acid mix tank (DB-T6)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
69	Tank - Boric acid mix tank (DB-T6)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
70	Tank - Boric acid mix tank (DB-T6)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
71	Tank - Lithium hydroxide and hydrazine mix tank (DB-T8)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	C

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Tank - Lithium hydroxide and hydrazine mix tank (DB-T8)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	C
73	Tank - Lithium hydroxide and hydrazine mix tank (DB-T8)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
74	Tank - Lithium hydroxide and hydrazine mix tank (DB-T8)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
75	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
76	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
77	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
78	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
79	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
80	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
81	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
82	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
83	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
84	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
85	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
86	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
87	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
88	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
89	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
90	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
91	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
92	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
93	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
94	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
95	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
96	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
97	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
98	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
99	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
100	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A

Table 3.3.2-6 Aging Management Review Results – Circulating Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
2	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Flexible Connection	Structural integrity	Elastomer	Raw water (Internal)	Hardening and loss of strength	One-Time Inspection	VII.C1-1	3.3.1-75	E
5	Flexible Connection	Structural integrity	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
6	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
7	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
8	Pump Casing – Cooling tower makeup pump (DB-P116-1 & 2)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B

Table 3.3.2-6 Aging Management Review Results – Circulating Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Pump Casing – Cooling tower makeup pump (DB-P116-1 & 2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
10	Strainer (body)	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
11	Strainer (body)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
12	Tubing	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
13	Tubing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
14	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
15	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
6	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
8	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
9	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
10	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
11	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
12	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
13	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
15	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
16	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
17	Filter Housing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
18	Filter Housing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
19	Filter Housing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
20	Filter Housing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
21	Heat Exchanger (channel) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
22	Heat Exchanger (channel) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-5	3.3.1-77	B
23	Heat Exchanger (shell) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	Heat Exchanger (shell) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
25	Heat Exchanger (shell) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
26	Heat Exchanger (tubes) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Heat transfer	Stainless Steel	Raw water (Internal)	Reduction in heat transfer	Open-Cycle Cooling Water	VII.C1-7	3.3.1-83	B

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
27	Heat Exchanger (tubes) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-3	3.3.1-52	B
28	Heat Exchanger (tubes) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	One-Time Inspection	VII.C2-3	3.3.1-52	E 0314
29	Heat Exchanger (tubes) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	D

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
30	Heat Exchanger (tubes) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
31	Heat Exchanger (tubes) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
32	Heat Exchanger (tubesheet) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	D

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
33	Heat Exchanger (tubesheet) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
34	Heat Exchanger (tubesheet) - Component cooling heat exchangers (DB-E22-1, 2 & 3)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
35	Orifice	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
36	Orifice	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
37	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
38	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Orifice	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
40	Orifice	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
41	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
42	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
43	Orifice	Throttling	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
44	Orifice	Throttling	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
45	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
46	Piping	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
47	Piping	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
48	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
49	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
50	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
51	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
52	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314
53	Piping	Pressure boundary	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B 0310
54	Piping	Pressure boundary	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0310 0314
55	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
56	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
57	Piping	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
58	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
59	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
60	Piping	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
61	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
62	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
63	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
64	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
65	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
66	Piping	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B 0310
67	Piping	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0310 0314
68	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
69	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
70	Pump Casing - CRDC booster pumps (DB-P170-1 & 2)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
71	Pump Casing - CRDC booster pumps (DB-P170-1 & 2)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
72	Pump Casing - CRDC booster pumps (DB-P170-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
73	Pump Casing - CRDC booster pumps (DB-P170-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
74	Pump Casing - Component cooling pumps (DB-P43-1, 2 & 3)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
75	Pump Casing - Component cooling pumps (DB-P43-1, 2, 3)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314
76	Pump Casing - Component cooling pumps (DB-P43-1, 2 & 3)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
77	Tank - Chemical pot feeder (DB-T13)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0307
78	Tank - Chemical pot feeder (DB-T13)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
79	Tank - Chemical pot feeder (DB-T13)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
80	Tank - Chemical pot feeder (DB-T13)	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0312 0332
81	Tank - Chemical pot feeder (DB-T13)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
82	Tank - Chemical pot feeder (DB-T13)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
83	Tank - Component cooling surge tank (DB-T12)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
84	Tank - Component cooling surge tank (DB-T12)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314
85	Tank - Component cooling surge tank (DB-T12)	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	C
86	Tank - Component cooling surge tank (DB-T12)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
87	Tank - Component cooling surge tank (DB-T12)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
88	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
89	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
90	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
91	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
92	Tubing	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-4	3.3.1-51	B
93	Tubing	Structural integrity	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-4	3.3.1-51	E 0314
94	Tubing	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
95	Tubing	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
96	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
97	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
98	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
99	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
100	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
101	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
102	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
103	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
104	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
105	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314
106	Valve Body	Pressure boundary	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B 0310
107	Valve Body	Pressure boundary	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0310 0314
108	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
109	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
110	Valve Body	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
111	Valve Body	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
112	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
113	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
114	Valve Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
115	Valve Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314
116	Valve Body	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B 0310
117	Valve Body	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0310 0314
118	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
119	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
6	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
8	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
9	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
10	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
11	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B
12	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
13	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
14	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
16	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
17	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
18	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
19	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
20	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
21	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
23	Damper Housing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
24	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
25	Demister (DB-S432)	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
26	Demister (DB-S432)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
27	Demister (DB-S432)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
28	Demister (DB-S432)	Water removal	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
29	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A 0307

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
30	Duct	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
31	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
32	Fan Housing - Hydrogen dilution system blowers (DB-C62-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0307
33	Fan Housing - Hydrogen dilution system blowers (DB-C62-1 & 2)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	D
34	Fan Housing - Hydrogen dilution system blowers (DB-C62-1 & 2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
35	Fan Housing - Hydrogen dilution system blowers (DB-C62-1 &,2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
36	Filter Housing (DB-F60)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0307

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
37	Filter Housing (DB-F60)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
38	Filter Housing (DB-F60)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
39	Heat Exchanger (shell) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
40	Heat Exchanger (shell) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
41	Heat Exchanger (shell) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
42	Heat Exchanger (shell) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
43	Heat Exchanger (tubes) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Heat transfer	Stainless Steel	Air-indoor uncontrolled (Internal)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
44	Heat Exchanger (tubes) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-3	3.3.1-52	B
45	Heat Exchanger (tubes) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	One-Time Inspection	VII.C2-3	3.3.1-52	E 0314
46	Heat Exchanger (tubes) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
47	Heat Exchanger (tubes) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
48	Heat Exchanger (tubes) - Containment gas analyzer heat exchangers (DB-E197-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
49	Moisture Separator (DB-F131 & 132)	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
50	Moisture Separator (DB-F131 & 132)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
51	Moisture Separator (DB-F131 & 132)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
52	Moisture Separator (DB-F131 & 132)	Water removal	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
53	Moisture Separator (DB-S404-1 & 2)	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F2-3	3.3.1-72	E
54	Moisture Separator (DB-S404-1 & 2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
55	Moisture Separator (DB-S404-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
56	Moisture Separator (DB-S404-1 & 2)	Water removal	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F2-3	3.3.1-72	E
57	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
58	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
59	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
60	Orifice	Throttling	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
61	Orifice	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
62	Orifice	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
63	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
64	Piping	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
65	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
66	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
67	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
68	Piping	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
69	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
70	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
71	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
72	Piping	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
73	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
74	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
75	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
76	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
77	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
78	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
79	Pump Casing - Containment hydrogen analyzer pumps (DB-P267-1, -2, & DB-268-1, -2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
80	Pump Casing - Containment hydrogen analyzer pumps (DB-P267-1, -2, & DB-268-1, -2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
81	Pump Casing - Containment hydrogen analyzer pumps (DB-P267-1, -2, & DB-268-1, -2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
82	Silencer (muffler)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
83	Silencer (muffler)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
84	Silencer (muffler)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
85	Tank - Containment radiation monitor moisture accumulation tank (DB-T216)	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
86	Tank - Containment radiation monitor moisture accumulation tank (DB-T216)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
87	Tank - Containment radiation monitor moisture accumulation tank (DB-T216)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
88	Trap Body	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
89	Trap Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
90	Trap Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
91	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
92	Tubing	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
93	Tubing	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
94	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
95	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
96	Tubing	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
97	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
98	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
99	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
100	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
101	Tubing	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
102	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
103	Valve Body	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
104	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
105	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
106	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
107	Valve Body	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-3	3.3.1-72	E
108	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
109	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-8 Aging Management Review Results – Containment Hydrogen Control System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
110	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
111	Valve Body	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
112	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
113	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
114	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
115	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
116	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
117	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-9 Aging Management Review Results – Containment Purge System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
5	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
6	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
7	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
8	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-9 Aging Management Review Results – Containment Purge System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
10	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
11	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
12	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-10 Aging Management Review Results – Containment Vacuum Relief System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
5	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-10 Aging Management Review Results – Containment Vacuum Relief System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
6	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
7	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
8	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
9	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-11 Aging Management Review Results – Demineralized Water Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
6	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F

Table 3.3.2-11 Aging Management Review Results – Demineralized Water Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
8	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
10	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
11	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
12	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
13	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307

Table 3.3.2-11 Aging Management Review Results – Demineralized Water Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E4-14	3.3.1-24	A
15	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E4-14	3.3.1-24	A
16	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
17	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
18	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
19	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E4-14	3.3.1-24	A
20	Piping	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E4-14	3.3.1-24	A
21	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
22	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-11 Aging Management Review Results – Demineralized Water Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
23	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
24	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E4-17	3.3.1-17	A
25	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E4-17	3.3.1-17	A
26	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
27	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
28	Tank - Lab. demin. water storage tank (DB-T108)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0307
29	Tank - Lab. demin. water storage tank (DB-T108)	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0312 0332
30	Tank - Lab. demin. water storage tank (DB-T108)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E4-14	3.3.1-24	C

Table 3.3.2-11 Aging Management Review Results – Demineralized Water Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
31	Tank - Lab. demin. water storage tank (DB-T108)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E4-14	3.3.1-24	C
32	Tank - Lab. demin. water storage tank (DB-T108)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
33	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E4-14	3.3.1-24	A
34	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E4-14	3.3.1-24	A
35	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
36	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
37	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E4-14	3.3.1-24	A
38	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E4-14	3.3.1-24	A

Table 3.3.2-11 Aging Management Review Results – Demineralized Water Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
40	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
41	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E4-14	3.3.1-24	A
42	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E4-14	3.3.1-24	A
43	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
44	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
45	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E4-17	3.3.1-17	A
46	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E4-17	3.3.1-17	A
47	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-11 Aging Management Review Results – Demineralized Water Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
48	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
2	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
6	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
7	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
9	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
10	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
11	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
12	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
13	Compressor Casing – Turbocharger (DB-C148-1 & 2)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
14	Compressor Casing – Turbocharger (DB-C148-1 & 2)	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Compressor Casing – Turbocharger (DB-C148-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
16	Filter Body	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
17	Filter Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
18	Filter Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A
19	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
20	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
21	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	None	None	N/A	N/A	I 0325
22	Filter Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
23	Filter Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	Flame Arrestor	Pressure boundary	Aluminum	Air-outdoor (Internal)	None	None	N/A	N/A	G
25	Flame Arrestor	Pressure boundary	Aluminum	Air-outdoor (External)	None	None	N/A	N/A	G
26	Flexible Connection	Pressure boundary	Elastomer	Air-outdoor (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.G-2	3.3.1-61	E
27	Flexible Connection	Pressure boundary	Elastomer	Fuel oil (Internal)	None	None	N/A	N/A	F
28	Flexible Connection	Pressure boundary	Elastomer	Lubricating oil (Internal)	None	None	N/A	N/A	F
29	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
30	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
31	Flexible Connection	Pressure boundary	Stainless Steel	Diesel exhaust (Internal)	Cracking	One-Time Inspection	VII.H2-1	3.3.1-06	E
32	Flexible Connection	Pressure boundary	Stainless Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
33	Flexible Connection	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
34	Flexible Connection	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-6	3.3.1-32	A
35	Flexible Connection	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
36	Flexible Connection	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	One-Time Inspection	VII.H2-17	3.3.1-33	A
37	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
38	Heat Exchanger (shell) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
39	Heat Exchanger (shell) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
40	Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-2	3.3.1-52	B
41	Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	One-Time Inspection	VII.C2-2	3.3.1-52	E
42	Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Heat transfer	Copper Alloy > 15% Zn	Air-outdoor (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H
43	Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	Closed Cooling Water Chemistry	N/A	N/A	H
44	Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	One-Time Inspection	N/A	N/A	H

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
45	Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-2	3.3.1-51	B
46	Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-2	3.3.1-51	E 0314
47	Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.H2-12	3.3.1-84	C
48	Heat Exchanger (tubes) – Aftercooler (DB-E196-1A, 1B, 2A, & 2B)	Pressure boundary	Copper Alloy > 15% Zn	Air-outdoor (External)	None	None	N/A	N/A	G
49	Heat Exchanger (shell) – EDG immersion heater	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
50	Heat Exchanger (shell) – EDG immersion heater	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
51	Heat Exchanger (shell) – EDG immersion heater	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
52	Heat Exchanger (channel) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
53	Heat Exchanger (channel) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
54	Heat Exchanger (channel) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
55	Heat Exchanger (shell) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
56	Heat Exchanger (shell) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
57	Heat Exchanger (shell) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
58	Heat Exchanger (tubes) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Heat transfer	Steel	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.F4-9	3.3.1-52	B

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
59	Heat Exchanger (tubes) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Heat transfer	Steel	Closed cycle cooling water (Internal)	Reduction in heat transfer	One-Time Inspection	VII.F4-9	3.3.1-52	E 0314
60	Heat Exchanger (tubes) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Heat transfer	Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.F4-9	3.3.1-52	B
61	Heat Exchanger (tubes) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Heat transfer	Steel	Closed cycle cooling water (External)	Reduction in heat transfer	One-Time Inspection	VII.F4-9	3.3.1-52	E 0314
62	Heat Exchanger (tubes) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
63	Heat Exchanger (tubes) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
64	Heat Exchanger (tubes) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
65	Heat Exchanger (tubes) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
66	Heat Exchanger (tubesheet) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
67	Heat Exchanger (tubesheet) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
68	Heat Exchanger (tubesheet) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
69	Heat Exchanger (tubesheet) – EDG jacket cooling water heat exchanger (DB-E10-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
70	Heat Exchanger (shell) – Lube oil cooler (DB-E94-1 & 2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-5	3.3.1-21	A
71	Heat Exchanger (shell) – Lube oil cooler (DB-E94-1 & 2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-5	3.3.1-21	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Heat Exchanger (shell) – Lube oil cooler (DB-E94-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
73	Heat Exchanger (tubes) – Lube oil cooler (DB-E94-1 & 2)	Heat transfer	Stainless Steel	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-3	3.3.1-52	B
74	Heat Exchanger (tubes) – Lube oil cooler (DB-E94-1 & 2)	Heat transfer	Stainless Steel	Closed cycle cooling water (Internal)	Reduction in heat transfer	One-Time Inspection	VII.C2-3	3.3.1-52	E
75	Heat Exchanger (tubes) – Lube oil cooler (DB-E94-1 & 2)	Heat transfer	Stainless Steel	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	V.D1-10	3.2.1-09	A
76	Heat Exchanger (tubes) – Lube oil cooler (DB-E94-1 & 2)	Heat transfer	Stainless Steel	Lubricating oil (External)	Reduction in heat transfer	One-Time Inspection	V.D1-10	3.2.1-09	A
77	Heat Exchanger (tubes) – Lube oil cooler (DB-E94-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
78	Heat Exchanger (tubes) – Lube oil cooler (DB-E94-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
79	Heat Exchanger (tubes) – Lube oil cooler (DB-E94-1 & 2)	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	C
80	Heat Exchanger (tubes) – Lube oil cooler (DB-E94-1 & 2)	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	One-Time Inspection	VII.H2-17	3.3.1-33	C
81	Piping	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
82	Piping	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-6	3.3.1-32	A
83	Piping	Pressure boundary	Stainless Steel	Fuel oil (External)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
84	Piping	Pressure boundary	Stainless Steel	Fuel oil (External)	Loss of material	One-Time Inspection	VII.H1-6	3.3.1-32	A
85	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
86	Piping	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
87	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
88	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.H2-23	3.3.1-47	E 0314
89	Piping	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-2	3.3.1-53	E
90	Piping	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
91	Piping	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
92	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
93	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A
94	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
95	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
96	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
97	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
98	Piping	Pressure boundary	Steel	Fuel oil (External)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B 0326
99	Piping	Pressure boundary	Steel	Fuel oil (External)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A 0326
100	Piping	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
101	Piping	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
102	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.H1-9	3.3.1-19	A
103	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
104	Piping	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
105	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
106	Piping	Structural integrity	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
107	Piping	Structural integrity	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
108	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
109	Piping	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
110	Pump Casing – DC turbo oil pump (DB-P147-5 & 6)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
111	Pump Casing – DC turbo oil pump (DB-P147-5 & 6)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
112	Pump Casing – DC turbo oil pump (DB-P147-5 & 6)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
113	Pump Casing – Engine-driven main lube oil pump (DB-P150-1 & 2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
114	Pump Casing – Engine-driven main lube oil pump (DB-P150-1 & 2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
115	Pump Casing – Engine-driven main lube oil pump (DB-P150-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
116	Pump Casing – Engine-driven piston cooling pump (DB-P265-1 & 2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
117	Pump Casing – Engine-driven piston cooling pump (DB-P265-1 & 2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
118	Pump Casing – Engine-driven piston cooling pump (DB-P265-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
119	Pump Casing – Engine-driven scavenger pump (DB-P264-1 & 2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
120	Pump Casing – Engine-driven scavenger pump (DB-P264-1 & 2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
121	Pump Casing – Engine-driven scavenger pump (DB-P264-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
122	Pump Casing – Transfer pump (DB-P195-1 & 2)	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
123	Pump Casing – Transfer pump (DB-P195-1 & 2)	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-6	3.3.1-32	A
124	Pump Casing – Transfer pump (DB-P195-1 & 2)	Pressure boundary	Stainless Steel	Fuel oil (External)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
125	Pump Casing – Transfer pump (DB-P195-1 & 2)	Pressure boundary	Stainless Steel	Fuel oil (External)	Loss of material	One-Time Inspection	VII.H1-6	3.3.1-32	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
126	Silencer (exhaust)	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
127	Silencer (exhaust)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
128	Silencer (intake)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
129	Silencer (intake)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
130	Strainer (body)	Pressure boundary	Aluminum	Air (Internal)	None	None	N/A	N/A	G
131	Strainer (body)	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	N/A	N/A	G
132	Strainer (body)	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	One-Time Inspection	N/A	N/A	G
133	Strainer (body)	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	VII.J-1	3.3.1-95	A
134	Strainer (body)	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
135	Strainer (body)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
136	Strainer (body)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A
137	Strainer (body)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
138	Strainer (body)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
139	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
140	Strainer (body)	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
141	Strainer (body)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
142	Strainer (screen)	Filtration	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
143	Strainer (screen)	Filtration	Stainless Steel	Fuel oil (External)	Loss of material	Fuel Oil Chemistry	VII.H2-16	3.3.1-32	B

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
144	Strainer (screen)	Filtration	Stainless Steel	Fuel oil (External)	Loss of material	One-Time Inspection	VII.H2-16	3.3.1-32	A
145	Strainer (screen)	Filtration	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
146	Strainer (screen)	Filtration	Stainless Steel	Lubricating oil (External)	Loss of material	One-Time Inspection	VII.H2-17	3.3.1-33	A
147	Tank – EDG day tank (DB-T46-1 & 2)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.H1-8	3.3.1-60	C 0307
148	Tank – EDG day tank (DB-T46-1 & 2)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
149	Tank – EDG day tank (DB-T46-1 & 2)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A
150	Tank – EDG day tank (DB-T46-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
151	Tank – EDG fuel oil storage tank (DB-T153-1 & 2)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.H1-8	3.3.1-60	C 0307
152	Tank – EDG fuel oil storage tank (DB-T153-1 & 2)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
153	Tank – EDG fuel oil storage tank (DB-T153-1 & 2)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A
154	Tank – EDG fuel oil storage tank (DB-T153-1 & 2)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.H1-8	3.3.1-60	C
155	Tank – EDG fuel oil storage tank (DB-T153-1 & 2)	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.H1-9	3.3.1-19	C
156	Tank – EDG starting air receiver (DB-T86-1, 2, 3, & 4)	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
157	Tank – EDG starting air receiver (DB-T86-1, 2, 3, & 4)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
158	Tank – Jacket water expansion tank (DB-T121-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
159	Tank – Jacket water expansion tank (DB-T121-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
160	Tank – Jacket water expansion tank (DB-T121-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.H2-23	3.3.1-47	E 0314
161	Tank – Jacket water expansion tank (DB-T121-1 & 2)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0313
162	Tank – Jacket water expansion tank (DB-T121-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
163	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
164	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
165	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
166	Tubing	Pressure boundary	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
167	Tubing	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
168	Tubing	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-6	3.3.1-32	A
169	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
170	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-17	3.3.1-33	A
171	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
172	Tubing	Pressure boundary	Stainless Steel	Fuel oil (External)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
173	Tubing	Pressure boundary	Stainless Steel	Fuel oil (External)	Loss of material	One-Time Inspection	VII.H1-6	3.3.1-32	A
174	Tubing	Structural integrity	Stainless Steel	Air-outdoor (Internal)	None	None	N/A	N/A	G

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
175	Tubing	Structural integrity	Stainless Steel	Diesel exhaust (Internal)	Cracking	One-Time Inspection	VII.H2-1	3.3.1-06	E
176	Tubing	Structural integrity	Stainless Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
177	Tubing	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
178	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
179	Valve Body	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-16	3.3.1-32	B
180	Valve Body	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-16	3.3.1-32	A
181	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
182	Valve Body	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
183	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
184	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.H2-23	3.3.1-47	E 0314
185	Valve Body	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-2	3.3.1-53	E
186	Valve Body	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
187	Valve Body	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
188	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
189	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A
190	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
191	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
192	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-12 Aging Management Review Results – Emergency Diesel Generators System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
193	Valve Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
194	Valve Body	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
195	Valve Body	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
196	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
197	Valve Body	Structural integrity	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
198	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-13 Aging Management Review Results – Emergency Ventilation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A 0301
5	Damper Housing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
6	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
7	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A 0301
8	Duct	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-13 Aging Management Review Results – Emergency Ventilation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
10	Fan Housing – Emergency ventilation fans (DB-C30-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A 0301
11	Fan Housing – Emergency ventilation fans (DB-C30-1 & 2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
12	Fan Housing – Emergency ventilation fans (DB-C30-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
13	Filter Housing – Emergency ventilation system filter units (DB-F19-1 & 2)	Pressure boundary	Glass	Air-indoor uncontrolled (Internal)	None	None	VII.J-8	3.3.1-93	C 0301
14	Filter Housing – Emergency ventilation system filter units (DB-F19-1 & 2)	Pressure boundary	Glass	Air with borated water leakage (External)	None	None	N/A	N/A	G

Table 3.3.2-13 Aging Management Review Results – Emergency Ventilation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Filter Housing – Emergency ventilation system filter units (DB-F19-1 & 2)	Pressure boundary	Glass	Air-indoor uncontrolled (External)	None	None	VII.J-8	3.3.1-93	C
16	Filter Housing – Emergency ventilation system filter units (DB-F19-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A 0301
17	Filter Housing – Emergency ventilation system filter units (DB-F19-1 & 2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
18	Filter Housing – Emergency ventilation system filter units (DB-F19-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F2-2	3.3.1-56	A
19	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
20	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E

Table 3.3.2-13 Aging Management Review Results – Emergency Ventilation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
21	Mechanical Sealant	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
22	Mechanical Sealant	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
23	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0301
24	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
25	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
26	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0301
27	Tubing	Pressure boundary	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
28	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
29	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0301

Table 3.3.2-13 Aging Management Review Results – Emergency Ventilation System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
30	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A 0305
31	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
32	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0301
33	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A 0305
34	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
Fire Protection System									
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
6	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
7	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
9	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
10	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
11	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
12	Bolting	Pressure boundary	Steel	Raw water (External)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	G 0324
13	Bolting	Pressure boundary	Steel	Raw water (External)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-19	3.3.1-76	E 0324
14	Bolting	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	C
15	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
16	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
17	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
18	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
19	Heat Exchanger (channel) – Fire water storage tank heat exchanger (DB-E52)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.G-5	3.3.1-59	A
20	Heat Exchanger (channel) – Fire water storage tank heat exchanger (DB-E52)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	C

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
21	Heat Exchanger (shell) – Fire water storage tank heat exchanger (DB-E52)	Pressure boundary	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-8	3.4.1-37	E 0315
22	Heat Exchanger (shell) – Fire water storage tank heat exchanger (DB-E52)	Pressure boundary	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-8	3.4.1-37	C
23	Heat Exchanger (shell) – Fire water storage tank heat exchanger (DB-E52)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.G-5	3.3.1-59	A
24	Heat Exchanger (tubes) – Fire water storage tank heat exchanger (DB-E52)	Heat transfer	Stainless Steel	Raw water (Internal)	Reduction in heat transfer	Collection, Drainage, and Treatment Components Inspection	VII.G-7	3.3.1-83	E

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
25	Heat Exchanger (tubes) – Fire water storage tank heat exchanger (DB-E52)	Heat transfer	Stainless Steel	Steam (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	G
26	Heat Exchanger (tubesheet) - Fire water storage tank heat exchanger (DB-E52)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	C
27	Heat Exchanger (tubesheet) - Fire water storage tank heat exchanger (DB-E52)	Pressure boundary	Steel	Steam (External)	Loss of material	One-Time Inspection	VIII.B1-8	3.4.1-37	E 0315
28	Heat Exchanger (tubesheet) - Fire water storage tank heat exchanger (DB-E52)	Pressure boundary	Steel	Steam (External)	Loss of material	PWR Water Chemistry	VIII.B1-8	3.4.1-37	C
29	Hydrant	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
30	Hydrant	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
31	Hydrant	Pressure boundary	Gray Cast Iron	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
32	Hydrant	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A
33	Hydrant	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Selective Leaching Inspection	VII.G-15	3.3.1-85	A
34	Orifice	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
35	Orifice	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
36	Orifice	Throttling	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
37	Piping	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
38	Piping	Pressure boundary	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Piping	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
40	Piping	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
41	Piping	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
42	Piping	Pressure boundary	Gray Cast Iron	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
43	Piping	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A
44	Piping	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Selective Leaching Inspection	VII.G-15	3.3.1-85	A
45	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	C 0307
46	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
47	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
48	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
49	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
50	Piping	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
51	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
52	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
53	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
54	Piping	Pressure boundary	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
55	Piping	Pressure boundary	Steel	Raw water (External)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A 0323
56	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
57	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
58	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
59	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
60	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Moist air (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	H 0321
61	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313
62	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
63	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
64	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
65	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Moist air (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G 0321
66	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Moist air (External)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313 0322
67	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
68	Pump Casing – Diesel fire pump (DB-P5-2)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
69	Pump Casing – Electric fire pump (DB-P5-1)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
70	Pump Casing – Electric fire pump (DB-P5-1)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
71	Pump Casing – Electric fire pump (DB-P5-1)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Pump Casing – Fire water storage tank recirculation pump (DB-P114)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
73	Pump Casing – Fire water storage tank recirculation pump (DB-P114)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
74	Pump Casing – Fire water storage tank recirculation pump (DB-P114)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
75	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	VIII.I-2	3.4.1-41	A 0307
76	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Air-outdoor (Internal)	None	None	N/A	N/A	G
77	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Fire Water	N/A	N/A	H
78	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
79	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-13	3.3.1-84	A
80	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
81	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
82	Spray Nozzle	Pressure boundary	Copper Alloy > 15% Zn	Air-outdoor (External)	None	None	N/A	N/A	G
83	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	VIII.I-2	3.4.1-41	A 0307
84	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Air-outdoor (Internal)	None	None	N/A	N/A	G
85	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Fire Water	N/A	N/A	H
86	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
87	Spray Nozzle	Spray	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-13	3.3.1-84	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
88	Spray Nozzle	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Fire Water	N/A	N/A	H
89	Spray Nozzle	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
90	Spray Nozzle	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-13	3.3.1-84	A
91	Spray Nozzle	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
92	Spray Nozzle	Structural integrity	Copper Alloy > 15% Zn	Air-outdoor (External)	None	None	N/A	N/A	G
93	Strainer (body)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
94	Strainer (body)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
95	Strainer (body)	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
96	Strainer (body)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
97	Strainer (body)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
98	Strainer (body)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
99	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
100	Strainer (screen)	Filtration	Copper Alloy > 15% Zn	Raw water (External)	Cracking	Fire Water	N/A	N/A	H
101	Strainer (screen)	Filtration	Copper Alloy > 15% Zn	Raw water (External)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
102	Strainer (screen)	Filtration	Copper Alloy > 15% Zn	Raw water (External)	Loss of material	Selective Leaching Inspection	VII.G-13	3.3.1-84	A
103	Strainer (screen)	Filtration	Stainless Steel	Raw water (External)	Loss of material	Fire Water	VII.G-19	3.3.1-69	A
104	Tank – Fire water storage tank (DB-T81)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313
105	Tank – Fire water storage tank (DB-T81)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	C

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
106	Tank – Fire water storage tank (DB-T81)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Aboveground Steel Tanks Inspection	VII.H1-11	3.3.1-40	A
107	Tank – Retard chamber	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	VIII.I-2	3.4.1-41	C 0307
108	Tank – Retard chamber	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	C
109	Tank – Retard chamber	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	C
110	Tank – Retard chamber	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
111	Tank – Retard chamber	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
112	Tank – Retard chamber	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
113	Tubing	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
114	Tubing	Pressure boundary	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
115	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
116	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
117	Tubing	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
118	Tubing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
119	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
120	Tubing	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
121	Tubing	Structural integrity	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
122	Tubing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
123	Valve Body	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (Internal)	None	None	VIII.I-2	3.4.1-41	A 0307
124	Valve Body	Pressure boundary	Copper Alloy	Air-outdoor (Internal)	None	None	N/A	N/A	G
125	Valve Body	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
126	Valve Body	Pressure boundary	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
127	Valve Body	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
128	Valve Body	Pressure boundary	Copper Alloy	Air-outdoor (External)	None	None	N/A	N/A	G
129	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	VIII.I-2	3.4.1-41	A
130	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-outdoor (Internal)	None	None	N/A	N/A	G

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
131	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Fire Water	N/A	N/A	H
132	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A
133	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-13	3.3.1-84	A
134	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
135	Valve Body	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
136	Valve Body	Pressure boundary	Gray Cast Iron	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
137	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
138	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
139	Valve Body	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
140	Valve Body	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
141	Valve Body	Pressure boundary	Gray Cast Iron	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
142	Valve Body	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A
143	Valve Body	Pressure boundary	Gray Cast Iron	Soil (External)	Loss of material	Selective Leaching Inspection	VII.G-15	3.3.1-85	A
144	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
145	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
146	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
147	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
148	Valve Body	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Fire Water	VII.G-12	3.3.1-70	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
149	Valve Body	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
150	Valve Body	Structural integrity	Copper Alloy	Air-outdoor (External)	None	None	N/A	N/A	G
151	Valve Body	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
152	Valve Body	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
153	Valve Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
Fire Pump Diesel Engine and Associated Components									
154	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
155	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
156	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
157	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
158	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
159	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
160	Compressor Casing – Turbocharger	Pressure boundary	Aluminum	Air-indoor uncontrolled (Internal)	None	None	V.F-2	3.2.1-50	A 0307
161	Compressor Casing – Turbocharger	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	V.F-2	3.2.1-50	A
162	Compressor Casing – Turbocharger	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
163	Compressor Casing – Turbocharger	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
164	Compressor Casing – Turbocharger	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
165	Filter Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-24	3.3.1-68	E
166	Filter Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
167	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	None	None	N/A	N/A	I 0325
168	Filter Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
169	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
170	Flexible Connection	Pressure boundary	Elastomer	Fuel oil (Internal)	None	None	N/A	N/A	F
171	Flexible Connection	Pressure boundary	Elastomer	Lubricating oil (Internal)	None	None	N/A	N/A	F
172	Flexible Connection	Pressure boundary	Elastomer	Raw water (Internal)	Hardening and loss of strength	One-Time Inspection	VII.C1-1	3.3.1-75	E

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
173	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
174	Flexible Connection	Pressure boundary	Stainless Steel	Diesel exhaust (Internal)	Cracking	One-Time Inspection	VII.H2-1	3.3.1-06	E
175	Flexible Connection	Pressure boundary	Stainless Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
176	Flexible Connection	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.G-17	3.3.1-32	B
177	Flexible Connection	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.G-17	3.3.1-32	A
178	Flexible Connection	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-19	3.3.1-69	E
179	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
180	Gear Housing	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.G-22	3.3.1-14	C 0304

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
181	Gear Housing	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.G-22	3.3.1-14	C
182	Gear Housing	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
183	Heat Exchanger (shell) – Gear housing oil cooler	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	N/A	N/A	G
184	Heat Exchanger (shell) – Gear housing oil cooler	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	One-Time Inspection	N/A	N/A	G
185	Heat Exchanger (shell) – Gear housing oil cooler	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	V.F-2	3.2.1-50	C
186	Heat Exchanger (tubes) – Gear housing oil cooler	Heat transfer	Copper Alloy	Raw water (Internal)	Reduction in heat transfer	Collection, Drainage, and Treatment Components Inspection	VII.C1-6	3.3.1-83	E

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
187	Heat Exchanger (tubes) – Gear housing oil cooler	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	V.A-12	3.2.1-09	A
188	Heat Exchanger (tubes) – Gear housing oil cooler	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	One-Time Inspection	V.A-12	3.2.1-09	A
189	Heat Exchanger (tubes) – Gear housing oil cooler	Pressure boundary	Copper Alloy	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-12	3.3.1-70	E
190	Heat Exchanger (tubes) – Gear housing oil cooler	Pressure boundary	Copper Alloy	Lubricating oil (External)	None	None	VII.G-11	3.3.1-26	I 0302
191	Heat Exchanger (shell) – Radiator	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H
192	Heat Exchanger (shell) – Radiator	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-12	3.3.1-70	E

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
193	Heat Exchanger (shell) – Radiator	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-4	3.3.1-84	A
194	Heat Exchanger (shell) – Radiator	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	C
195	Heat Exchanger (tubes) – Radiator	Heat transfer	Copper Alloy > 15% Zn	Raw water (Internal)	Reduction in heat transfer	Collection, Drainage, and Treatment Components Inspection	VII.C1-6	3.3.1-83	E
196	Heat Exchanger (tubes) – Radiator	Heat transfer	Copper Alloy > 15% Zn	Raw water (External)	Reduction in heat transfer	Collection, Drainage, and Treatment Components Inspection	VII.C1-6	3.3.1-83	E
197	Heat Exchanger (tubes) – Radiator	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H
198	Heat Exchanger (tubes) – Radiator	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-12	3.3.1-70	E 0303

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
199	Heat Exchanger (tubes) – Radiator	Pressure boundary	Copper Alloy > 15% Zn	Raw water (External)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H
200	Heat Exchanger (tubes) – Radiator	Pressure boundary	Copper Alloy > 15% Zn	Raw water (External)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-12	3.3.1-70	E 0303
201	Piping	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
202	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.G-22	3.3.1-14	A
203	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.G-22	3.3.1-14	A
204	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
205	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
206	Silencer (exhaust)	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
207	Silencer (exhaust)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
208	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
209	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (External)	Loss of material	One-Time Inspection	VII.H2-17	3.3.1-33	A
210	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
211	Tubing	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
212	Tubing	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A
213	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.G-22	3.3.1-14	A
214	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.G-22	3.3.1-14	A

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
215	Tubing	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-24	3.3.1-68	E
216	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
217	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-24	3.3.1-68	E
218	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H
219	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-12	3.3.1-70	E
220	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-4	3.3.1-84	C
221	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	C

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
222	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.G-22	3.3.1-14	A
223	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.G-22	3.3.1-14	A
224	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-15 Aging Management Review Results – Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	G
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
5	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
6	Flexible Connection	Pressure boundary	Elastomer	Fuel oil (Internal)	None	None	N/A	N/A	F
7	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
8	Piping	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-3	3.3.1-32	B
9	Piping	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-3	3.3.1-32	A

Table 3.3.2-15 Aging Management Review Results – Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
10	Piping	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
11	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
12	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A
13	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
14	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
15	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.H1-9	3.3.1-19	A
16	Pump Casing – Diesel Oil Transfer Pump (DB-P8-1)	Pressure boundary	Gray cast iron	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
17	Pump Casing – Diesel Oil Transfer Pump (DB-P8-1)	Pressure boundary	Gray cast iron	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A
18	Pump Casing – Diesel Oil Transfer Pump (DB-P8-1)	Pressure boundary	Gray cast iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-15 Aging Management Review Results – Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
19	Strainer (body)	Pressure boundary	Gray cast iron	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
20	Strainer (body)	Pressure boundary	Gray cast iron	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A
21	Strainer (body)	Pressure boundary	Gray cast iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
22	Strainer (screen)	Filtration	Stainless Steel	Fuel oil (External)	Loss of material	Fuel Oil Chemistry	VII.H2-16	3.3.1-32	B
23	Strainer (screen)	Filtration	Stainless Steel	Fuel oil (External)	Loss of material	One-Time Inspection	VII.H2-16	3.3.1-32	A
24	Tank – Diesel Oil Storage Tank (DB-T45)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
25	Tank – Diesel Oil Storage Tank (DB-T45)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
26	Tank – Diesel Oil Storage Tank (DB-T45)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A
27	Tank – Diesel Oil Storage Tank (DB-T45)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-15 Aging Management Review Results – Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
28	Tank – Diesel Oil Storage Tank (DB-T45)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Aboveground Steel Tanks Inspection	VII.H1-11	3.3.1-40	A 0333
29	Tank – Fire pump diesel day tank (DB-T47)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
30	Tank – Fire pump diesel day tank (DB-T47)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
31	Tank – Fire pump diesel day tank (DB-T47)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A
32	Tank – Fire pump diesel day tank (DB-T47)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
33	Tubing	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-3	3.3.1-32	B
34	Tubing	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-3	3.3.1-32	A
35	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A

Table 3.3.2-15 Aging Management Review Results – Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
36	Tubing	Pressure boundary	Copper Alloy	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	N/A	N/A	G
37	Tubing	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
38	Tubing	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A
39	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
40	Valve Body	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-3	3.3.1-32	B
41	Valve Body	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-3	3.3.1-32	A
42	Valve Body	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
43	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Fuel oil (Internal)	Cracking	Fuel Oil Chemistry	N/A	N/A	H
44	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Fuel oil (Internal)	Cracking	One-Time Inspection	N/A	N/A	H

Table 3.3.2-15 Aging Management Review Results – Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
45	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-9	3.3.1-32	B
46	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-9	3.3.1-32	A
47	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
48	Valve Body	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-6	3.3.1-32	B
49	Valve Body	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-6	3.3.1-32	A
50	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
51	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
52	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H1-10	3.3.1-20	A
53	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-15 Aging Management Review Results – Fuel Oil System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
54	Valve Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
6	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
7	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Compressor Casing – Waste gas compresssor (DB-C10-1 & 2)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
10	Compressor Casing – Waste gas compresssor (DB-C10-1 & 2)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
11	Compressor Casing – Waste gas compresssor (DB-C10-1 & 2)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
12	Compressor Casing – Waste gas compresssor (DB-C10-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
13	Compressor Casing – Waste gas compresssor (DB-C10-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
14	Filter Housing - Waste gas absolute filter (DB-F8)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
15	Filter Housing - Waste gas absolute filter (DB-F8)	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E
16	Filter Housing - Waste gas absolute filter (DB-F8)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
17	Filter Housing - Waste gas absolute filter (DB-F8)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
18	Heat Exchanger (shell) – Aftercooler (DB-C10-1 & 2)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
19	Heat Exchanger (shell) – Aftercooler (DB-C10-1 & 2)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
20	Heat Exchanger (shell) – Aftercooler (DB-C10-1 & 2)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.C2-8	3.3.1-85	C
21	Heat Exchanger (shell) – Aftercooler (DB-C10-1 & 2)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
22	Heat Exchanger (shell) – Aftercooler (DB-C10-1 & 2)	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
23	Orifice	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
25	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
26	Orifice	Throttling	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E
27	Orifice	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
28	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
29	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
30	Piping	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
31	Piping	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
33	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
34	Piping	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
35	Piping	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E
36	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
37	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
38	Pump Casing - Waste gas surge tank transfer pump (DB-P168)	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Pump Casing - Waste gas surge tank transfer pump (DB-P168)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
40	Pump Casing - Waste gas surge tank transfer pump (DB-P168)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
41	Tank - Waste gas decay tanks (DB-T25-1, -2, & -3)	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
42	Tank - Waste gas decay tanks (DB-T25-1, -2, & -3)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
43	Tank - Waste gas decay tanks (DB-T25-1, -2, & -3)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
44	Tank - Waste gas surge tank (DB-T24)	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
45	Tank - Waste gas surge tank (DB-T24)	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E
46	Tank - Waste gas surge tank (DB-T24)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
47	Tank - Waste gas surge tank (DB-T24)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
48	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
49	Tubing	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E
50	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
51	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
52	Tubing	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Tubing	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E
54	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
55	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
56	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
57	Valve Body	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E
58	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
59	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
60	Valve Body	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-16 Aging Management Review Results – Gaseous Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
61	Valve Body	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.D-4	3.3.1-54	E
62	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
63	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-17 Aging Management Review Results – Instrument Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Bolting	Structural Integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
5	Bolting	Structural Integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
6	Bolting	Structural Integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
7	Drain Trap Body	Structural Integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
8	Drain Trap Body	Structural Integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A

Table 3.3.2-17 Aging Management Review Results – Instrument Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Drain Trap Body	Structural Integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	Selective Leaching Inspection	VII.F1-18	3.3.1-85	A
10	Drain Trap Body	Structural Integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-2	3.3.1-53	E 0319
11	Moisture Separator Body	Structural Integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
12	Moisture Separator Body	Structural Integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A
13	Moisture Separator Body	Structural Integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	Selective Leaching Inspection	VII.F1-18	3.3.1-85	A
14	Moisture Separator Body	Structural Integrity	Gray Cast Iron	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-2	3.3.1-53	E 0319
15	Piping	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0318
16	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
17	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A

Table 3.3.2-17 Aging Management Review Results – Instrument Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
18	Piping	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0307
19	Piping	Structural integrity	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A 0318
20	Piping	Structural integrity	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
21	Piping	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
22	Tubing	Structural integrity	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A 0318
23	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
24	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0307
25	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
26	Tubing	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G

Table 3.3.2-17 Aging Management Review Results – Instrument Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
27	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
28	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
29	Tubing	Structural integrity	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-4	3.3.1-54	E 0319
30	Valve Body	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0318
31	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
32	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
33	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (Internal)	None	None	V.F-3	3.2.1-53	A 0307
34	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A 0318
35	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A

Table 3.3.2-17 Aging Management Review Results – Instrument Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
36	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
37	Valve Body	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
38	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
39	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bearing Housing	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.E1-19	3.3.1-14	C 0304
2	Bearing Housing	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.E1-19	3.3.1-14	C
3	Bearing Housing	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
4	Bearing Housing	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
5	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
6	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
7	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
10	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
11	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
12	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
13	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
14	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
16	Filter Housing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
17	Filter Housing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
18	Filter Housing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
19	Filter Housing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
20	Gear Housing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.E1-19	3.3.1-14	C
21	Gear Housing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.E1-19	3.3.1-14	C
22	Gear Housing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
23	Gear Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
24	Heat Exchanger (channel) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-9	3.3.1-07	E 0315
25	Heat Exchanger (channel) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-9	3.3.1-07	A
26	Heat Exchanger (channel) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
27	Heat Exchanger (channel) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C 0329

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
28	Heat Exchanger (channel) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
29	Heat Exchanger (channel) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
30	Heat Exchanger (shell) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
31	Heat Exchanger (shell) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Heat Exchanger (shell) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
33	Heat Exchanger (shell) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
34	Heat Exchanger (shell) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-6	3.3.1-48	B
35	Heat Exchanger (shell) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-6	3.3.1-48	E 0314

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
36	Heat Exchanger (shell) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-6	3.3.1-48	B
37	Heat Exchanger (shell) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-6	3.3.1-48	E 0314
38	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Reduction in heat transfer	Lubricating Oil Analysis	N/A	N/A	H
39	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
40	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.F1-12	3.3.1-52	B
41	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Reduction in heat transfer	One-Time Inspection	VII.F1-12	3.3.1-52	E 0314
42	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.E1-12	3.3.1-26	C

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
43	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.E1-12	3.3.1-26	C
44	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Cracking	Closed Cooling Water Chemistry	N/A	N/A	H
45	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Cracking	One-Time Inspection	N/A	N/A	H

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
46	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.E1-2	3.3.1-51	B
47	Heat Exchanger (tubes) – Makeup pump lube oil coolers (DB-E188-1, 2 & DB-E212-1, 2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	VII.E1-2	3.3.1-51	E 0314
48	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Heat transfer	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H 0315
49	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Heat transfer	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Reduction in heat transfer	PWR Water Chemistry	N/A	N/A	H

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
50	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-9	3.3.1-07	E 0315
51	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-9	3.3.1-07	A
52	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
53	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C 0329
54	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.E3-5	3.3.1-52	B

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
55	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Heat transfer	Stainless Steel	Closed cycle cooling water (External)	Reduction in heat transfer	One-Time Inspection	VII.E3-5	3.3.1-52	E 0314
56	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
57	Heat Exchanger (tubes) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
58	Heat Exchanger (tubesheet) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-9	3.3.1-07	E 0315
59	Heat Exchanger (tubesheet) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-9	3.3.1-07	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
60	Heat Exchanger (tubesheet) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
61	Heat Exchanger (tubesheet) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C 0329
62	Heat Exchanger (tubesheet) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
63	Heat Exchanger (tubesheet) – Seal return coolers (DB-E26-1 & 2)	Pressure boundary	Stainless Steel	Closed cycle cooling water (External)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
64	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
65	Orifice	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
66	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
67	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
68	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
69	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
70	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
71	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Orifice	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
73	Orifice	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
74	Orifice	Throttling	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
75	Orifice	Throttling	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
76	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
77	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
78	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
79	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
80	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
81	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
82	Piping	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
83	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
84	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
85	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.E1-1	3.3.1-89	A
86	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
87	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.E1-19	3.3.1-14	A
88	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.E1-19	3.3.1-14	A
89	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
90	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E
91	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
92	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
93	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
94	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
95	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
96	Piping	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
97	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
98	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
99	Pump Casing – Makeup pump lubrication oil pumps (DB-P371A-D & DB-P372A-D)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.E1-19	3.3.1-14	A 0304
100	Pump Casing – Makeup pump lubrication oil pumps (DB-P371A-D & DB-P372A-D)	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.E1-19	3.3.1-14	A
101	Pump Casing – Makeup pump lubrication oil pumps (DB-P371A-D & DB-P372A-D)	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
102	Pump Casing – Makeup pump lubrication oil pumps (DB-P371A-D & DB-P372A-D)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
103	Pump Casing – Makeup pumps (DB-P37-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
104	Pump Casing – Makeup pumps (DB-P37-1 & 2)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
105	Pump Casing – Makeup pumps (DB-P37-1 & 2)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
106	Pump Casing – Makeup pumps (DB-P37-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
107	Strainer (body)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
108	Strainer (body)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
109	Strainer (body)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
110	Strainer (body)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
111	Strainer (screen)	Filtration	Stainless Steel	Treated borated water (External)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
112	Strainer (screen)	Filtration	Stainless Steel	Treated borated water (External)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
113	Strainer (body)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.E1-1	3.3.1-89	A
114	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
115	Strainer (body)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.E1-19	3.3.1-14	A
116	Strainer (body)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.E1-19	3.3.1-14	A
117	Strainer (screen)	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.E1-19	3.3.1-14	A
118	Strainer (screen)	Pressure boundary	Steel	Lubricating oil (External)	Loss of material	One-Time Inspection	VII.E1-19	3.3.1-14	A
119	Tank – Air volume tanks	Pressure boundary	Aluminum	Dried air (Internal)	None	None	N/A	N/A	G 0318
120	Tank – Air volume tanks	Pressure boundary	Aluminum	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.E1-10	3.3.1-88	C
121	Tank – Air volume tanks	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	V.F-2	3.2.1-50	A
122	Tank – Air volume tanks	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	C 0318
123	Tank – Makeup pump lubricating oil reservoir	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.E1-19	3.3.1-14	C

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
124	Tank – Makeup pump lubricating oil reservoir	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.E1-19	3.3.1-14	C
125	Tank – Makeup pump lubricating oil reservoir	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
126	Tank – Makeup pump lubricating oil reservoir	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
127	Tank – Air volume tanks (DB-T6406 & DB-T6407)	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	C 0318
128	Tank – Air volume tanks (DB-T6406 & DB-T6407)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
129	Tank – Air volume tanks (DB-T6406 & DB-T6407)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
130	Tank – Makeup storage tank (DB-T4_MU)	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
131	Tank – Makeup storage tank (DB-T4_MU)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
132	Tank – Makeup storage tank (DB-T4_MU)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
133	Tank – Makeup storage tank (DB-T4_MU)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
134	Tank – Makeup storage tank (DB-T4_MU)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
135	Tank – Purification demineralizers (DB-T5-1, 2, & 3)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
136	Tank – Purification demineralizers (DB-T5-1, 2, & 3)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
137	Tank – Purification demineralizers (DB-T5-1, 2, & 3)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
138	Tank – Purification demineralizers (DB-T5-1, 2, & 3)	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
139	Tubing	Pressure boundary	Stainless Steel	Dried air (Internal)	None	None	VII.J-18	3.3.1-98	A
140	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
141	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
142	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
143	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
144	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
145	Tubing	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
146	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
147	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
148	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.E1-19	3.3.1-14	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
149	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.E1-19	3.3.1-14	A
150	Tubing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.E1-1	3.3.1-89	A
151	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
152	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
153	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
154	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
155	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
156	Valve Body	Pressure boundary	Copper Alloy	Lubricating oil (Internal)	None	None	VII.E1-12	3.3.1-26	I 0302

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
157	Valve Body	Pressure boundary	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
158	Valve Body	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
159	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
160	Valve Body	Pressure boundary	Stainless Steel	Dried air (Internal)	None	None	VII.J-18	3.3.1-98	A
161	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
162	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
163	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
164	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
165	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
166	Valve Body	Pressure boundary	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
167	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
168	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
169	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
170	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
171	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
172	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
173	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
174	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
175	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
176	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
177	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
178	Venturi	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
179	Venturi	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
180	Venturi	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
181	Venturi	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
182	Venturi	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
183	Venturi	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
184	Venturi	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
185	Venturi	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
186	Venturi	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
187	Venturi	Throttling	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
188	Venturi	Throttling	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-18 Aging Management Review Results – Makeup and Purification System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
189	Venturi	Throttling	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-19 Aging Management Review Results – Makeup Water Treatment System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
2	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Piping	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-9	3.3.1-81	E
6	Piping	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
7	Piping	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A

Table 3.3.2-19 Aging Management Review Results – Makeup Water Treatment System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-19	3.3.1-76	E
9	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
10	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
11	Tubing	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-9	3.3.1-81	E
12	Tubing	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
13	Tubing	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
14	Tubing	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H

Table 3.3.2-19 Aging Management Review Results – Makeup Water Treatment System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Tubing	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-9	3.3.1-81	E
16	Tubing	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A
17	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
18	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
19	Tubing	Structural integrity	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-19	3.3.1-76	E
20	Tubing	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
21	Tubing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-19 Aging Management Review Results – Makeup Water Treatment System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Valve Body	Structural integrity	Copper Alloy	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-9	3.3.1-81	E
23	Valve Body	Structural integrity	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
24	Valve Body	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A

Table 3.3.2-20 Aging Management Review Results – Miscellaneous Building HVAC System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
3	Damper Housing	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0301
4	Damper Housing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Filter Body	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
6	Filter Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Filter Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
8	Filter Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
9	Filter Body	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-19	3.3.1-76	E
10	Filter Body	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
11	Filter Body	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
12	Filter Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
13	Filter Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-19	3.3.1-76	E

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Filter Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
15	Filter Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
16	Flexible Connection	Structural integrity	Elastomer	Raw water (Internal)	Hardening and loss of strength	One-Time Inspection	VII.C1-1	3.3.1-75	E
17	Flexible Connection	Structural integrity	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
18	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
19	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
20	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
21	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
22	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
23	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
24	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
25	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
26	Pump Casing – Detergent waste drain tank pump (DB-P52_WM)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
27	Pump Casing – Detergent waste drain tank pump (DB-P52_WM)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
28	Pump Casing – Detergent waste drain tank pump (DB-P52_WM)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
29	Pump Casing – Detergent waste drain tank pump (DB-P52_WM)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
30	Pump Casing – Miscellaneous waste drain tank pump (DB-P51_WM)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
31	Pump Casing – Miscellaneous waste drain tank pump (DB-P51_WM)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
32	Pump Casing – Miscellaneous waste drain tank pump (DB-P51_WM)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
33	Pump Casing – Miscellaneous waste drain tank pump (DB-P51_WM)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
34	Pump Casing – Miscellaneous waste monitor tank pump (DB-P54_WM)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
35	Pump Casing – Miscellaneous waste monitor tank pump (DB-P54_WM)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
36	Pump Casing – Miscellaneous waste monitor tank pump (DB-P54_WM)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
37	Pump Casing – Miscellaneous waste monitor tank pump (DB-P54_WM)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
38	Rupture Disc	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
39	Rupture Disc	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
40	Rupture Disc	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
41	Rupture Disc	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
42	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H
43	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-9	3.3.1-81	E
44	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-10	3.3.1-84	A

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
45	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
46	Strainer (body)	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
47	Strainer (body)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
48	Strainer (body)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
49	Strainer (body)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
50	Strainer (body)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
51	Tank – DWDT 1-1 (DB-T27)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
52	Tank – DWDT 1-1 (DB-T27)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
53	Tank – DWDT 1-1 (DB-T27)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
54	Tank – DWDT 1-1 (DB-T27)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
55	Tank – DWDT 1-1 (DB-T27)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
56	Tank – DWDT 1-1 hold-up tank (DB-T161)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
57	Tank – DWDT 1-1 hold-up tank (DB-T161)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
58	Tank – DWDT 1-1 hold-up tank (DB-T161)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
59	Tank – DWDT 1-1 hold-up tank (DB-T161)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
60	Tank – DWDT 1-1 hold-up tank (DB-T161)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
61	Tank – Miscellaneous liquid waste monitor tank (DB-T29)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
62	Tank – Miscellaneous liquid waste monitor tank (DB-T29)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
63	Tank – Miscellaneous liquid waste monitor tank (DB-T29)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
64	Tank – Miscellaneous liquid waste monitor tank (DB-T29)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
65	Tank – Miscellaneous liquid waste monitor tank (DB-T29)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
66	Tank – Miscellaneous waste drain tank (DB-T26)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
67	Tank – Miscellaneous waste drain tank (DB-T26)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
68	Tank – Miscellaneous waste drain tank (DB-T26)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
69	Tank – Miscellaneous waste drain tank (DB-T26)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
70	Tank – Miscellaneous waste drain tank (DB-T26)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
71	Tank – Miscellaneous waste evaporator storage tank (DB-T28)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
72	Tank – Miscellaneous waste evaporator storage tank (DB-T28)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
73	Tank – Miscellaneous waste evaporator storage tank (DB-T28)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
74	Tank – Miscellaneous waste evaporator storage tank (DB-T28)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
75	Tank – Miscellaneous waste evaporator storage tank (DB-T28)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
76	Tank – Radwaste Demineralizer skid vessel (1 through 5)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
77	Tank – Radwaste Demineralizer skid vessel (1 through 5)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
78	Tank – Radwaste Demineralizer skid vessel (1 through 5)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
79	Tank – Radwaste Demineralizer skid vessel (1 through 5)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
80	Tank – Waste polishing demineralizer (DB-T125)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
81	Tank – Waste polishing demineralizer (DB-T125)	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
82	Tank – Waste polishing demineralizer (DB-T125)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
83	Tank – Waste polishing demineralizer (DB-T125)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
84	Tank – Waste polishing demineralizer (DB-T125)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
85	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
86	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
87	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
88	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
89	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0316
90	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
91	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
92	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-22 Aging Management Review Results – Nitrogen Gas System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
5	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
6	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
7	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B

Table 3.3.2-22 Aging Management Review Results – Nitrogen Gas System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
9	Piping	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
10	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
11	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A
12	Piping	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
13	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
14	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
15	Piping	Structural integrity	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A

Table 3.3.2-22 Aging Management Review Results – Nitrogen Gas System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
16	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
17	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A
18	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
19	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
20	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
21	Tubing	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
22	Tubing	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
23	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A

Table 3.3.2-22 Aging Management Review Results – Nitrogen Gas System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
25	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
26	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
27	Valve Body	Pressure boundary	Steel	Gas (Internal)	None	None	VII.J-23	3.3.1-97	A
28	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
29	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A
30	Valve Body	Structural Integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
31	Valve Body	Structural Integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-22 Aging Management Review Results – Nitrogen Gas System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Valve Body	Structural Integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-23 Aging Management Review Results – Process and Area Radiation Monitoring System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
6	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
7	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B

Table 3.3.2-23 Aging Management Review Results – Process and Area Radiation Monitoring System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
9	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
10	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	C 0307
11	Duct	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
12	Duct	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.F1-2	3.3.1-56	A
13	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
14	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
15	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
16	Orifice	Throttling	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307

Table 3.3.2-23 Aging Management Review Results – Process and Area Radiation Monitoring System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
17	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
18	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
19	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
20	Pump Casing - Control room emergency ventilation system vacuum pumps (DB-MRE5327 & 5328)	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
21	Pump Casing - Control room emergency ventilation system vacuum pumps (DB-MRE5327 & 5328)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-23 Aging Management Review Results – Process and Area Radiation Monitoring System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Pump Casing - Control room emergency ventilation system vacuum pumps (DB-MRE5327 & 5328)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
23	Pump Casing - Kaman radiation monitor pumps (DB-P273-1, -2, -3 & -4; and P274-1, -2, -3 & -4)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
24	Pump Casing - Kaman radiation monitor pumps (DB-P273-1, -2, -3, & -4, and P274-1, -2, -3, & -4)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-23 Aging Management Review Results – Process and Area Radiation Monitoring System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
25	Pump Casing - Kaman radiation monitor pumps (DB-P273-1, -2, -3 & -4; and P274-1, -2, -3 & -4)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
26	Trap Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
27	Trap Body	Pressure boundary	Stainless Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.F1-1	3.3.1-27	E
28	Trap Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
29	Trap Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
30	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
31	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-23 Aging Management Review Results – Process and Area Radiation Monitoring System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
33	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
34	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
35	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
6	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
7	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
8	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
10	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
11	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
12	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
13	Heat Exchanger (channel) - Quench tank cooler (DB-E36)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
14	Heat Exchanger (channel) - Quench tank cooler (DB-E36)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
15	Heat Exchanger (channel) - Quench tank cooler (DB-E36)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
16	Heat Exchanger (channel) - Quench tank cooler (DB-E36)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
17	Heat Exchanger (shell) - Quench tank cooler (DB-E36)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-6	3.3.1-48	E 0314
18	Heat Exchanger (shell) - Quench tank cooler (DB-E36)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-6	3.3.1-48	B
19	Heat Exchanger (shell) - Quench tank cooler (DB-E36)	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.E1-1	3.3.1-89	A
20	Heat Exchanger (shell) - Quench tank cooler (DB-E36)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
21	Orifice	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
23	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
24	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
25	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
26	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
27	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
28	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
29	Orifice	Throttling	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
30	Piping	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
31	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
32	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
33	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
34	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
35	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
36	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
37	Piping	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
38	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
39	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
40	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
41	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
42	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
43	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-10	3.3.1-76	E 0328
44	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.E1-1	3.3.1-89	A
45	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
46	Pump Casing - Quench tank circulation pump (DB-P87)	Structural integrity	Cast Austenitic Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
47	Pump Casing - Quench tank circulation pump (DB-P87)	Structural integrity	Cast Austenitic Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
48	Pump Casing - Quench tank circulation pump (DB-P87)	Structural integrity	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
49	Pump Casing - Quench tank circulation pump (DB-P87)	Structural integrity	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
50	Pump Casing - Reactor coolant drain tank pump (DB-P46-1)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
51	Pump Casing - Reactor coolant drain tank pump (DB-P46-1)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
52	Pump Casing - Reactor coolant drain tank pump (DB-P46-1)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Pump Casing - Reactor coolant drain tank pump (DB-P46-2)	Structural integrity	Cast Austenitic Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
54	Pump Casing - Reactor coolant drain tank pump (DB-P46-2)	Structural integrity	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
55	Pump Casing - Reactor coolant drain tank pump (DB-P46-2)	Structural integrity	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
56	Rupture Disc	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
57	Rupture Disc	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
58	Rupture Disc	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
59	Rupture Disc	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
60	Tank - Pressurizer quench tank (DB-T3)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C
61	Tank - Pressurizer quench tank (DB-T3)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
62	Tank - Pressurizer quench tank (DB-T3)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
63	Tank - Pressurizer quench tank (DB-T3)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
64	Tank - Pressurizer quench tank (DB-T3)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
65	Tank - Reactor coolant drain tank (DB-T14)	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	C

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
66	Tank - Reactor coolant drain tank (DB-T14)	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
67	Tank - Reactor coolant drain tank (DB-T14)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
68	Tank - Reactor coolant drain tank (DB-T14)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
69	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
70	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
71	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
72	Tubing	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
73	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
74	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
75	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
76	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
77	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
78	Valve Body	Pressure boundary	Cast Austenitic Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
79	Valve Body	Pressure boundary	Cast Austenitic Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
80	Valve Body	Pressure boundary	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
81	Valve Body	Pressure boundary	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
82	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
83	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
84	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
85	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
86	Valve Body	Structural integrity	Cast Austenitic Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
87	Valve Body	Structural integrity	Cast Austenitic Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
88	Valve Body	Structural integrity	Cast Austenitic Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
89	Valve Body	Structural integrity	Cast Austenitic Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
90	Valve Body	Structural integrity	Cast Austenitic Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-24 Aging Management Review Results – Reactor Coolant Vent and Drain System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
91	Valve Body	Structural integrity	Cast Austenitic Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
92	Valve Body	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
93	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E 0328
94	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
95	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
96	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
97	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
6	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
8	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
10	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
11	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
12	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
13	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
14	Heat Exchanger (shell) - Local grab sample coolers	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D
15	Heat Exchanger (shell) - Local grab sample coolers	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
16	Heat Exchanger (shell) - Local grab sample coolers	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.E3-2	3.3.1-46	B
17	Heat Exchanger (shell) - Local grab sample coolers	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E3-2	3.3.1-46	E 0314

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
18	Heat Exchanger (shell) - Local grab sample coolers	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D 0310
19	Heat Exchanger (shell) - Local grab sample coolers	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314 0310
20	Heat Exchanger (shell) - Local grab sample coolers	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
21	Heat Exchanger (shell) - Local grab sample coolers	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
22	Heat Exchanger (shell) - PASS sample coolers (DB-E144-1, 2, 3, & 4)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
23	Heat Exchanger (shell) - PASS sample coolers (DB-E144-1, 2, 3, & 4)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
24	Heat Exchanger (shell) - PASS sample coolers (DB-E144-1, 2, 3, & 4)	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.E3-2	3.3.1-46	B
25	Heat Exchanger (shell) - PASS sample coolers (DB-E144-1, 2, 3, & 4)	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.C2-11	3.3.1-46	E 0314
26	Heat Exchanger (shell) - PASS sample coolers (DB-E144-1, 2, 3, & 4)	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D 0310

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
27	Heat Exchanger (shell) - PASS sample coolers (DB-E144-1, 2, 3, & 4)	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314 0310
28	Heat Exchanger (shell) - PASS sample coolers (DB-E144-1, 2, 3, & 4)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
29	Heat Exchanger (shell) - PASS sample coolers (DB-E144-1, 2, 3, & 4)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
30	Heat Exchanger (shell) - Reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204, & 205)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
31	Heat Exchanger (shell) - Reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204, & 205)	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
32	Heat Exchanger (shell) - Reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204, & 205)	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.E3-2	3.3.1-46	B
33	Heat Exchanger (shell) - Reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204, & 205)	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.C2-11	3.3.1-46	E 0314

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
34	Heat Exchanger (shell) - Reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204, & 205)	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	D 0310
35	Heat Exchanger (shell) - Reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204, & 205)	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314 0310
36	Heat Exchanger (shell) - Reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204, & 205)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
37	Heat Exchanger (shell) - Reactor coolant primary grab sampling panel coolers (DB-E202, 203, 204, & 205)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
38	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
39	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
40	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
41	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
42	Piping	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
43	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
44	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
45	Piping	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
46	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
47	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
48	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
49	Piping	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
50	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
51	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
52	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
53	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314
54	Piping	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B 0310
55	Piping	Structural integrity	Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314 0310
56	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
57	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
58	Sample Bomb	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
59	Sample Bomb	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
60	Sample Bomb	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
61	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
62	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
63	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.C2-11	3.3.1-46	B
64	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.C2-11	3.3.1-46	E 0314

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
65	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B 0310
66	Tubing	Pressure boundary	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314 0310
67	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
68	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
69	Tubing	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
70	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
71	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
73	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
74	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.C2-11	3.3.1-46	B
75	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.C2-11	3.3.1-46	E 0314
76	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B 0310
77	Tubing	Structural integrity	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314 0310

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
78	Tubing	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
79	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
80	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
81	Tubing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
82	Tubing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
83	Tubing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
84	Tubing	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
85	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A
86	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
87	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
88	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
89	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.C2-11	3.3.1-46	B

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
90	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.C2-11	3.3.1-46	E 0314
91	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B 0310
92	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314 0310
93	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
94	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
95	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
96	Valve Body	Structural integrity	Stainless Steel	Closed cycle cooling water > 60°C (> 140°F) (Internal)	Cracking	Closed Cooling Water Chemistry	VII.C2-11	3.3.1-46	B
97	Valve Body	Structural integrity	Stainless Steel	Closed cycle cooling water > 60°C (> 140°F) (Internal)	Cracking	One-Time Inspection	VII.C2-11	3.3.1-46	E 0314
98	Valve Body	Structural integrity	Stainless Steel	Closed cycle cooling water > 60°C (> 140°F) (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B 0310
99	Valve Body	Structural integrity	Stainless Steel	Closed cycle cooling water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314 0310
100	Valve Body	Structural integrity	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
101	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
102	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
103	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VII.E1-20	3.3.1-90	E 0315
104	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VII.E1-20	3.3.1-90	A
105	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315 0329
106	Valve Body	Structural integrity	Stainless Steel	Treated borated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A 0329
107	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VII.E3-15	3.3.1-24	A

Table 3.3.2-25 Aging Management Review Results – Sampling System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
108	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VII.E3-15	3.3.1-24	A
109	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
110	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Stainless Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	F
6	Bolting	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.F1-1	3.3.1-27	E
7	Bolting	Pressure boundary	Stainless Steel	Condensation (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
8	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
10	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
11	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
12	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
13	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
14	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
15	Bolting	Pressure boundary	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
16	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
17	Bolting	Pressure boundary	Steel	Condensation (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
18	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
19	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
20	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
21	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
22	Bolting	Structural integrity	Stainless Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	F
23	Bolting	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.F1-1	3.3.1-27	E
24	Bolting	Structural integrity	Stainless Steel	Condensation (External)	Loss of preload	Bolting Integrity	N/A	N/A	F

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
25	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
26	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
27	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
28	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
29	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
30	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
31	Bolting	Structural integrity	Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
32	Bolting	Structural integrity	Steel	Condensation (External)	Cracking	Bolting Integrity	N/A	N/A	H
33	Bolting	Structural integrity	Steel	Condensation (External)	Loss of material	Bolting Integrity	VII.D-1	3.3.1-44	B

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
34	Bolting	Structural integrity	Steel	Condensation (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
35	Expansion Joint	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
36	Expansion Joint	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
37	Expansion Joint	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
38	Expansion Joint	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
39	Flow Element	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
40	Flow Element	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
41	Flow Element	Throttling	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
42	Orifice	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
43	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
44	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
45	Orifice	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
46	Orifice	Throttling	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
47	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
48	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
49	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
50	Piping	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
51	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
52	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
53	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
54	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
55	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
56	Piping	Pressure boundary	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
57	Piping	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
58	Piping	Pressure boundary	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
59	Piping	Pressure boundary	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18	3.3.1-19	A
60	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
61	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
62	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
63	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
64	Piping	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
65	Piping	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
66	Piping	Structural integrity	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
67	Piping	Structural integrity	Steel	Soil (External)	Loss of material	Buried Piping and Tanks Inspection	VII.C1-18	3.3.1-19	A
68	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
69	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
70	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
71	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
72	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
73	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313
74	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
75	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
76	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Steel	Moist air (External)	Loss of material	One-Time Inspection	N/A	N/A	G 0313

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
77	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
78	Pump Casing – Dilution pump (DB-P180)	Pressure boundary	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
79	Pump Casing – Service water pump (DB-P3-1, 2, & 3)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
80	Pump Casing – Service water pump (DB-P3-1, 2, & 3)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0313
81	Pump Casing – Service water pump (DB-P3-1, 2, & 3)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
82	Pump Casing – Service water pump (DB-P3-1, 2, & 3)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
83	Pump Casing – Service water pump (DB-P3-1, 2, & 3)	Pressure boundary	Steel	Moist air (External)	Loss of material	One-Time Inspection	N/A	N/A	G 0313
84	Pump Casing – Service water pump (DB-P3-1, 2, & 3)	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
85	Pump Casing – Service water pump (DB-P3-1, 2, & 3)	Pressure boundary	Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
86	Strainer (body)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
87	Strainer (body)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
88	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
89	Strainer (screen)	Filtration	Stainless Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	D

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
90	Strainer (tubes)	Filtration	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	D
91	Strainer (tubes)	Filtration	Stainless Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	D
92	Strainer (tubesheet)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	D
93	Strainer (tubesheet)	Pressure boundary	Stainless Steel	Raw water (External)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	D
94	Tank	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	C
95	Tank	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
96	Tank	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
97	Tubing	Pressure boundary	Copper Alloy	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A
98	Tubing	Pressure boundary	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
99	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
100	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A
101	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
102	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
103	Tubing	Pressure boundary	Stainless Steel	Dried air (Internal)	None	None	VII.J-18	3.3.1-98	A
104	Tubing	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A
105	Tubing	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
106	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
107	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
108	Tubing	Pressure boundary	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
109	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
110	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
111	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
112	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
113	Tubing	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E
114	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A
115	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
116	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
117	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
118	Valve Body	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
119	Valve Body	Pressure boundary	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
120	Valve Body	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
121	Valve Body	Pressure boundary	Gray Cast Iron	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
122	Valve Body	Pressure boundary	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
123	Valve Body	Pressure boundary	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
124	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
125	Valve Body	Pressure boundary	Stainless Steel	Gas (Internal)	None	None	VII.J-19	3.3.1-97	A

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
126	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-15	3.3.1-79	B
127	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
128	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
129	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
130	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
131	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
132	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
133	Valve Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
134	Valve Body	Pressure boundary	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
135	Valve Body	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B
136	Valve Body	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.C1-11	3.3.1-85	A
137	Valve Body	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
138	Valve Body	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
139	Valve Body	Structural integrity	Gray Cast Iron	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
140	Valve Body	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
141	Valve Body	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
142	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
143	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Open-Cycle Cooling Water	VII.C1-19	3.3.1-76	B

Table 3.3.2-26 Aging Management Review Results – Service Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
144	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
145	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
146	Valve Body	Structural integrity	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
147	Valve Body	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
6	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
8	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
9	Filter Housing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
10	Filter Housing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
11	Filter Housing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
12	Filter Housing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
13	Heat Exchanger (channel) - Spent fuel pool heat exchangers (DB-E23-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Heat Exchanger (channel) - Spent fuel pool heat exchangers (DB-E23-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
15	Heat Exchanger (channel) - Spent fuel pool heat exchangers (DB-E23-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
16	Heat Exchanger (channel) - Spent fuel pool heat exchangers (DB-E23-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
17	Heat Exchanger (shell) – Spent fuel pool heat exchangers (DB-E23-1 & 2)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-6	3.3.1-48	E 0314

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
18	Heat Exchanger (shell) – Spent fuel pool heat exchangers (DB-E23-1 & 2)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-6	3.3.1-48	B
19	Heat Exchanger (shell) – Spent fuel pool heat exchangers (DB-E23-1 & 2)	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.E1-1	3.3.1-89	A
20	Heat Exchanger (shell) – Spent fuel pool heat exchangers (DB-E23-1 & 2)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
21	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
22	Orifice	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
23	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
25	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307
26	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
27	Piping	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
28	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
29	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
30	Piping	Pressure boundary	Stainless Steel	Treated borated water (External)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
31	Piping	Pressure boundary	Stainless Steel	Treated borated water (External)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
32	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VII.J-15	3.3.1-94	A 0307

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
33	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E
34	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
35	Piping	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
36	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
37	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
38	Piping	Structural integrity	Stainless Steel	Moist air (External)	Loss of material	One-Time Inspection	N/A	N/A	G
39	Piping	Structural integrity	Stainless Steel	Treated borated water (External)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
40	Piping	Structural integrity	Stainless Steel	Treated borated water (External)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
41	Pump Casing – Spent fuel pool pumps (DB-P44-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
42	Pump Casing – Spent fuel pool pumps (DB-P44-1 & 2)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
43	Pump Casing – Spent fuel pool pumps (DB-P44-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
44	Pump Casing – Spent fuel pool pumps (DB-P44-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
45	Pump Casing – Spent fuel pool skimmer pump (DB-P45)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
46	Pump Casing – Spent fuel pool skimmer pump (DB-P45)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
47	Pump Casing – Spent fuel pool skimmer pump (DB-P45)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
48	Pump Casing – Spent fuel pool skimmer pump (DB-P45)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
49	Pump Casing – Refueling canal skimmer pump (DB-P134)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
50	Pump Casing – Refueling canal skimmer pump (DB-P134)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
51	Pump Casing – Refueling canal skimmer pump (DB-P134)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
52	Pump Casing – Refueling canal skimmer pump (DB-P134)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
53	Strainer (body)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
54	Strainer (body)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
55	Strainer (body)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
56	Strainer (body)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
57	Tank – Spent fuel pool demineralizer (DB-T18)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
58	Tank – Spent fuel pool demineralizer (DB-T18)	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	C
59	Tank – Spent fuel pool demineralizer (DB-T18)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
60	Tank – Spent fuel pool demineralizer (DB-T18)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	C
61	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
62	Tubing	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
63	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-27 Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
64	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
65	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
66	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
67	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
68	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
69	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (External)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
70	Valve Body	Pressure boundary	Stainless Steel	Treated borated water (External)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
71	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C3-7	3.3.1-78	E

Table 3.3.2-27		Aging Management Review Results – Spent Fuel Pool Cooling and Cleanup System							
Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	One-Time Inspection	VII.E1-17	3.3.1-91	E 0315
73	Valve Body	Structural integrity	Stainless Steel	Treated borated water (Internal)	Loss of material	PWR Water Chemistry	VII.E1-17	3.3.1-91	A
74	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
75	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-28 Aging Management Review Results – Spent Resin Transfer System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Flexible Connection	Structural integrity	Elastomer	Treated water > 60ºC (> 140ºF) (Internal)	Hardening and loss of strength	One-Time Inspection	VII.A4-1	3.3.1-12	E 0311
6	Flexible Connection	Structural integrity	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
7	Orifice	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A 0315

Table 3.3.2-28 Aging Management Review Results – Spent Resin Transfer System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Orifice	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
9	Orifice	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0311
10	Orifice	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0311
11	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
12	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
13	Piping	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A 0315
14	Piping	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
15	Piping	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0311

Table 3.3.2-28 Aging Management Review Results – Spent Resin Transfer System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
16	Piping	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0311
17	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
18	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
19	Pump Casing – Spent resin tank overflow pump (DB-P140)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A 0315
20	Pump Casing – Spent resin tank overflow pump (DB-P140)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
21	Pump Casing – Spent resin tank overflow pump (DB-P140)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0311
22	Pump Casing – Spent resin tank overflow pump (DB-P140)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0311

Table 3.3.2-28 Aging Management Review Results – Spent Resin Transfer System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
23	Pump Casing – Spent resin tank overflow pump (DB-P140)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
24	Pump Casing – Spent resin tank overflow pump (DB-P140)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
25	Pump Casing – Spent resin transfer pump (DB-P121-1 & 2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A
26	Pump Casing – Spent resin transfer pump (DB-P121-1 & 2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
27	Pump Casing – Spent resin transfer pump (DB-P121-1 & 2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0311
28	Pump Casing – Spent resin transfer pump (DB-P121-1 & 2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0311

Table 3.3.2-28 Aging Management Review Results – Spent Resin Transfer System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
29	Pump Casing – Spent resin transfer pump (DB-P121-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
30	Pump Casing – Spent resin transfer pump (DB-P121-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
31	Rupture Disc	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A
32	Rupture Disc	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
33	Rupture Disc	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0311
34	Rupture Disc	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0311
35	Rupture Disc	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-28 Aging Management Review Results – Spent Resin Transfer System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
36	Rupture Disc	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
37	Strainer (body)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A
38	Strainer (body)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
39	Strainer (body)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0311
40	Strainer (body)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0311
41	Strainer (body)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
42	Strainer (body)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
43	Tank – Resin fill tank (DB-T17-2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A

Table 3.3.2-28 Aging Management Review Results – Spent Resin Transfer System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
44	Tank – Resin fill tank (DB-T17-2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
45	Tank – Resin fill tank (DB-T17-2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	C 0311
46	Tank – Resin fill tank (DB-T17-2)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	C 0311
47	Tank – Resin fill tank (DB-T17-2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
48	Tank – Resin fill tank (DB-T17-2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
49	Tank – Spent resin storage tank (DB-T22)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A
50	Tank – Spent resin storage tank (DB-T22)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
51	Tank – Spent resin storage tank (DB-T22)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	C 0311

Table 3.3.2-28 Aging Management Review Results – Spent Resin Transfer System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
52	Tank – Spent resin storage tank (DB-T22)	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	C 0311
53	Tank – Spent resin storage tank (DB-T22)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
54	Tank – Spent resin storage tank (DB-T22)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
55	Tubing	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A
56	Tubing	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
57	Tubing	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0311
58	Tubing	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0311
59	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.3.2-28 Aging Management Review Results – Spent Resin Transfer System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
60	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
61	Valve Body	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A
62	Valve Body	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
63	Valve Body	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0311
64	Valve Body	Structural integrity	Stainless Steel	Treated water > 60ºC (> 140ºF) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0311
65	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
66	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-29 Aging Management Review Results – Station Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
5	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
6	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
7	Filter Housing	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-2	3.3.1-53	E 0319
8	Filter Housing	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-29 Aging Management Review Results – Station Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Filter Housing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A
10	Piping	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
11	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
12	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A
13	Piping	Structural integrity	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
14	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
15	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A
16	Tubing	Structural integrity	Copper Alloy > 15% Zn	Condensation (Internal)	Loss of material	One-Time Inspection	VII.G-9	3.3.1-28	E 0319

Table 3.3.2-29 Aging Management Review Results – Station Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
17	Tubing	Structural integrity	Copper Alloy > 15% Zn	Condensation (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	G 0320
18	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
19	Tubing	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
20	Tubing	Structural integrity	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
21	Tubing	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
22	Tubing	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A 0307
23	Tubing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A
24	Valve Body	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312

Table 3.3.2-29 Aging Management Review Results – Station Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
25	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
26	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A
27	Valve Body	Structural integrity	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
28	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A 0307
29	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
30	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.D-3	3.3.1-57	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
2	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
5	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	Bolting Integrity	VII.I-1	3.3.1-43	B
6	Bolting	Pressure boundary	Steel	Air-outdoor (External)	Loss of preload	Bolting Integrity	N/A	N/A	H
7	Compressor Casing – Turbocharger	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
8	Compressor casing – Turbocharger	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Compressor Casing – Turbocharger	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
10	Filter Body	Pressure boundary	Aluminum	Air (Internal)	None	None	N/A	N/A	G
11	Filter Body	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	VII.J-1	3.3.1-95	A
12	Filter Body	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
13	Filter Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
14	Filter Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A
15	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
16	Filter Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
17	Filter Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
18	Flexible Connection	Pressure boundary	Elastomer	Air-outdoor (Internal)	Hardening and loss of strength	External Surfaces Monitoring	VII.G-2	3.3.1-61	E
19	Flexible Connection	Pressure boundary	Elastomer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	VII.F1-7	3.3.1-11	E
20	Flexible Connection	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
21	Flexible Connection	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
22	Flexible Connection	Pressure boundary	Stainless Steel	Diesel exhaust (Internal)	Cracking	One-Time Inspection	VII.H2-1	3.3.1-06	E
23	Flexible Connection	Pressure boundary	Stainless Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
24	Flexible Connection	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-16	3.3.1-32	B
25	Flexible Connection	Pressure boundary	Stainless Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-16	3.3.1-32	A
26	Flexible Connection	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
27	Heat Exchanger (shell) – Aftercooler (DB-E215-1 & 2)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
28	Heat Exchanger (shell) – Aftercooler (DB-E215-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
29	Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-2	3.3.1-52	B
30	Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	One-Time Inspection	VII.C2-2	3.3.1-52	E
31	Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Heat transfer	Copper Alloy > 15% Zn	Air-outdoor (External)	Reduction in heat transfer	One-Time Inspection	N/A	N/A	H

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	Closed Cooling Water Chemistry	N/A	N/A	H
33	Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	One-Time Inspection	N/A	N/A	H
34	Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-2	3.3.1-51	B
35	Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-2	3.3.1-51	E 0314
36	Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.H2-12	3.3.1-84	C

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
37	Heat Exchanger (tubes) – Aftercooler (DB-E215-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Air-outdoor (External)	None	None	N/A	N/A	G
38	Heat Exchanger (shell) – SBO diesel lube oil immersion heater (DB-E216)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
39	Heat Exchanger (shell) – SBO diesel lube oil immersion heater (DB-E216)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
40	Heat Exchanger (shell) – SBO diesel lube oil immersion heater (DB-E216)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
41	Heat Exchanger (shell) – Lube oil cooler (DB-E214)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-5	3.3.1-21	A
42	Heat Exchanger (shell) – Lube oil cooler (DB-E214)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-5	3.3.1-21	A
43	Heat Exchanger (shell) – Lube oil cooler (DB-E214)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
44	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-2	3.3.1-52	B
45	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	One-Time Inspection	VII.C2-2	3.3.1-52	E
46	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	V.D1-8	3.2.1-09	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
47	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (External)	Reduction in heat transfer	One-Time Inspection	V.D1-8	3.2.1-09	A
48	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	Closed Cooling Water Chemistry	N/A	N/A	H
49	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	One-Time Inspection	N/A	N/A	H
50	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-2	3.3.1-51	B
51	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-2	3.3.1-51	E 0314
52	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.H2-12	3.3.1-84	C

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	C 0304
54	Heat Exchanger (tubes) – Lube oil cooler (DB-E214)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (External)	Loss of material	One-Time Inspection	VII.H2-10	3.3.1-26	C
55	Heat Exchanger (channel) – Radiator (DB-E211)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
56	Heat Exchanger (channel) – Radiator (DB-E211)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
57	Heat Exchanger (channel) – Radiator (DB-E211)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
58	Heat Exchanger (fins) – Radiator (DB-E211)	Heat transfer	Aluminum	Air-outdoor (External)	Reduction in heat transfer	External Surfaces Monitoring	N/A	N/A	G

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
59	Heat Exchanger (tubes) – Radiator (DB-E211)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	Closed Cooling Water Chemistry	VII.C2-2	3.3.1-52	B 0303
60	Heat Exchanger (tubes) – Radiator (DB-E211)	Heat transfer	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Reduction in heat transfer	One-Time Inspection	VII.C2-2	3.3.1-52	E 0303
61	Heat Exchanger (tubes) – Radiator (DB-E211)	Heat transfer	Copper Alloy > 15% Zn	Air-outdoor (External)	Reduction in heat transfer	External Surfaces Monitoring	N/A	N/A	G
62	Heat Exchanger (tubes) – Radiator (DB-E211)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	Closed Cooling Water Chemistry	N/A	N/A	H
63	Heat Exchanger (tubes) – Radiator (DB-E211)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	One-Time Inspection	N/A	N/A	H
64	Heat Exchanger (tubes) – Radiator (DB-E211)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-2	3.3.1-51	B 0303

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
65	Heat Exchanger (tubes) – Radiator (DB-E211)	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-2	3.3.1-51	E 0303 0314
66	Heat Exchanger (tubes) – Radiator (DB-E211)	Pressure boundary	Copper Alloy > 15% Zn	Air-outdoor (External)	None	None	N/A	N/A	G
67	Heat Exchanger (tubesheet) – Radiator (DB-E211)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
68	Heat Exchanger (tubesheet) – Radiator (DB-E211)	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
69	Heat Exchanger (tubesheet) – Radiator (DB-E211)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
70	Orifice	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
71	Orifice	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
72	Orifice	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
73	Orifice	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-17	3.3.1-33	A
74	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
75	Orifice	Throttling	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
76	Orifice	Throttling	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314
77	Orifice	Throttling	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
78	Orifice	Throttling	Stainless Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-17	3.3.1-33	A
79	Piping	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
80	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
81	Piping	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.H2-23	3.3.1-47	E 0314
82	Piping	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-2	3.3.1-53	E
83	Piping	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
84	Piping	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
85	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
86	Piping	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A
87	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
88	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
89	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
90	Piping	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A
91	Pump Casing – DC Turbocharger lube pump (DB-P280C)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
92	Pump Casing – DC Turbocharger lube pump (DB-P280C)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
93	Pump Casing – DC Turbocharger lube pump (DB-P280C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
94	Pump Casing – Engine-driven main lube oil pump (DB-P286A)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
95	Pump Casing – Engine-driven main lube oil pump (DB-P286A)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
96	Pump Casing – Engine-driven main lube oil pump (DB-P286A)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
97	Pump Casing – Engine-driven piston cooling oil pump (DB-P286B)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
98	Pump Casing – Engine-driven piston cooling oil pump (DB-P286B)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
99	Pump Casing – Engine-driven piston cooling oil pump (DB-P286B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
100	Pump Casing – Engine-driven lube oil scavenger pump (DB-P286C)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
101	Pump Casing – Engine-driven lube oil scavenger pump (DB-P286C)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
102	Pump Casing – Engine-driven lube oil scavenger pump (DB-P286C)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
103	Pump Casing – Fuel priming pump (DB-P281-2)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
104	Pump Casing – Fuel priming pump (DB-P281-2)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A
105	Pump Casing – Fuel priming pump (DB-P281-2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
106	Silencer (exhaust)	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
107	Silencer (exhaust)	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
108	Strainer (body)	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
109	Strainer (body)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
110	Strainer (body)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
111	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
112	Strainer (screen)	Filtration	Stainless Steel	Air (External)	None	None	N/A	N/A	G
113	Strainer (screen)	Filtration	Stainless Steel	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
114	Strainer (screen)	Filtration	Stainless Steel	Lubricating oil (External)	Loss of material	One-Time Inspection	VII.H2-17	3.3.1-33	A
115	Tank – Air receiver tank (DB-T209-1 & 2)	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
116	Tank – Air receiver tank (DB-T209-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
117	Tank – Jacket water expansion tank	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	C 0307
118	Tank – Jacket water expansion tank	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
119	Tank – Jacket water expansion tank	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.H2-23	3.3.1-47	E 0314
120	Tank – Jacket water expansion tank	Pressure boundary	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0313
121	Tank – Jacket water expansion tank	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
122	Tank – SBODG day tank (DB-T210)	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
123	Tank – SBODG day tank (DB-T210)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
124	Tank – SBODG day tank (DB-T210)	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
125	Tank – SBODG day tank (DB-T210)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
126	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air (Internal)	None	None	N/A	N/A	G
127	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
128	Tubing	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
129	Tubing	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.H2-23	3.3.1-47	E 0314
130	Tubing	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
131	Tubing	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312
132	Tubing	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
133	Tubing	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
134	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.G-22	3.3.1-14	A
135	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.G-22	3.3.1-14	A
136	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
137	Valve Body	Pressure boundary	Aluminum	Air (Internal)	None	None	N/A	N/A	G
138	Valve Body	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	VII.J-1	3.3.1-95	A
139	Valve Body	Pressure boundary	Copper Alloy	Air (Internal)	None	None	N/A	N/A	G
140	Valve Body	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-2	3.3.1-51	B
141	Valve Body	Pressure boundary	Copper Alloy	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-2	3.3.1-51	E 0314
142	Valve Body	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-9	3.3.1-32	B

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
143	Valve Body	Pressure boundary	Copper Alloy	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-9	3.3.1-32	A
144	Valve Body	Pressure boundary	Copper Alloy	Lubricating oil (Internal)	None	None	VII.C1-8	3.3.1-26	I 0302
145	Valve Body	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	V.F-3	3.2.1-53	A
146	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air (Internal)	None	None	N/A	N/A	G
147	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	Closed Cooling Water Chemistry	N/A	N/A	H
148	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Cracking	One-Time Inspection	N/A	N/A	H
149	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.E1-2	3.3.1-51	B
150	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.E1-2	3.3.1-51	E 0314
151	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.H2-12	3.3.1-84	A

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
152	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Fuel oil (Internal)	Cracking	Fuel Oil Chemistry	N/A	N/A	H
153	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Fuel oil (Internal)	Cracking	One-Time Inspection	N/A	N/A	H
154	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-9	3.3.1-32	B
155	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-9	3.3.1-32	A
156	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	A 0304
157	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-10	3.3.1-26	A
158	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
159	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-10	3.3.1-50	B
160	Valve Body	Pressure boundary	Stainless Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-10	3.3.1-50	E 0314

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
161	Valve Body	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
162	Valve Body	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-17	3.3.1-33	A
163	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
164	Valve Body	Pressure boundary	Steel	Air-outdoor (Internal)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	C 0307
165	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.H2-23	3.3.1-47	B
166	Valve Body	Pressure boundary	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.H2-23	3.3.1-47	E 0314
167	Valve Body	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VII.D-2	3.3.1-53	E
168	Valve Body	Pressure boundary	Steel	Diesel exhaust (Internal)	Loss of material	One-Time Inspection	VII.H2-2	3.3.1-18	E
169	Valve Body	Pressure boundary	Steel	Air (Internal)	Loss of material	One-Time Inspection	VII.H2-21	3.3.1-71	E 0312

Table 3.3.2-30 Aging Management Review Results – Station Blackout Diesel Generator System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
170	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	Fuel Oil Chemistry	VII.H2-24	3.3.1-20	B
171	Valve Body	Pressure boundary	Steel	Fuel oil (Internal)	Loss of material	One-Time Inspection	VII.H2-24	3.3.1-20	A
172	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
173	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VII.H2-20	3.3.1-14	A
174	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
175	Valve Body	Pressure boundary	Steel	Air-outdoor (External)	Loss of material	External Surfaces Monitoring	VII.I-9	3.3.1-58	A

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A
6	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
8	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
9	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
10	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
11	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
12	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
13	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-2	3.3.1-89	A

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
15	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VII.I-6	3.3.1-42	B
16	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
17	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0330
18	Orifice	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
19	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
20	Piping	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0312 0332

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
21	Piping	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
22	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
23	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
24	Piping	Pressure boundary	Stainless Steel	Raw water (External)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
25	Piping	Pressure boundary	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0312
26	Piping	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-19	3.3.1-76	E
27	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
28	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
29	Piping	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
30	Piping	Structural integrity	Gray Cast Iron	Condensation (External)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
31	Piping	Structural integrity	Gray Cast Iron	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0312
32	Piping	Structural integrity	Gray Cast Iron	Moist air (Internal)	Loss of material	Selective Leaching Inspection	N/A	N/A	G
33	Piping	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.G-24	3.3.1-68	E
34	Piping	Structural integrity	Gray Cast Iron	Raw water (Internal)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
35	Piping	Structural integrity	Gray Cast Iron	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
36	Piping	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
37	Piping	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0312 0332
38	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0330
39	Piping	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
40	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
41	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
42	Piping	Structural integrity	Stainless Steel	Concrete (External)	None	None	VII.J-17	3.3.1-96	A
43	Piping	Structural integrity	Stainless Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.F1-1	3.3.1-27	E

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
44	Piping	Structural integrity	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0312
45	Piping	Structural integrity	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-19	3.3.1-76	E
46	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
47	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
48	Piping	Structural integrity	Steel	Concrete (External)	None	None	VII.J-21	3.3.1-96	A
49	Piping	Structural integrity	Steel	Condensation (External)	Loss of material	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
50	Pump Casing - ECCS sump pumps (DB-P89-1, 2, & 3)	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
51	Pump Casing - ECCS sump pumps (DB-P89-1, 2, & 3)	Pressure boundary	Stainless Steel	Raw water (External)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
52	Tubing	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0312 0332
53	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0330
54	Tubing	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
55	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
56	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
57	Valve Body	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0312 0332

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
58	Valve Body	Pressure boundary	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
59	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
60	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
61	Valve Body	Pressure boundary	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0312
62	Valve Body	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-19	3.3.1-76	E
63	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
64	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
65	Valve Body	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	One-Time Inspection	V.D1-29	3.2.1-08	E 0312 0332
66	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Cracking	Collection, Drainage, and Treatment Components Inspection	N/A	N/A	H 0330
67	Valve Body	Structural integrity	Stainless Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-15	3.3.1-79	E
68	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
69	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
70	Valve Body	Structural integrity	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	VII.G-23	3.3.1-71	E 0312
71	Valve Body	Structural integrity	Steel	Raw water (Internal)	Loss of material	Collection, Drainage, and Treatment Components Inspection	VII.C1-19	3.3.1-76	E

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
73	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-32 Aging Management Review Results – Turbine Plant Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VII.I-3	3.3.1-41	B
2	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VII.I-4	3.3.1-43	B
3	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VII.I-5	3.3.1-45	B
4	Heat Exchanger (channel) – Startup feed pump lube oil cooler (DB-E30)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
5	Heat Exchanger (channel) – Startup feed pump lube oil cooler (DB-E30)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314

Table 3.3.2-32 Aging Management Review Results – Turbine Plant Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
6	Heat Exchanger (channel) – Startup feed pump lube oil cooler (DB-E30)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Selective Leaching Inspection	VII.F3-18	3.3.1-85	C
7	Heat Exchanger (channel) – Startup feed pump lube oil cooler (DB-E30)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
8	Heat Exchanger (channel) – Startup feed pump seal water cooler (DB-E99)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
9	Heat Exchanger (channel) – Startup feed pump seal water cooler (DB-E99)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314

Table 3.3.2-32 Aging Management Review Results – Turbine Plant Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
10	Heat Exchanger (channel) – Startup feed pump seal water cooler (DB-E99)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
11	Heat Exchanger (shell) – Startup feed pump lube oil cooler (DB-E30)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
12	Heat Exchanger (shell) – Startup feed pump lube oil cooler (DB-E30)	Structural integrity	Gray Cast Iron	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
13	Heat Exchanger (shell) – Startup feed pump lube oil cooler (DB-E30)	Structural integrity	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-32 Aging Management Review Results – Turbine Plant Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
14	Heat Exchanger (shell) – Startup feed pump seal water cooler (DB-E99)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-1	3.3.1-48	B
15	Heat Exchanger (shell) – Startup feed pump seal water cooler (DB-E99)	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-1	3.3.1-48	E 0314
16	Heat Exchanger (shell) – Startup feed pump seal water cooler (DB-E99)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
17	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
18	Piping	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314
19	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Table 3.3.2-32 Aging Management Review Results – Turbine Plant Cooling Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
20	Tubing	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
21	Tubing	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314
22	Tubing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
23	Valve Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	Closed Cooling Water Chemistry	VII.C2-14	3.3.1-47	B
24	Valve Body	Structural integrity	Steel	Closed cycle cooling water (Internal)	Loss of material	One-Time Inspection	VII.C2-14	3.3.1-47	E 0314
25	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Generic Notes:	
A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0301	This environment is the same as the NUREG-1801 environment except that it is an internal rather than an external environment. Also, for the purposes of AMR and NUREG-1801 comparison, outdoor air as an internal environment is essentially the same as the uncontrolled indoor air environment because the subject internal surfaces are not exposed to weather.
0302	This material is copper alloy < 15% Zn and is not in contact with a more cathodic metal; therefore, there are no aging effects requiring management in the lubricating oil environment.
0303	Material is admiralty brass, which is an inhibited copper alloy. Therefore, loss of material due to selective leaching is not an aging effect requiring management in this environment.

Plant-Specific Notes:	
0304	The Lubricating Oil Analysis Program also manages loss of material due to selective leaching for susceptible materials by ensuring that water contamination is minimized.
0305	Instrumentation tubing (fittings) and valve bodies in the Emergency Ventilation System and Fuel-Handling Area Heating and Ventilation System.
0306	Airborne boric acid residue may collect inside (ECCS pump room) cooling units.
0307	This environment is the same as the NUREG-1801 environment except that it is an internal rather than an external environment.
0308	The “Condensation (Internal)” environment is evaluated as equivalent to the “Treated water” NUREG-1801 environment.
0309	The internal environment of the upper portion of the tank (this does not include the air-water interface which is evaluated as moist air) is not the same as the external environment, however the external environment is more aggressive, and aging effects are more likely to occur on the external surface prior to occurrence on the internal surface.
0310	For the purposes of NUREG-1801 comparison, “Closed cycle cooling water > 60ºC (> 140ºF)” is equivalent to the “Closed cycle cooling water” NUREG-1801 environment for this material and aging effect.
0311	For the purposes of NUREG-1801 comparison, “Treated water > 60ºC (> 140ºF)” is equivalent to the “Treated water” NUREG-1801 environment for this material and aging effect.
0312	The One-Time Inspection will confirm the absence of aging effects or that aging is slow acting so as to not affect the subject component's intended function during the period of extended operation.
0313	The One-Time Inspection will detect and characterize loss of material at the air-water interface.
0314	The One-Time Inspection will provide verification of Closed Cooling Water Chemistry Program effectiveness.
0315	The One-Time Inspection will provide verification of PWR Water Chemistry Program effectiveness.
0316	Cracking due to stess corrosion cracking /intergranular attack (SCC/IGA) is an aging effect requiring management for components with a normal operating temperature above 140ºF.
0317	Flow-accelerated corrosion was determined to be an applicable aging effect in accordance with the flow-accelerated corrosion susceptibility study.
0318	The Air Quality Monitoring Program ensures that the Instrument Air System remains dry and free of contaminants, thereby sustaining the aging management review conclusion that there are no aging effects that require management.

Plant-Specific Notes:	
0319	The One-Time Inspection will confirm, for station air and instrument air drainage components, the absence of aging effects or that periodic exposure to condensation does not affect the subject component's intended function during the period of extended operation.
0320	The Selective Leaching Inspection will confirm, for station air drainage components, the absence of selective leaching of copper alloy > 15% Zn tubing from periodic exposure to condensation.
0321	The Selective Leaching Inspection will detect and characterize loss of material due to selective leaching at the air-water interface on the diesel fire protection pump.
0322	Environment is considered a match even though the environment is internal rather than external for this NUREG-1801 item.
0323	The subject piping exposed to a raw water (external) environment is submerged inside the fire water storage tank (DB-T81).
0324	The subject bolting exposed to a raw water (external) environment is associated with the diesel fire pump (DB-P5-2) casing.
0325	The aging effects of steel in a lubricating oil environment are not applicable in the air intake filter bodies in the diesel systems due to the regular replacement of the lubricating oil.
0326	The subject piping exposed to a fuel oil (external) environment is submerged inside the fuel oil storage tanks (DB-T153-1 & 2).
0327	Not Used
0328	Environment is evaluated as raw water since the source of water is from treated water systems (both borated and unborated) that are not chemistry controlled.
0329	For the purposes of NUREG-1801 comparison, "Treated borated water > 60ºC (> 140ºF)" is equivalent to the "Treated borated water" NUREG-1801 environment for this material and aging effect.
0330	Cracking due to SCC/IGA is an aging effect requiring management for components with a normal operating temperature above 140ºF only (HCC-49 and associated components).
0331	Loss of material due to boric acid wastage or galvanic corrosion (of aluminum fins), inside cooling units could affect the heat transfer function of the fins.
0332	The "Moist air (internal)" environment is enveloped by the NUREG-1801 Chapter IX definition of "Condensation (internal/external)".
0333	The Aboveground Steel Tanks Inspection focuses on the tank bottom and the interface between the tank and foundation. The External Surfaces Monitoring Program manages the external surfaces of the tank above the foundation.

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3.4 AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEMS

3.4.1 INTRODUCTION

Section 3.4 provides the results of the aging management reviews (AMRs) for those components identified in Section 2.3.4, Steam and Power Conversion Systems, as subject to AMR. The systems or portions of systems are described in the indicated sections of the Application.

- Auxiliary Feedwater System (Section 2.3.4.1)
- Condensate Storage System (Section 2.3.4.2)
- Main Feedwater System (Section 2.3.4.3)
- Main Steam System (Section 2.3.4.4)

Table 3.4.1, Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.4.2.2.

3.4.2 RESULTS

The following tables summarize the results of the AMR for the Steam and Power Conversion Systems.

Table 3.4.2-1 Aging Management Review Results - Auxiliary Feedwater System

Table 3.4.2-2 Aging Management Review Results - Condensate Storage System

Table 3.4.2-3 Aging Management Review Results - Main Feedwater System

Table 3.4.2-4 Aging Management Review Results - Main Steam System

3.4.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the aging effects requiring management, and the aging management programs (AMPs) used to manage these aging effects are provided for each of the above systems in the following sections.

3.4.2.1.1 Auxiliary Feedwater System

Materials

The materials of construction for the subject mechanical components of the Auxiliary Feedwater System are:

- Copper alloy
- Gray cast iron
- Stainless steel
- Steel

Environments

The subject mechanical components of the Auxiliary Feedwater System are exposed to the following normal plant operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam and water leakage
- Lubricating oil
- Treated water
- Treated water > 60°C (> 140°F)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Auxiliary Feedwater System:

- Cracking
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Auxiliary Feedwater System:

- Bolting Integrity Program
- Boric Acid Corrosion Program

- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- One-Time Inspection
- PWR Water Chemistry Program

3.4.2.1.2 Condensate Storage System

Materials

The materials of construction for the subject mechanical components of the Condensate Storage System are:

- Aluminum
- Stainless steel
- Steel

Environments

The subject mechanical components of the Condensate Storage System are exposed to the following normal plant operating environments:

- Air-indoor uncontrolled
- Air with steam and water leakage
- Moist air
- Treated water

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Condensate Storage System:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the subject mechanical components of the Condensate Storage System:

- Bolting Integrity Program
- External Surfaces Monitoring Program

- One-Time Inspection
- PWR Water Chemistry Program

3.4.2.1.3 Main Feedwater System

Materials

The materials of construction for subject mechanical components of the Main Feedwater System are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Gray cast iron
- Stainless steel
- Steel

Environments

Subject mechanical components of the Main Feedwater System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Dried air
- Lubricating oil
- Treated water
- Treated water > 60°C (> 140°F)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Main Feedwater System:

- Cracking
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Main Feedwater System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- Flow Accelerated Corrosion (FAC) Program
- Lubricating Oil Analysis Program
- One-Time Inspection
- PWR Water Chemistry Program

3.4.2.1.4 Main Steam System

Materials

The materials of construction for subject mechanical components of the Main Steam System are:

- Aluminum
- Copper alloy
- Copper alloy > 15% Zn
- Gray cast iron
- Polymer
- Stainless steel
- Steel

Environments

Subject mechanical components of the Main Steam System are exposed to the following normal operating environments:

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Condensation
- Dried air

- Lubricating oil
- Steam
- Treated water
- Treated water > 60°C (> 140°F)

Aging Effects Requiring Management

The following aging effects require management for the subject mechanical components of the Main Steam System:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction in heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Main Steam System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion (FAC) Program
- Lubricating Oil Analysis Program
- One-Time Inspection
- PWR Water Chemistry Program
- Selective Leaching Inspection

3.4.2.2 Aging Management Review Results for Which Further Evaluation is Recommended by NUREG-1801

For the Steam and Power Conversion systems, those items requiring further evaluation are addressed in the following sections.

3.4.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis as defined in 10 CFR 54.3. Time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluations of the fatigue time-limited aging analyses are addressed in Section 4.

3.4.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

3.4.2.2.2.1 Steel Piping, Piping Components, Piping Elements, Tanks, and Heat Exchangers-Treated Water and Steam

Loss of material due to general, pitting and crevice corrosion could occur for steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water and for steel piping, piping components, and piping elements exposed to steam. At Davis-Besse, loss of material due to general, pitting, and crevice corrosion for steel (including gray cast iron) piping, piping components, piping elements, tanks, and heat exchanger components that are exposed to treated water (including steam) is managed by the PWR Water Chemistry Program. The PWR Water Chemistry Program manages loss of material through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material.

3.4.2.2.2.2 Steel Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to general, pitting and crevice corrosion could occur for steel piping, piping components, and piping elements exposed to lubricating oil. Loss of material due to general, pitting, and crevice corrosion for Davis-Besse steel piping, piping components, and piping elements that are exposed to lubricating oil in the Steam and Power Conversion Systems is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. This item is also applied to steel tanks in the Steam and Power Conversion Systems that are exposed to lubricating oil.

3.4.2.2.3 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion (MIC), and Fouling

Loss of material due to general, pitting, crevice, and MIC, and fouling could occur in steel piping, piping components, and piping elements exposed to raw water. The

Davis-Besse Steam and Power Conversion Systems do not contain steel piping, piping components, and piping elements that are exposed to raw water and subject to aging management review.

3.4.2.2.4 Reduction of Heat Transfer due to Fouling

3.4.2.2.4.1 Stainless Steel and Copper Alloy Heat Exchanger Tubes – Treated Water

Reduction of heat transfer due to fouling could occur for stainless steel and copper alloy heat exchanger tubes exposed to treated water. At Davis-Besse, reduction in heat transfer due to fouling for stainless steel and copper alloy heat exchanger tubes that are exposed to treated water in the Steam and Power Conversion Systems is managed by the PWR Water Chemistry Program. The PWR Water Chemistry Program manages reduction in heat transfer through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage reduction in heat transfer.

3.4.2.2.4.2 Steel, Stainless Steel, and Copper Alloy Heat Exchanger Tubes – Lubricating Oil

Reduction of heat transfer due to fouling could occur for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. Reduction in heat transfer due to fouling for Davis-Besse copper alloy heat exchanger tubes that are exposed to lubricating oil in the Steam and Power Conversion Systems is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages reduction in heat transfer through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage reduction in heat transfer. The Steam and Power Conversion Systems do not contain steel or stainless steel heat exchanger tubes that are exposed to lubricating oil and subject to aging management review.

3.4.2.2.5 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

3.4.2.2.5.1 Steel Piping, Piping Components, and Piping Elements - Soil

Loss of material due to general, pitting and crevice corrosion, and MIC could occur in steel (with or without coating or wrapping) piping, piping components, piping elements and tanks exposed to soil. The Davis-Besse Steam and Power Conversion Systems do not contain steel (with or without coating or wrapping) piping, piping components, piping elements, or tanks that are exposed to soil and subject to aging management review.

3.4.2.2.5.2 Steel Heat Exchanger Components – Lubricating Oil

Loss of material due to general, pitting and crevice corrosion, and MIC could occur in steel heat exchanger components exposed to lubricating oil. At Davis-Besse, loss of material due to general, pitting and crevice corrosion in steel and gray cast iron heat exchanger components, and loss of material due to selective leaching in gray cast iron heat exchanger components, that are exposed to lubricating oil in the Steam and Power Conversion Systems are managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material.

3.4.2.2.6 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to SCC could occur in the stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water greater than 60°C (>140°F), and for stainless steel piping, piping components, and piping elements exposed to steam. Cracking due to SCC for Davis-Besse stainless steel piping, piping components, and piping elements that are exposed to treated water greater than 60°C (>140°F) is managed by the PWR Water Chemistry Program. The PWR Water Chemistry Program manages cracking through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage cracking. The Steam and Power Conversion Systems do not contain stainless steel tanks or heat exchanger components that are exposed to treated water greater than 60°C (>140°F) or steam and subject to aging management review.

3.4.2.2.7 Loss of Material due to Pitting and Crevice Corrosion

3.4.2.2.7.1 Stainless Steel, Aluminum, and Copper Alloy Piping, Piping Components, Piping Elements, Tanks, and Heat Exchanger Components-Treated Water

Loss of material due to pitting and crevice corrosion could occur for stainless steel, aluminum, and copper alloy piping, piping components and piping elements and for stainless steel tanks and heat exchanger components exposed to treated water. At Davis-Besse, loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, piping elements, tanks, and heat exchanger components that are exposed to treated water (including treated water greater than 60°C (>140°F)) is managed by the PWR Water Chemistry Program. The PWR Water Chemistry Program manages loss of material through periodic monitoring and control of contaminants. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. This item is also applied to copper alloy heat exchanger components in the Davis-Besse Steam and Power Conversion Systems that are exposed to treated water. The Steam and Power Conversion Systems do not contain aluminum or copper alloy piping, piping components, or piping elements that are exposed to treated water and subject to aging management review.

3.4.2.2.7.2 Stainless Steel Piping, Piping Components, Piping Elements - Soil

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil. The Davis-Besse Steam and Power Conversion Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to soil and subject to aging management review.

3.4.2.2.7.3 Copper Alloy Piping, Piping Components, Piping Elements – Lubricating Oil

Loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components, and piping elements exposed to lubricating oil. At Davis-Besse, loss of material due to pitting and crevice corrosion, and selective leaching, for copper alloy (copper alloy > 15% Zn) piping, piping components, and piping elements that are exposed to lubricating oil in the Steam and Power Conversion Systems is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. This item is also applied to copper alloy (copper alloy > 15% Zn) heat exchanger components that are exposed to lubricating oil in the Steam and Power Conversion Systems.

3.4.2.2.8 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

Loss of material due to pitting, crevice, and MIC could occur in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil. Loss of material due to pitting and crevice corrosion for Davis-Besse stainless steel piping, piping components, and piping elements that are exposed to lubricating oil in the Steam and Power Conversion Systems is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages loss of material through periodic monitoring and control of contaminants, including water. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material.

3.4.2.2.9 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion

Loss of material for Boling Water Reactor (BWR) steel heat exchanger components exposed to treated water is applicable to BWR plants only.

3.4.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B, Section B.1.3, for a discussion of FirstEnergy Nuclear Operating Company quality assurance procedures and administrative controls for aging management programs

3.4.2.3 Time-Limited Aging Analyses

The time-limited aging analysis identified below is associated with the Steam and Power Conversion Systems components. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Metal Fatigue (Section 4.3, Metal Fatigue)

3.4.3 CONCLUSIONS

The Steam and Power Conversion Systems components and commodities subject to AMR have been identified in accordance with 10 CFR 54.21. The aging management programs selected to manage the effects of aging for the mechanical components and commodities are identified in the following tables and Section 3.4.2.1. A description of the aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging associated with the Steam and Power Conversion Systems components and commodities will be managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-01	Steel piping, piping components, and piping elements exposed to steam or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. Further evaluation is documented in Section 3.4.2.2.1.
3.4.1-02	Steel piping, piping components, and piping elements exposed to steam	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion in steel (including gray cast iron) piping, piping components, and piping elements that are exposed to steam is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. For loss of material for steel piping, piping components, and piping elements exposed to steam in the Main Steam System, refer to Item Number 3.4.1-37. Further evaluation is documented in Section 3.4.2.2.2.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-03	Steel heat exchanger components exposed to treated water	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion in steel heat exchanger components that are exposed to treated water is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. Further evaluation is documented in Section 3.4.2.2.2.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-04	Steel piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements that are exposed to treated water (including treated water > 60°C (> 140°F)) is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. This item is also applied to gray cast iron (steel) heat exchanger components that are exposed to treated water. Further evaluation is documented in Section 3.4.2.2.2.1.
3.4.1-05	BWR only				

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-06	Steel and stainless steel tanks exposed to treated water	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion in steel tanks that are exposed to treated water is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. For loss of material for stainless steel tanks that are exposed to treated water, refer to Item Number 3.4.1-16. Further evaluation is documented in Section 3.4.2.2.2.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-07	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. This item is also applied to steel tanks that are exposed to lubricating oil. Further evaluation is documented in Section 3.4.2.2.2.2.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-08	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Plant specific	Yes, plant specific	Not applicable. The Steam and Power Conversion Systems do not contain steel piping, piping components, or piping elements that are exposed to raw water and subject to aging management review. Further evaluation is documented in Section 3.4.2.2.3.
3.4.1-09	Stainless steel and copper alloy heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Reduction in heat transfer due to fouling for stainless steel and copper alloy (including copper alloy > 15% Zn) heat exchanger tubes that are exposed to treated water is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage reduction in heat transfer. Further evaluation is documented in Section 3.4.2.2.4.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-10	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Reduction in heat transfer due to fouling for copper alloy (including copper alloy > 15% Zn) heat exchanger tubes that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage reduction in heat transfer. The Steam and Power Conversion Systems do not contain steel or stainless steel heat exchanger tubes that are exposed to lubricating oil and subject to aging management review. Further evaluation is documented in Section 3.4.2.2.4.2.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-11	Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Surveillance Or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Not applicable. The Steam and Power Conversion Systems do not contain steel (with or without coating or wrapping) piping, piping components, piping elements, or tanks that are exposed to soil and subject to aging management review. Further evaluation is documented in Section 3.4.2.2.5.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-12	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion in steel and gray cast iron heat exchanger components is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. This item is also applied to loss of material due to selective leaching in gray cast iron heat exchanger components that are exposed to lubricating oil. Further evaluation is documented in Section 3.4.2.2.5.2.
3.4.1-13	BWR only				

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-14	Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water >60 °C (>140 °F)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Cracking due to SCC in stainless steel piping, piping components, piping elements, and tanks that are exposed to treated water > 60°C (> 140°F) is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage cracking. The Steam and Power Conversion Systems do not contain stainless steel heat exchanger components that are exposed to treated water > 60°C (> 140°F) and subject to aging management review. For stainless steel piping, piping components, and piping elements in the Steam and Power Conversion Systems that are exposed to steam, refer to Item Number 3.4.1-39. Further evaluation is documented in Section 3.4.2.2.6.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-15	Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The Steam and Power Conversion Systems do not contain aluminum or copper alloy piping, piping components, or piping elements that are exposed to treated water and subject to aging management review. This item is, however, applied to copper alloy heat exchanger components that are exposed to treated water. Loss of material due to pitting and crevice corrosion in copper alloy (including copper alloy > 15% Zn) heat exchanger components that are exposed to treated water is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. Further evaluation is documented in Section 3.4.2.2.7.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-16	Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion in stainless steel piping, piping components, piping elements, tanks, and heat exchanger components that are exposed to treated water (including treated water > 60°C (> 140°F)) is managed by the PWR Water Chemistry Program. The One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material. Further evaluation is documented in Section 3.4.2.2.7.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-17	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	Not applicable. The Steam and Power Conversion Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to soil and subject to aging management review. Further evaluation is documented in Section 3.4.2.2.7.2.
3.4.1-18	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion in copper alloy (copper alloy > 15% Zn) piping, piping components, and piping elements that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. [continued]

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-18 [cont'd]	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material due to pitting and crevice corrosion was not identified as an aging effect requiring management for copper alloy piping, piping components, and piping elements with a zinc content less than 15% that are exposed to lubricating oil. This item is also applied to copper alloy (copper alloy > 15% Zn) heat exchanger components that are exposed to lubricating oil.This item is also applied to loss of material due to selective leaching for copper alloy (copper alloy > 15% Zn) components that are exposed to lubricating oil. Further evaluation is documented in Section 3.4.2.2.7.3.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-19	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion in stainless steel piping, piping components, and piping elements that are exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The One-Time Inspection will provide verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material. Further evaluation is documented in Section 3.4.2.2.8.
3.4.1-20	Steel tanks exposed to air – outdoor (external)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Not applicable. The Steam and Power Conversion Systems do not contain steel tanks that are exposed to air-outdoor (external) and subject to aging management review.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Cracking in high-strength steel bolting that is exposed to air with steam or water leakage is managed by the Bolting Integrity Program.
3.4.1-22	Steel bolting and closure bolting exposed to air with steam or water leakage, air – outdoor (external) or air – indoor uncontrolled (external);	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Consistent with NUREG-1801, with exceptions. Loss of material and loss of preload in steel bolting that is exposed to air with steam or water leakage and air-indoor uncontrolled (external) are managed by the Bolting Integrity Program.
3.4.1-23	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60 °C (>140 °F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Not applicable. The Steam and Power Conversion Systems do not contain stainless steel piping, piping components, or piping elements that are exposed to closed cycle cooling water > 60°C (> 140°F) and subject to aging management review.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-24	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. The Steam and Power Conversion Systems do not contain steel heat exchanger components that are exposed to closed cycle cooling water and subject to aging management review.
3.4.1-25	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable. The Steam and Power Conversion Systems do not contain stainless steel piping, piping components, piping elements, or heat exchanger components that are exposed to closed cycle cooling water and subject to aging management review.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-26	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. The Steam and Power Conversion Systems do not contain copper alloy piping, piping components, or piping elements that are exposed to closed cycle cooling water and subject to aging management review.
3.4.1-27	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Not applicable. The Steam and Power Conversion Systems do not contain steel, stainless steel, or copper alloy heat exchanger tubes that are exposed to closed cycle cooling water and subject to aging management review.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-28	Steel external surfaces exposed to air – indoor uncontrolled (external), condensation (external) or air outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. Loss of material for external surfaces of steel components, except for bolting, that are exposed to air-indoor uncontrolled (external) is managed by the External Surfaces Monitoring Program. For bolting, loss of material is managed by the Bolting Integrity Program (see Item Number 3.4.1-22). This item is also applied to internal surfaces of steel piping, piping components, and piping elements that are exposed to air-indoor uncontrolled (internal) where it has been demonstrated that the internal environment is the same as the external environment. The Steam and Power Conversion Systems do not contain steel components that are exposed to condensation (external) or air-outdoor (external) and subject to aging management review.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-29	Steel piping, piping components, and piping elements exposed to steam or treated water	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Consistent with NUREG-1801. Loss of material (wall thinning) due to FAC in steel piping, piping components, and piping elements that are exposed to steam or treated water (> 60°C (> 140°F)) is managed by the Flow-Accelerated Corrosion (FAC) Program.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-30	Steel piping, piping components, and piping elements exposed to air outdoor (internal) or condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Consistent with NUREG-1801, but a different aging management program is assigned. Loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements that are exposed to condensation (internal) will be detected and characterized by the One-Time Inspection. The Steam and Power Conversion Systems do not contain steel piping, piping components, or piping elements that are exposed to air outdoor (internal) and subject to aging management review.
3.4.1-31	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. The Steam and Power Conversion Systems do not contain steel heat exchanger components that are exposed to raw water and subject to aging management review.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-32	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable. The Steam and Power Conversion Systems do not contain stainless steel or copper alloy piping, piping components, or piping elements that are exposed to raw water and subject to aging management review.
3.4.1-33	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. The Steam and Power Conversion Systems do not contain stainless steel heat exchanger components that are exposed to raw water and subject to aging management review.
3.4.1-34	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable. The Steam and Power Conversion Systems do not contain steel, stainless steel, or copper alloy heat exchanger tubes that are exposed to raw water and subject to aging management review.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-35	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water, raw water or treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Steam and Power Conversion Systems do not contain copper alloy >15% Zn piping, piping components, or piping elements that are exposed to closed cycle cooling water, raw water or treated water and subject to aging management review. However, loss of material due to selective leaching in copper alloy >15% Zn heat exchanger components that are exposed to treated water will be detected and characterized by the Selective Leaching Inspection.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-36	Gray cast iron piping, piping components, and piping elements exposed to soil, treated water or raw water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Steam and Power Conversion Systems do not contain gray cast iron piping, piping components, or piping elements that are exposed to soil, treated water or raw water and subject to aging management review. However, loss of material due to selective leaching for gray cast iron heat exchanger components that are exposed to treated water will be detected and characterized by the Selective Leaching Inspection.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-37	Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Consistent with NUREG-1801. Loss of material in steel, stainless steel, and nickel alloy piping, piping components, and piping elements that are exposed to steam is managed by the PWR Water Chemistry Program. This item is also applied to steel and stainless steel heat exchanger components that are exposed to steam. In addition, the One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage loss of material.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-38	Steel bolting and external surfaces exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Consistent with NUREG-1801. Loss of material for external surfaces of steel bolting and steel (including gray cast iron) external surfaces that are exposed to air with borated water leakage is managed by the Boric Acid Corrosion Program.
3.4.1-39	Stainless steel piping, piping components, and piping elements exposed to steam	Cracking due to stress corrosion cracking	Water Chemistry	No	Consistent with NUREG-1801. Cracking in stainless steel piping, piping components, and piping elements that are exposed to steam is managed by the PWR Water Chemistry Program. In addition, the One-Time Inspection will provide verification of the effectiveness of the PWR Water Chemistry Program to manage cracking.
3.4.1-40	Glass piping elements exposed to air, lubricating oil, raw water, and treated water	None	None	NA - No AEM or AMP	Not applicable. The Steam and Power Conversion Systems do not contain glass piping elements that are subject to aging management review.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-41	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. No aging effects requiring management were identified for stainless steel or copper alloy (including copper alloy > 15% Zn) piping, piping components, or piping elements that are exposed to air-indoor uncontrolled (external). This item is also applied to stainless steel and copper alloy (including copper alloy > 15% Zn) heat exchanger components and tanks that are exposed to an air-indoor uncontrolled (external). This item is also applied to internal surfaces of stainless steel and copper alloy piping, piping components, and piping elements, and tanks that are exposed to air-indoor uncontrolled (internal) where it has been demonstrated that the internal environment is the same as the external environment.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-42	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. The Steam and Power Conversion Systems do not contain steel piping, piping components, or piping elements that are exposed to air-indoor controlled (external) because all air-indoor environments were conservatively evaluated as uncontrolled environments.
3.4.1-43	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Not applicable. The Steam and Power Conversion Systems do not contain steel or stainless steel piping, piping components, or piping elements that are embedded in concrete and subject to aging management review.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-44	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Not applicable. The Steam and Power Conversion Systems do not contain steel, stainless steel, aluminum, or copper alloy piping, piping components, or piping elements that are exposed to gas and subject to aging management review.

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
2	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
3	Bolting	Pressure boundary	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
4	Bolting	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
5	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-2	3.4.1-38	A
6	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VIII.H-3	3.4.1-21	B
7	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VIII.H-5	3.4.1-22	B
9	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
10	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F
11	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
12	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
13	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-2	3.4.1-38	A
14	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VIII.H-3	3.4.1-21	B

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
16	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VIII.H-5	3.4.1-22	B
17	Flow Element	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
18	Flow Element	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A
19	Flow Element	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
20	Flow Element	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
21	Flow Element	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
22	Flow Element	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
23	Heat Exchanger (casing) – AFW pump oil coolers	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.G-6	3.4.1-12	A 0403
24	Heat Exchanger (casing) – AFW pump oil coolers	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.G-6	3.4.1-12	A
25	Heat Exchanger (casing) – AFW pump oil coolers	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
26	Heat Exchanger (fins) – AFW pump oil coolers	Heat transfer	Copper Alloy	Treated water (Internal)	Reduction in heat transfer	One-Time Inspection	VIII.E-10	3.4.1-09	C
27	Heat Exchanger (fins) – AFW pump oil coolers	Heat transfer	Copper Alloy	Treated water (Internal)	Reduction in heat transfer	PWR Water Chemistry	VIII.E-10	3.4.1-09	C
28	Heat Exchanger (fins) – AFW pump oil coolers	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	VIII.G-8	3.4.1-10	C

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
29	Heat Exchanger (fins) – AFW pump oil coolers	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	One-Time Inspection	VIII.G-8	3.4.1-10	C
30	Heat Exchanger (tubes) – AFW pump oil coolers	Heat transfer	Copper Alloy	Treated water (Internal)	Reduction in heat transfer	One-Time Inspection	VIII.E-10	3.4.1-09	A
31	Heat Exchanger (tubes) – AFW pump oil coolers	Heat transfer	Copper Alloy	Treated water (Internal)	Reduction in heat transfer	PWR Water Chemistry	VIII.E-10	3.4.1-09	A
32	Heat Exchanger (tubes) – AFW pump oil coolers	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	VIII.G-8	3.4.1-10	A
33	Heat Exchanger (tubes) – AFW pump oil coolers	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	One-Time Inspection	VIII.G-8	3.4.1-10	A
34	Heat Exchanger (tubes) – AFW pump oil coolers	Pressure boundary	Copper Alloy	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.F-15	3.4.1-15	C

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
35	Heat Exchanger (tubes) – AFW pump oil coolers	Pressure boundary	Copper Alloy	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.F-15	3.4.1-15	C
36	Heat Exchanger (tubes) – AFW pump oil coolers	Pressure boundary	Copper Alloy	Lubricating oil (External)	None	None	VII.C1-8	3.3.1-26	I 0413
37	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
38	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A
39	Orifice	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
40	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
41	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
42	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
43	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
44	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
45	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
46	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A
47	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0405
48	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-38	3.4.1-04	A
49	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-38	3.4.1-04	A
50	Piping	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VIII.G-38	3.4.1-04	A 0402

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
51	Piping	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	PWR Water Chemistry	VIII.G-38	3.4.1-04	A 0402
52	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
53	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
54	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0405
55	Piping	Structural integrity	Steel	Lubricating Oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.G-35	3.4.1-07	A
56	Piping	Structural integrity	Steel	Lubricating Oil (Internal)	Loss of material	One-Time Inspection	VIII.G-35	3.4.1-07	A
57	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-38	3.4.1-04	A
58	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-38	3.4.1-04	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
59	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
60	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
61	Pump Casing – AFW pumps (DB-P14-1 & 2)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-38	3.4.1-04	A
62	Pump Casing – AFW pumps (DB-P14-1 & 2)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-38	3.4.1-04	A
63	Pump Casing – AFW pumps (DB-P14-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
64	Strainer (body)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
65	Strainer (body)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A
66	Strainer (body)	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
67	Strainer (body)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
68	Strainer (body)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-38	3.4.1-04	A
69	Strainer (body)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-38	3.4.1-04	A
70	Strainer (body)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
71	Strainer (screen)	Filtration	Stainless Steel	Treated water (External)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
72	Strainer (screen)	Filtration	Stainless Steel	Treated water (External)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A
73	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
74	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A
75	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
76	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
77	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
78	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A
79	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
80	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
81	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-32	3.4.1-16	A
82	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-32	3.4.1-16	A
83	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
84	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
85	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-38	3.4.1-04	A
86	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-38	3.4.1-04	A
87	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
88	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
89	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.G-38	3.4.1-04	A
90	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.G-38	3.4.1-04	A
91	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A

Table 3.4.2-1 Aging Management Review Results – Auxiliary Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
92	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-2 Aging Management Review Results – Condensate Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VIII.H-3	3.4.1-21	B
2	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VIII.H-5	3.4.1-22	B
4	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0405
5	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.E-34	3.4.1-04	A
6	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.E-34	3.4.1-04	A
7	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
8	Tank - Condensate storage tanks (DB-T31-1 & 2)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	One-Time Inspection	N/A	N/A	G 0404

Table 3.4.2-2 Aging Management Review Results – Condensate Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Tank - Condensate storage tanks (DB-T31-1 & 2)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.E-40	3.4.1-06	A
10	Tank - Condensate storage tanks (DB-T31-1 & 2)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.E-40	3.4.1-06	A
11	Tank - Condensate storage tanks (DB-T31-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0405
12	Tank - Condensate storage tanks (DB-T31-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
13	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.E-29	3.4.1-16	A
14	Tubing	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.E-29	3.4.1-16	A
15	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A

Table 3.4.2-2 Aging Management Review Results – Condensate Storage System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
16	Tubing	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.E-34	3.4.1-04	A
17	Tubing	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.E-34	3.4.1-04	A
18	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
19	Valve Body	Pressure boundary	Aluminum	Air-indoor uncontrolled (Internal)	None	None	V.F-2	3.2.1-50	A
20	Valve Body	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	V.F-2	3.2.1-50	A
21	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.E-34	3.4.1-04	A
22	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.E-34	3.4.1-04	A
23	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-2	3.4.1-38	A
2	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VIII.H-3	3.4.1-21	B
3	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VIII.H-5	3.4.1-22	B
5	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-2	3.4.1-38	A
6	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VIII.H-3	3.4.1-21	B
7	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VIII.H-5	3.4.1-22	B
9	Filter Housing	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	V.F-2	3.2.1-50	A
10	Filter Housing	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	N/A	N/A	G
11	Filter Housing	Pressure boundary	Aluminum	Lubricating oil (Internal)	Loss of material	One-Time Inspection	N/A	N/A	G
12	Filter Housing	Pressure boundary	Aluminum	Dried air (Internal)	None	None	N/A	N/A	G 0406
13	Filter Housing	Structural integrity	Aluminum	Air-indoor uncontrolled (External)	None	None	V.F-2	3.2.1-50	A
14	Filter Housing	Structural integrity	Aluminum	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	N/A	N/A	G
15	Filter Housing	Structural integrity	Aluminum	Lubricating oil (Internal)	Loss of material	One-Time Inspection	N/A	N/A	G

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
16	Heat Exchanger (casing) – MDFP LO cooler (DB-E183)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
17	Heat Exchanger (casing) – MDFP LO cooler (DB-E183)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.E-37	3.4.1-03	A
18	Heat Exchanger (casing) – MDFP LO cooler (DB-E183)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.E-37	3.4.1-03	A
19	Heat Exchanger (casing) - MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	C

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
20	Heat Exchanger (casing) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.E-36	3.4.1-16	A
21	Heat Exchanger (casing) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.E-36	3.4.1-16	A
22	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (External)	Cracking	PWR Water Chemistry	N/A	N/A	H
23	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (External)	Cracking	One-Time Inspection	N/A	N/A	H

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (External)	Loss of material	PWR Water Chemistry	VIII.A-5	3.4.1-15	C 0410
25	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (External)	Loss of material	One-Time Inspection	VIII.A-5	3.4.1-15	C
26	Heat Exchanger (tubes) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.E-36	3.4.1-16	A
27	Heat Exchanger (tubes) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.E-36	3.4.1-16	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
28	Heat Exchanger (tubes) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	PWR Water Chemistry	VIII.E-36	3.4.1-16	A
29	Heat Exchanger (tubes) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	One-Time Inspection	VIII.E-36	3.4.1-16	A
30	Heat Exchanger (tubesheet) – MDFP LO cooler (DB-E183)	Pressure boundary	Steel	Treated water (External)	Loss of material	PWR Water Chemistry	VIII.E-37	3.4.1-03	A
31	Heat Exchanger (tubesheet) – MDFP LO cooler (DB-E183)	Pressure boundary	Steel	Treated water (External)	Loss of material	One-Time Inspection	VIII.E-37	3.4.1-03	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Heat Exchanger (tubesheet) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.E-36	3.4.1-16	A
33	Heat Exchanger (tubesheet) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.E-36	3.4.1-16	A
34	Heat Exchanger (tubesheet) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	PWR Water Chemistry	VIII.E-36	3.4.1-16	A
35	Heat Exchanger (tubesheet) – MDFP seal water coolers (DB-184-1 & 2)	Pressure boundary	Stainless Steel	Treated water (External)	Loss of material	One-Time Inspection	VIII.E-36	3.4.1-16	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
36	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Heat transfer	Copper Alloy > 15% Zn	Treated water (External)	Reduction in heat Transfer	PWR Water Chemistry	VIII.E-10	3.4.1-09	A
37	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Heat transfer	Copper Alloy > 15% Zn	Treated water (External)	Reduction in heat Transfer	One-Time Inspection	VIII.E-10	3.4.1-09	A
38	Heat Exchanger (tubes) – MDFP seal water coolers (DB-184-1 & 2)	Heat transfer	Stainless Steel	Treated water (Internal)	Reduction in heat Transfer	PWR Water Chemistry	VIII.E-13	3.4.1-09	A
39	Heat Exchanger (tubes) – MDFP seal water coolers (DB-184-1 & 2)	Heat transfer	Stainless Steel	Treated water (Internal)	Reduction in heat Transfer	One-Time Inspection	VIII.E-13	3.4.1-09	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
40	Heat Exchanger (tubes) – MDFP seal water coolers (DB-184-1 & 2)	Heat transfer	Stainless Steel	Treated water (External)	Reduction in heat Transfer	PWR Water Chemistry	VIII.E-13	3.4.1-09	A
41	Heat Exchanger (tubes) – MDFP seal water coolers (DB-184-1 & 2)	Heat transfer	Stainless Steel	Treated water (External)	Reduction in heat Transfer	One-Time Inspection	VIII.E-13	3.4.1-09	A
42	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.G-19	3.4.1-18	C
43	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.G-19	3.4.1-18	C

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
44	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Reduction in heat transfer	Lubricating Oil Analysis	VIII.G-8	3.4.1-10	A
45	Heat Exchanger (tubes) – MDFP LO cooler (DB-E183)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Reduction in heat transfer	One-Time Inspection	VIII.G-8	3.4.1-10	A
46	Heat Exchanger (tubesheet) – MDFP LO cooler (DB-E183)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.G-6	3.4.1-12	A
47	Heat Exchanger (tubesheet) – MDFP LO cooler (DB-E183)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.G-6	3.4.1-12	A
48	Orifice	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
49	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-4	3.4.1-16	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
50	Orifice	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-4	3.4.1-16	A
51	Orifice	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
52	Orifice	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
53	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-4	3.4.1-16	A
54	Orifice	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-4	3.4.1-16	A
55	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-4	3.4.1-16	A
56	Orifice	Throttling	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-4	3.4.1-16	A
57	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0405

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
58	Piping	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
59	Piping	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
60	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A 0405
61	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A
62	Piping	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A
63	Piping	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A 0402
64	Piping	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.D1-9	3.4.1-29	A 0402
65	Piping	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A 0402

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
66	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
67	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
68	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	VIII.H-7	3.4.1-28	I 0408
69	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-6	3.4.1-07	A
70	Piping	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-6	3.4.1-07	A
71	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A
72	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A
73	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
74	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
75	Pump Casing – MDFP (DB-P241)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A
76	Pump Casing – MDFP (DB-P241)	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A
77	Pump Casing – MDFP (DB-P241)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
78	Pump Casing – Motor driven MDFP LO pump (DB-P242-1)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-6	3.4.1-07	A
79	Pump Casing – Motor driven MDFP LO pump (DB-P242-1)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-6	3.4.1-07	A
80	Pump Casing – Motor driven MDFP LO pump (DB-P242-1)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
81	Pump Casing – Shaft driven MDFP LO pump (DB-P242-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-6	3.4.1-07	A
82	Pump Casing – Shaft driven MDFP LO pump (DB-P242-2)	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-6	3.4.1-07	A
83	Pump Casing – Shaft driven MDFP LO pump (DB-P242-2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
84	Pump Casing – Motor driven SUFP LO pump	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-6	3.4.1-07	A
85	Pump Casing – Motor driven SUFP LO pump	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-6	3.4.1-07	A
86	Pump Casing – Motor driven SUFP LO pump	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
87	Pump Casing – Shaft driven SUFP LO pump	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-6	3.4.1-07	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
88	Pump Casing – Shaft driven SUFP LO pump	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-6	3.4.1-07	A
89	Pump Casing – Shaft driven SUFP LO pump	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
90	Pump Casing – SUFP (DB-P15)	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A
91	Pump Casing – SUFP (DB-P15)	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A
92	Pump Casing – SUFP (DB-P15)	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
93	Tank – Air volume tank	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0406
94	Tank – Air volume tank	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
95	Tank – MDFP LO reservoir	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
96	Tank – MDFP LO reservoir	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A 0405
97	Tank – MDFP LO reservoir	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-6	3.4.1-07	C
98	Tank – MDFP LO reservoir	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-6	3.4.1-07	C
99	Tank – SUFP LO reservoir	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
100	Tank – SUFP LO reservoir	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A 0405
101	Tank – SUFP LO reservoir	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-6	3.4.1-07	C
102	Tank – SUFP LO reservoir	Structural integrity	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-6	3.4.1-07	C
103	Tubing	Pressure boundary	Copper Alloy	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A 0406
104	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
105	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A 0406
106	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
107	Tubing	Pressure boundary	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Cracking	One-Time Inspection	VIII.D1-5	3.4.1-14	A
108	Tubing	Pressure boundary	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Cracking	PWR Water Chemistry	VIII.D1-5	3.4.1-14	A
109	Tubing	Pressure boundary	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VIII.D1-4	3.4.1-16	A 0402
110	Tubing	Pressure boundary	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-4	3.4.1-16	A 0402
111	Tubing	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
112	Tubing	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
113	Tubing	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A
114	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-6	3.4.1-07	A
115	Tubing	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-6	3.4.1-07	A
116	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
117	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
118	Tubing	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A
119	Tubing	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A
120	Tubing	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
121	Tubing	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
122	Valve Body	Pressure boundary	Aluminum	Dried air (Internal)	None	None	N/A	N/A	G 0406
123	Valve Body	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	V.F-2	3.2.1-50	A
124	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A 0406
125	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-2	3.4.1-18	A 0403
126	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-2	3.4.1-18	A
127	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
128	Valve Body	Pressure Boundary	Gray Cast Iron	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0406
129	Valve Body	Pressure Boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
130	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0405
131	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-4	3.4.1-16	A
132	Valve Body	Pressure boundary	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-4	3.4.1-16	A
133	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
134	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A 0405
135	Valve Body	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A 0402
136	Valve Body	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.D1-9	3.4.1-29	A 0402
137	Valve Body	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A 0402

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
138	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
139	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
140	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	None	None	VIII.H-7	3.4.1-28	I 0408
141	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A
142	Valve Body	Pressure boundary	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A
143	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-6	3.4.1-07	A
144	Valve Body	Pressure boundary	Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-6	3.4.1-07	A
145	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.D1-2	3.4.1-18	A 0403
146	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.D1-2	3.4.1-18	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
147	Valve Body	Structural integrity	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
148	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-4	3.4.1-16	A
149	Valve Body	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-4	3.4.1-16	A
150	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
151	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
152	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.D1-8	3.4.1-04	A
153	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.D1-8	3.4.1-04	A
154	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A

Table 3.4.2-3 Aging Management Review Results – Main Feedwater System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
155	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-2	3.4.1-38	A
2	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VIII.H-3	3.4.1-21	B
3	Bolting	Pressure boundary	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VIII.H-6	3.4.1-22	B
4	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
5	Bolting	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VIII.H-5	3.4.1-22	B
6	Bolting	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	C
7	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	N/A	N/A	F

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Bolting	Structural integrity	Stainless Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	N/A	N/A	F
9	Bolting	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	N/A	N/A	F
10	Bolting	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-2	3.4.1-38	A
11	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Cracking	Bolting Integrity	VIII.H-3	3.4.1-21	B
12	Bolting	Structural integrity	Steel	Air with steam or water leakage (External)	Loss of material	Bolting Integrity	VIII.H-6	3.4.1-22	B
13	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	Bolting Integrity	VIII.H-4	3.4.1-22	B
14	Bolting	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of preload	Bolting Integrity	VIII.H-5	3.4.1-22	B

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
15	Heat Exchanger (fins) – AFW pump turbine bearing lube oil cooler	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	VIII.G-8	3.4.1-10	A
16	Heat Exchanger (fins) – AFW pump turbine bearing lube oil cooler	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	One-Time Inspection	VIII.G-8	3.4.1-10	A
17	Heat Exchanger (tubes) – AFW pump turbine bearing lube oil cooler	Heat transfer	Copper Alloy	Treated water (Internal)	Reduction in heat transfer	PWR Water Chemistry	VIII.E-10	3.4.1-09	A
18	Heat Exchanger (tubes) – AFW pump turbine bearing lube oil cooler	Heat transfer	Copper Alloy	Treated water (Internal)	Reduction in heat transfer	One-Time Inspection	VIII.E-10	3.4.1-09	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
19	Heat Exchanger (shell) – AFW pump turbine bearing lube oil cooler	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.G-6	3.4.1-12	A 0403
20	Heat Exchanger (shell) – AFW pump turbine bearing lube oil cooler	Pressure boundary	Gray Cast Iron	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.G-6	3.4.1-12	A
21	Heat Exchanger (shell) – AFW pump turbine bearing lube oil cooler	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
22	Heat Exchanger (tubes) – AFW pump turbine bearing lube oil cooler	Pressure boundary	Copper Alloy	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.F-15	3.4.1-15	C

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
23	Heat Exchanger (tubes) – AFW pump turbine bearing lube oil cooler	Pressure boundary	Copper Alloy	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.F-15	3.4.1-15	C
24	Heat Exchanger (tubes) – AFW pump turbine bearing lube oil cooler	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	VIII.G-8	3.4.1-10	A
25	Heat Exchanger (tubes) – AFW pump turbine bearing lube oil cooler	Heat transfer	Copper Alloy	Lubricating oil (External)	Reduction in heat transfer	One-Time Inspection	VIII.G-8	3.4.1-10	A
26	Heat Exchanger (tubes) – AFW pump turbine bearing lube oil cooler	Pressure boundary	Copper Alloy	Lubricating oil (External)	None	None	VII.C1-8	3.3.1-26	I 0413

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
27	Heat Exchanger (channel) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.B1-11	3.4.1-04	C
28	Heat Exchanger (channel) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-11	3.4.1-04	C
29	Heat Exchanger (channel) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Gray Cast Iron	Treated water (Internal)	Loss of material	Selective Leaching Inspection	VIII.G-26	3.4.1-36	C

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
30	Heat Exchanger (channel) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Gray Cast Iron	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
31	Heat Exchanger (shell) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.G-19	3.4.1-18	C 0403
32	Heat Exchanger (shell) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.G-19	3.4.1-18	C

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
33	Heat Exchanger (shell) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	C
34	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Heat transfer	Copper Alloy > 15% Zn	Treated water (Internal)	Reduction in heat transfer	PWR Water Chemistry	VIII.E-10	3.4.1-09	A
35	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Heat transfer	Copper Alloy > 15% Zn	Treated water (Internal)	Reduction in heat transfer	One-Time Inspection	VIII.E-10	3.4.1-09	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
36	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (External)	Reduction in heat transfer	Lubricating Oil Analysis	VIII.G-8	3.4.1-10	A
37	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Heat transfer	Copper Alloy > 15% Zn	Lubricating oil (External)	Reduction in heat transfer	One-Time Inspection	VIII.G-8	3.4.1-10	A
38	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (Internal)	Cracking	One-Time Inspection	N/A	N/A	H

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (Internal)	Cracking	PWR Water Chemistry	N/A	N/A	H
40	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.F-15	3.4.1-15	C 0410
41	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.F-15	3.4.1-15	C 0410

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
42	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VIII.G-19	3.4.1-18	C 0403 0410
43	Heat Exchanger (tubes) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (External)	Loss of material	One-Time Inspection	VIII.G-19	3.4.1-18	C 0410
44	Heat Exchanger (tubesheet) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.F-15	3.4.1-15	C

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
45	Heat Exchanger (tubesheet) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.F-15	3.4.1-15	C
46	Heat Exchanger (tubesheet) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Treated water (Internal)	Loss of material	Selective Leaching Inspection	VIII.G-23	3.4.1-35	C
47	Heat Exchanger (tubesheet) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (External)	Loss of material	Lubricating Oil Analysis	VIII.G-19	3.4.1-18	C 0403

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
48	Heat Exchanger (tubesheet) – AFW pump turbine governor lube oil cooler (DB-E194-1 & 2)	Pressure boundary	Copper Alloy > 15% Zn	Lubricating oil (External)	Loss of material	One-Time Inspection	VIII.G-19	3.4.1-18	C
49	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0405 0409
50	Piping	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VIII.B1-7	3.4.1-30	E
51	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-8	3.4.1-37	E 0411
52	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B1-9	3.4.1-29	A
53	Piping	Pressure boundary	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-8	3.4.1-37	A
54	Piping	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VIII.B1-11	3.4.1-04	A 0402

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
55	Piping	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.F-26	3.4.1-29	A 0402
56	Piping	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-11	3.4.1-04	A 0402
57	Piping	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
58	Piping	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A 0409
59	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0405
60	Piping	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
61	Piping	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
62	Piping	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0405 0409

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
63	Piping	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VIII.B1-7	3.4.1-30	E
64	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-8	3.4.1-37	E 0411
65	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B1-9	3.4.1-29	A
66	Piping	Structural integrity	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-8	3.4.1-37	A
67	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.B1-11	3.4.1-04	A
68	Piping	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-11	3.4.1-04	A
69	Piping	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
70	Piping	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A 0409

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
71	Pump Casing – Steam generator wet layup chemical addition metering pump (DB-P259-1 & 2)	Structural integrity	Polymer	Treated water (Internal)	None	None	N/A	N/A	F
72	Pump Casing – Steam generator wet layup chemical addition metering pump (DB-P259-1 & 2)	Structural integrity	Polymer	Air with borated water leakage (External)	None	None	N/A	N/A	F
73	Pump Casing – Steam generator wet layup chemical addition metering pump (DB-P259-1 & 2)	Structural integrity	Polymer	Air-indoor uncontrolled (External)	Hardening and loss of strength	External Surfaces Monitoring	N/A	N/A	F

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
74	Pump Casing – Steam generator wet layup chemical addition metering pump (DB-P182-1 & 2)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A
75	Pump Casing – Steam generator wet layup chemical addition metering pump (DB-P182-1 & 2)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A
76	Pump Casing – Steam generator wet layup chemical addition metering pump (DB-P182-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
77	Pump Casing – Steam generator wet layup chemical addition metering pump (DB-P182-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
78	Tank – Air volume tank (DB-T143-1 & 2)	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0406
79	Tank – Air volume tank (DB-T143-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
80	Tank – Air volume tank (DB-T191-1 & 2)	Pressure boundary	Steel	Dried air (Internal)	None	None	VII.J-22	3.3.1-98	A 0406
81	Tank – Air volume tank (DB-T191-1 & 2)	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
82	Tank – Air volume tank (DB-T191-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
83	Tank – Steam generator wet layup chemical addition tank (DB-T139-1 & 2)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A
84	Tank – Steam generator wet layup chemical addition tank (DB-T139-1 & 2)	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A
85	Tank – Steam generator wet layup chemical addition tank (DB-T139-1 & 2)	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
86	Tank – Steam generator wet layup chemical addition tank (DB-T139-1 & 2)	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	C
87	Trap Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-8	3.4.1-37	E 0411
88	Trap Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B1-9	3.4.1-29	A
89	Trap Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-8	3.4.1-37	A
90	Trap Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
91	Trap Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A 0409
92	Trap Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0405 0409

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
93	Trap Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
94	Trap Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A 0409
95	Tubing	Pressure boundary	Copper Alloy	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A 0406
96	Tubing	Pressure boundary	Copper Alloy	Air with borated water leakage (External)	None	None	VII.J-5	3.3.1-99	A
97	Tubing	Pressure boundary	Copper Alloy	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
98	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A 0406
99	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
100	Tubing	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
101	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VIII.G-29	3.4.1-19	A
102	Tubing	Pressure boundary	Stainless Steel	Lubricating oil (Internal)	Loss of material	One-Time Inspection	VIII.G-29	3.4.1-19	A
103	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	One-Time Inspection	VIII.B1-2	3.4.1-39	E 0411
104	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	PWR Water Chemistry	VIII.B1-2	3.4.1-39	A
105	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-3	3.4.1-37	E 0411
106	Tubing	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-3	3.4.1-37	A
107	Tubing	Pressure boundary	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A
108	Tubing	Pressure boundary	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
109	Tubing	Pressure boundary	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0402
110	Tubing	Pressure boundary	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0402
111	Tubing	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
112	Tubing	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
113	Tubing	Structural integrity	Stainless Steel	Steam (Internal)	Cracking	One-Time Inspection	VIII.B1-2	3.4.1-39	E 0411
114	Tubing	Structural integrity	Stainless Steel	Steam (Internal)	Cracking	PWR Water Chemistry	VIII.B1-2	3.4.1-39	A
115	Tubing	Structural integrity	Stainless Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-3	3.4.1-37	E 0411
116	Tubing	Structural integrity	Stainless Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-3	3.4.1-37	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
117	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A
118	Tubing	Structural integrity	Stainless Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A
119	Tubing	Structural integrity	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Cracking	One-Time Inspection	VIII.B1-5	3.4.1-14	A
120	Tubing	Structural integrity	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Cracking	PWR Water Chemistry	VIII.B1-5	3.4.1-14	A
121	Tubing	Structural integrity	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VIII.B1-4	3.4.1-16	A 0402
122	Tubing	Structural integrity	Stainless Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-4	3.4.1-16	A 0402
123	Tubing	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
124	Tubing	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
125	Turbine Casing – AFW turbine casing (DB-K3-1 & 2)	Pressure boundary	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-8	3.4.1-37	E 0411
126	Turbine Casing – AFW turbine casing (DB-K3-1 & 2)	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B1-9	3.4.1-29	A
127	Turbine Casing – AFW turbine casing (DB-K3-1 & 2)	Pressure boundary	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-8	3.4.1-37	A
128	Turbine Casing – AFW turbine casing (DB-K3-1 & 2)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
129	Valve Body	Pressure boundary	Aluminum	Dried air (Internal)	None	None	N/A	N/A	G 0406
130	Valve Body	Pressure boundary	Aluminum	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.A3-4	3.3.1-88	A
131	Valve Body	Pressure boundary	Aluminum	Air-indoor uncontrolled (External)	None	None	V.F-2	3.2.1-50	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
132	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Dried air (Internal)	None	None	VII.J-3	3.3.1-98	A 0406
133	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
134	Valve Body	Pressure boundary	Copper Alloy > 15% Zn	Air-indoor uncontrolled (External)	None	None	VIII.I-2	3.4.1-41	A
135	Valve Body	Pressure boundary	Stainless Steel	Dried air (Internal)	None	None	VII.J-18	3.3.1-98	A 0406
136	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	One-Time Inspection	VIII.B1-2	3.4.1-39	E 0411
137	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Cracking	PWR Water Chemistry	VIII.B1-2	3.4.1-39	A
138	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-3	3.4.1-37	E 0411
139	Valve Body	Pressure boundary	Stainless Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-3	3.4.1-37	A

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
140	Valve Body	Pressure boundary	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
141	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
142	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0405 0409
143	Valve Body	Pressure boundary	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VIII.B1-7	3.4.1-30	E
144	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-8	3.4.1-37	E 0411
145	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B1-9	3.4.1-29	A
146	Valve Body	Pressure boundary	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-8	3.4.1-37	A
147	Valve Body	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	One-Time Inspection	VIII.B1-11	3.4.1-04	A 0402

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
148	Valve Body	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.F-26	3.4.1-29	A 0402
149	Valve Body	Pressure boundary	Steel	Treated water > 60°C (> 140°F) (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-11	3.4.1-04	A 0402
150	Valve Body	Pressure boundary	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
151	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A
152	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (Internal)	None	None	VIII.I-10	3.4.1-41	A 0405
153	Valve Body	Structural integrity	Stainless Steel	Air with borated water leakage (External)	None	None	VII.J-16	3.3.1-99	A
154	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VIII.I-10	3.4.1-41	A
155	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (Internal)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	C 0405 0409

Table 3.4.2-4 Aging Management Review Results – Main Steam System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
156	Valve Body	Structural integrity	Steel	Condensation (Internal)	Loss of material	One-Time Inspection	VIII.B1-7	3.4.1-30	E
157	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	One-Time Inspection	VIII.B1-8	3.4.1-37	E 0411
158	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	Flow-Accelerated Corrosion (FAC)	VIII.B1-9	3.4.1-29	A
159	Valve Body	Structural integrity	Steel	Steam (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-8	3.4.1-37	A
160	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	One-Time Inspection	VIII.B1-11	3.4.1-04	A
161	Valve Body	Structural integrity	Steel	Treated water (Internal)	Loss of material	PWR Water Chemistry	VIII.B1-11	3.4.1-04	A
162	Valve Body	Structural integrity	Steel	Air with borated water leakage (External)	Loss of material	Boric Acid Corrosion	VIII.H-9	3.4.1-38	A
163	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VIII.H-7	3.4.1-28	A

Generic Notes:	
A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0401	Not used.
0402	For the purposes of NUREG-1801 comparison, Treated water > 60°C (> 140°F) is equivalent to Treated water for this material and aging effect.
0403	The Lubricating Oil Analysis Program will also manage loss of material due to selective leaching by controlling water contamination of the lubricating oil environment.
0404	The air-water interface is evaluated as a moist air environment.
0405	This environment is the same as the NUREG-1801 environment except that it is an internal rather than an external environment.
0406	The Air Quality Monitoring Program will ensure that the control air environment, supplied from the Instrument Air System, remains dry and free of contaminants, thereby sustaining the aging management review conclusion that there are no aging effects that require management.
0407	Not used.
0408	Except for the motor-driven feedwater pump (MDFP) and startup feed pump (SUFP) portions of the Main Feedwater System, the control air supply components associated with the main and start-up control valves, and bolting exposed to "air with steam or water leakage", loss of material due to general corrosion is not an aging effect requiring management for the external surfaces of steel components in the Main Feedwater System that are exposed to the "air-indoor uncontrolled" because the surface temperature is greater than 212°F and, therefore, the surface is expected to be dry.
0409	This aging effect is only applicable for components with temperatures less than 212°F.
0410	The component is admiralty brass, which is an inhibited copper alloy, and, therefore, loss of material due to selective leaching is not an applicable aging mechanism.
0411	One-Time Inspection will provide verification of PWR Water Chemistry Program effectiveness.
0412	Not used.
0413	This material is copper alloy < 15% Zn and is not in contact with a more cathodic metal; therefore, there are no aging effects requiring management in the lubricating oil environment.

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3.5 AGING MANAGEMENT OF CONTAINMENT, STRUCTURES, AND COMPONENT SUPPORTS

3.5.1 INTRODUCTION

Section 3.5 provides the results of the aging management reviews (AMRs) for those structural components and commodities identified in Section 2.4, Scoping and Screening Results - Structures, subject to AMR. The structures or structural commodities are described in the indicated sections.

- Containment (including Containment Vessel, Shield Building, and Containment internal structures) (Section 2.4.1)
- Auxiliary Building (Section 2.4.2)
- Intake Structure, Forebay, and Service Water Discharge Structure (Section 2.4.3)
- Borated Water Storage Tank Level Transmitter Building (Section 2.4.4)
- Miscellaneous Diesel Generator Building (Section 2.4.5)
- Office Building (Condensate Storage Tanks) (Section 2.4.6)
- Personnel Shop Facility Passageway (Missile Shield Area) (Section 2.4.7)
- Service Water Pipe Tunnel and Valve Rooms (Section 2.4.8)
- Station Blackout Diesel Generator Building (including Transformer X-3051 and Radiator Skid Foundations) (Section 2.4.9)
- Turbine Building (Section 2.4.10)
- Water Treatment Building (Section 2.4.11)
- Yard Structures (Section 2.4.12)
- Bulk Commodities (Section 2.4.13)

Table 3.5.1, Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to structural component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.5.2.2.

3.5.2 RESULTS

The following tables summarize the results of the AMR for Containment, Structures, and Component Supports.

Table 3.5.2-1	Aging Management Review Results - Containment (including Containment Vessel, Shield Building, and Containment internal structures)
Table 3.5.2-2	Aging Management Review Results - Auxiliary Building
Table 3.5.2-3	Aging Management Review Results - Intake Structure, Forebay, and Service Water Discharge Structure
Table 3.5.2-4	Aging Management Review Results - Borated Water Storage Tank Level Transmitter Building
Table 3.5.2-5	Aging Management Review Results - Miscellaneous Diesel Generator Building
Table 3.5.2-6	Aging Management Review Results - Office Building (Condensate Storage Tanks)
Table 3.5.2-7	Aging Management Review Results - Personnel Shop Facility Passageway (Missile Shield Area)
Table 3.5.2-8	Aging Management Review Results - Service Water Pipe Tunnel and Valve Rooms
Table 3.5.2-9	Aging Management Review Results - Station Blackout Diesel Generator Building (including Transformer X-3051 and Radiator Skid Foundations)
Table 3.5.2-10	Aging Management Review Results - Turbine Building
Table 3.5.2-11	Aging Management Review Results - Water Treatment Building
Table 3.5.2-12	Aging Management Review Results - Yard Structures
Table 3.5.2-13	Aging Management Review Results – Bulk Commodities

3.5.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodities are fabricated, the environments to which they are exposed, the aging effects requiring management, and the aging management programs (AMPs) used to manage these aging effects are provided for each of the above structures and structural components in the following sections.

3.5.2.1.1 Containment (including Containment Vessel, Shield Building, and Containment internal structures)

Materials

Containment structural components subject to aging management review are constructed of the following materials:

- Aluminum
- Carbon steel
- Concrete
- Elastomer
- Galvanized steel
- Stainless steel
- Lubrite® sliding surfaces

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Containment structural components subject to aging management review are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Raw water
- Soil

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Containment structural components require management:

- Change in material properties
- Cracking
- Loss of material
- Loss of mechanical function

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Containment structural components:

- 10 CFR Part 50, Appendix J Program
- Boric Acid Corrosion Program
- Cranes and Hoists Inspection Program
- Fire Protection Program
- Inservice Inspection (ISI) Program – IWE
- Inservice Inspection (ISI) Program – IWF
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.2 Auxiliary Building

Materials

Auxiliary Building structural components subject to AMR are constructed of the following materials:

- Aluminum
- Boral®
- Carbon steel
- Concrete

- Concrete blocks
- Galvanized steel
- Stainless steel

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Auxiliary Building structural components subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Raw water
- Soil
- Treated borated water

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Auxiliary Building structural components require management:

- Change in material properties
- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Auxiliary Building structural components:

- Boral® Monitoring Program
- Boric Acid Corrosion Program
- Cranes and Hoists Inspection Program
- Fire Protection Program
- Leak Chase Monitoring Program

- Masonry Wall Inspection
- PWR Water Chemistry Program
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.3 Intake Structure, Forebay, and Service Water Discharge Structure

Materials

Intake Structure, Forebay, and Service Water Discharge Structure structural components subject to AMR are constructed of the following materials:

- Carbon steel
- Concrete
- Concrete blocks
- Galvanized steel
- Earthen

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Intake Structure, Forebay, and Service Water Discharge Structure structural components subject to AMR are exposed to the following environments:

- Soil
- Air-indoor
- Air-outdoor
- Water-flowing
- Raw water

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Intake Structure, Forebay, and Service Water Discharge Structure structural components require management:

- Loss of material
- Cracking

- Change in material properties
- Loss of form

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Intake Structure, Forebay, and Service Water Discharge Structure structural components:

- Water Control Structures Inspection
- Fire Protection Program
- Cranes and Hoists Inspection Program
- Masonry Wall Inspection

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.4 Borated Water Storage Tank Level Transmitter Building

Materials

Borated Water Storage Tank Level Transmitter Building structural components subject to AMR are constructed of the following materials:

- Aluminum
- Carbon steel
- Concrete

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Borated Water Storage Tank Level Transmitter Building structural components subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Soil

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Borated Water Storage Tank Level Transmitter Building structural components require management:

- Change in material properties
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Borated Water Storage Tank Level Transmitter Building structural components:

- Boric Acid Corrosion Program
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.5 Miscellaneous Diesel Generator Building

Materials

Miscellaneous Diesel Generator Building structural components subject to AMR are constructed of the following materials:

- Carbon steel
- Concrete
- Concrete blocks

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Miscellaneous Diesel Generator Building structural components subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Soil

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Miscellaneous Diesel Generator Building structural components require management:

- Change in material properties
- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Miscellaneous Diesel Generator Building structural components:

- Fire Protection Program
- Masonry Wall Inspection
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.6 Office Building (Condensate Storage Tanks)

Materials

Office Building (Condensate Storage Tanks) structural components subject to AMR are constructed of the following materials:

- Aluminum
- Carbon steel
- Concrete
- Concrete blocks
- Porcelain

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Office Building (Condensate Storage Tanks) structural components subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Soil

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Office Building (Condensate Storage Tanks) structural components require management:

- Change in material properties
- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Office Building (Condensate Storage Tanks) structural components:

- Fire Protection Program
- Masonry Wall Inspection
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.7 Personnel Shop Facility Passageway (Missile Shield Area)

Materials

Personnel Shop Facility Passageway (Missile Shield Area) structural components subject to AMR are constructed of the following materials:

- Carbon steel
- Concrete

- Galvanized steel

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Personnel Shop Facility Passageway (Missile Shield Area) structural components subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Soil

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Personnel Shop Facility Passageway (Missile Shield Area) structural components require management:

- Change in material properties
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following program is credited for managing the effects of aging on the Personnel Shop Facility Passageway (Missile Shield Area) structural components:

- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.8 Service Water Pipe Tunnel and Valve Rooms

Materials

Service Water Pipe Tunnel and Valve Rooms structural components subject to AMR are constructed of the following material:

- Concrete

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Service Water Pipe Tunnel and Valve Rooms structural components subject to AMR are exposed to the following environments:

- Air-indoor
- Raw water
- Soil

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Service Water Pipe Tunnel and Valve Rooms structural components require management:

- Change in material properties
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Service Water Pipe Tunnel and Valve Rooms structural components:

- Fire Protection Program
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.9 Station Blackout Diesel Generator Building (including Transformer X-3051 and Radiator Skid Foundations)

Materials

Station Blackout Diesel Generator Building (including Transformer X-3051 and Radiator Skid Foundations) structural components subject to AMR are constructed of the following materials:

- Carbon steel
- Concrete
- Concrete blocks

- Galvanized steel

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Station Blackout Diesel Generator Building (including Transformer X-3051 and Radiator Skid Foundations) structural components subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Raw water
- Soil

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Station Blackout Diesel Generator Building (including Transformer X-3051 and Radiator Skid Foundations) structural components require management:

- Change in material properties
- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Station Blackout Diesel Generator Building (including Transformer X-3051 and Radiator Skid Foundations) structural components:

- Masonry Wall Inspection
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.10 Turbine Building

Materials

Turbine Building structural components subject to AMR are constructed of the following materials:

- Carbon steel
- Concrete
- Concrete blocks
- Galvanized steel

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Turbine Building structural components subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Raw water
- Soil

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Turbine Building structural components require management:

- Change in material properties
- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Turbine Building structural components:

- Fire Protection Program

- Masonry Wall Inspection
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.11 Water Treatment Building

Materials

Water Treatment Building structural components subject to AMR are constructed of the following materials:

- Carbon steel
- Concrete
- Concrete blocks
- Galvanized steel

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Water Treatment Building structural components subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Raw water
- Soil

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with the Water Treatment Building structural components require management:

- Change in material properties
- Cracking
- Loss of material

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on the Water Treatment Building structural components:

- Fire Protection Program
- Masonry Wall Inspection
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.12 Yard Structures

Materials

Structural components of yard structures subject to AMR are constructed of the following materials:

- Carbon steel
- Concrete
- Concrete blocks
- Earthen
- Galvanized steel

Materials for bulk commodity components are addressed in Section 3.5.2.1.13.

Environments

Structural components of yard structures subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Concrete
- Raw water
- Soil
- Structural backfill

Environments for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Effects Requiring Management

The following aging effects associated with structural components of evaluated yard structures require management:

- Change in material properties
- Cracking
- Loss of material
- Loss of form

Aging effects requiring management for bulk commodity components are addressed in Section 3.5.2.1.13.

Aging Management Programs

The following programs are credited for managing the effects of aging on yard structures' structural components:

- Boric Acid Corrosion Program
- Fire Protection Program
- Masonry Wall Inspection
- Structures Monitoring Program

Aging management programs for bulk commodity components are addressed in Section 3.5.2.1.13.

3.5.2.1.13 Bulk Commodities

Materials

Structural components of bulk commodities subject to AMR are constructed of the following materials:

- Aluminum
- Carbon steel
- Concrete
- Elastomer
- Fire barrier materials (Ceramic fiber/ 3M Interam/ Isolatek/ Mandoseal/ Monokote)
- Galvanized steel

- Insulation materials (Calcium Silicate/ fiberglass/ aluminum jacketing/ stainless steel mirror insulation)
- Stainless steel

Environments

Structural components of bulk commodities subject to AMR are exposed to the following environments:

- Air-indoor
- Air-outdoor
- Soil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with structural components of evaluated bulk commodities require management:

- Change in material properties
- Cracking
- Delamination
- Loss of material
- Separation

Aging Management Programs

The following programs are credited for managing the effects of aging on bulk commodities:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Fire Protection Program
- Structures Monitoring Program
- PWR Water Chemistry Program
- Inservice Inspection (ISI) Program – IWF

3.5.2.2 Aging Management Review Results for Which Further Evaluation is Recommended by NUREG-1801

For the Davis-Besse containment, structures, and component supports, those items requiring further evaluation are addressed in the following sections.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete Areas

Increases in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel could occur in inaccessible areas of pressurized water reactor (PWR) and boiling water reactor (BWR) concrete and steel containments.

At Davis-Besse, the Inservice Inspection (ISI) Program – IWL does not apply since the Davis-Besse Containment is a free-standing, steel containment vessel.

Aggressive Chemical Attack and Corrosion of Embedded Steel

The below-grade environment at Davis-Besse is aggressive (Chlorides > 500 ppm and Sulfates > 1,500 ppm). Sampling results indicated a groundwater pH minimum value of 6.9, a chloride content maximum value of 2,870 ppm, and a sulfate content maximum value of 1,700 ppm.

In addition, portions of the containment structures are located below the normal groundwater level. The plant structures have been provided with waterproofing on the exterior portions of the below-grade structures. Water leakage (above and below grade) has been observed at the plant. Once the concrete has cracked, a path is available for water to reach the reinforcing steel, initiating corrosion in rebar that can result in reduced available reinforcing area and spalling of concrete.

Therefore, increases in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are applicable for Davis-Besse containment concrete in inaccessible areas.

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components. In addition, the Shield Building concrete is managed by the 10 CFR Part 50, Appendix J Program's Containment Vessel and Shield Building Visual Inspection.

3.5.2.2.1.2 Cracks and Distortion due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, Cracking and Differential Settlement due to Erosion of Porous Concrete Subfoundations, if Not Covered by Structures Monitoring Program

Cracks and distortion due to increased stress levels from settlement could occur in PWR and BWR concrete and steel containments. Also, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in all types of PWR and BWR containments.

Settlement

At Davis-Besse, cracking and distortion due to settlement are not aging effects requiring management for containment concrete components because, based on settlement analyses, it is estimated that maximum settlements of Class I structures (e.g., Containment or Shield Building) will be less than 1/8 inch. Therefore, further evaluation of increased stress levels due to settlement is not required.

Porous Concrete Subfoundations

The Davis-Besse Containment does not have a porous concrete subfoundation. Therefore, further evaluation for aging effects due to erosion of porous concrete is not required.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR concrete and steel containments.

Elevated Temperatures

Elevated temperature for the Containment basemat is well below the allowable limits of 150°F general and 200°F local and therefore the aging effect for this mechanism is not applicable. Elevated temperature is an issue of concern in the upper regions of the Containment internal structures. Concrete inside containment and the concrete foundation of the Shield Building that supports containment are evaluated in Section 3.5.2.2.2.3.

3.5.2.2.1.4 Loss of Material due to General, Pitting, and Crevice Corrosion

Loss of material due to general, pitting and crevice corrosion could occur in steel elements of accessible and inaccessible areas for all types of PWR and BWR containments.

Corrosion in inaccessible areas of steel containment liner

At Davis-Besse, loss of material due to corrosion in steel elements of accessible areas is managed by the Inservice Inspection (ISI) Program – IWE, the 10 CFR Part 50, Appendix J Program, the Boric Acid Corrosion Program, and the Structures Monitoring Program.

Information Notice (IN) 2004-09 "Corrosion of Steel Containment and Containment Liner," references the corrosion identified, in the Cycle 13 refueling outage, on the Davis-Besse containment vessel as one of the industry occurrences that led to the issuance of the IN. The IN discussion refers to an amendment to Section 50.55a of Title 10 of the Code of Federal Regulations (10 CFR 50.55a) (61 FR 41303). This amendment requires inservice inspections be performed in accordance with the ASME Code, Section XI, Subsections IWE and IWL. The Davis-Besse containment vessel was subject to a corrosion investigation during the Cycle 13 refueling outage.

The containment vessel corrosion investigation used ultrasonic (UT) thickness measurements of the vessel as one of the investigation methods. The UT measurements verified that the minimum recorded vessel wall thickness (1.404 inches) was greater than the minimum required wall thickness (1.35 inches), as documented in a plant calculation.

The containment vessel is inspected in accordance with the requirements of IWE of the ASME Code Section XI. These inspections include a visual examination of the entire accessible internal surface of the containment vessel every 3-1/3 years as well as visual inspection of the internal moisture barrier at the concrete-to-steel interface. The internal moisture barrier is inspected each refueling outage. The interior and exterior moisture barriers were installed to protect uncoated portions of the vessel and to minimize exposure to water. These inspections exceed the ASME Code Section XI inspection frequency requirements.

The containment vessel area behind the interior concrete structure has been designated as an area susceptible to corrosion and the Augmented Examination requirements of IWE have been imposed. The Augmented Examinations are scheduled to be completed during the Cycle 17 refueling outage.

Loss of material due to corrosion in steel elements of inaccessible areas is managed by the Inservice Inspection (ISI) Program – IWE with Augmented Examination and the 10 CFR Part 50, Appendix J Program.

The continued monitoring of the Containment for loss of material due to general, pitting, and crevice corrosion through the Inservice Inspection (ISI) Program – IWE and the 10 CFR Part 50, Appendix J Program provides reasonable assurance that loss of material in inaccessible areas of Containment is insignificant and will be detected prior to a loss of an intended function.

3.5.2.2.1.5 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

Loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for PWR prestressed concrete containments and BWR Mark II prestressed concrete containments is a Time- Limited Aging Analysis (TLAA) as defined in 10 CFR 54.3.

Davis-Besse has a free-standing steel containment vessel with no prestressed tendons. The Davis-Besse containment design eliminates loss of prestress forces as an applicable aging effect.

3.5.2.2.1.6 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. Time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c)(1).

Fatigue TLAAs evaluated for the Davis-Besse Containment are for the containment vessel shell, piping penetrations of the containment vessel, and the permanent reactor cavity seal plate (also known as, permanent canal seal plate (PCSP)). The evaluations of the fatigue TLAAs are addressed in Section 4.

3.5.2.2.1.7 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to stress corrosion cracking of stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds could occur in all types of PWR and BWR containments. Cracking due to SCC could also occur in stainless steel vent line bellows for BWR containments.

Stress corrosion cracking

Stress corrosion cracking requires a combination of a corrosive environment, susceptible materials, and high tensile stresses. To be susceptible to SCC, stainless steel must be subject to both high temperature (> 140°F) and an aggressive chemical environment. SCC is not an applicable effect for the Davis-Besse stainless steel penetration sleeves and bellows because these stainless steel components are not subject to an aggressive chemical environment.

3.5.2.2.1.8 Cracking due to Cyclic Loading

See Section 3.5.2.2.1.6 that addresses Fatigue TLAAs evaluated for the Davis-Besse containment vessel shell, piping penetrations of the containment vessel, and the permanent reactor cavity seal plate (also known as, permanent canal seal plate (PCSP)).

3.5.2.2.1.9 Loss of Material (Scaling, Cracking, and Spalling) due to Freeze-Thaw

Loss of material (scaling, cracking, and spalling) due to freeze-thaw could occur in PWR and BWR concrete containments.

Freeze-Thaw

Davis-Besse does not have a concrete containment. Davis-Besse has a free-standing steel containment vessel; therefore, loss of material (scaling, cracking, and spalling) from a concrete containment due to freeze-thaw is not applicable to Davis-Besse.

3.5.2.2.1.10 Cracking due to Expansion and Reaction with Aggregate, and Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide

Cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide could occur in concrete elements of PWR and BWR concrete and steel containments.

Reaction with Aggregate

Davis-Besse design specifications require that concrete aggregates conform to ASTM International (ASTM) Standard Specification C 33 and that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method) (ASTM C 289).

Concrete structures and components at Davis-Besse are designed in accordance with American Concrete Institute ACI 318-63 and constructed in accordance with ACI 301-66 using ingredients conforming to ACI and ASTM standards thereby precluding the expansion and reaction with aggregate aging mechanism.

Leaching of Calcium Hydroxide

Change in material properties due to leaching of calcium hydroxide is an aging effect requiring management for concrete components because water leakage (above and below grade) has been observed at Davis-Besse from operating experience.

The Davis-Besse Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components. In addition to aging management by the Structures Monitoring Program, the Shield Building concrete is managed by the 10 CFR Part 50, Appendix J Program's containment vessel and Shield Building Visual Inspection.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

NUREG-1801 recommends further evaluation of certain structure/aging effect combinations if they are not covered by the structures monitoring program.

The following aging effects (for NUREG-1800 items (1) through (4)) do not require further evaluation because the components are evaluated under the Structures Monitoring Program:

- Corrosion of embedded steel
- Aggressive chemical attack
- Loss of material due to corrosion
- Freeze-Thaw

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components. In addition, loss of material due to corrosion is managed by the Boric Acid Corrosion Program within areas that contain borated systems.

(5) Reaction with Aggregate

Davis-Besse design specifications require that concrete aggregates conform to ASTM C 33 and that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method) (ASTM C 289).

Concrete structures and components at Davis-Besse are designed in accordance with ACI 318-63 and constructed in accordance with ACI 301-66 using ingredients conforming to ACI and ASTM standards thereby precluding the expansion and reaction with aggregate aging mechanism.

(6) Settlement

Cracking due to settlement is not an aging effect requiring management for concrete components because, based on settlement analyses, it is estimated that maximum settlements of Class I and major Class II structures founded on bedrock (i.e., Containment, Shield Building, Auxiliary Building, Turbine and Office Buildings, Intake Structure, and Valve Room No. 1) will be less than 1/8 inch and that settlements of Class I structures founded on till deposit and granular fill (Borated Water Storage Tank Foundation, SW Pipe Tunnel, and Valve Room No. 2) will be less than 1/4 inch. Therefore, further evaluation of increased stress levels due to settlement is not required.

(7) Porous Concrete Subfoundations

There are no Davis-Besse structures that have a porous concrete subfoundation. Therefore, further evaluation for aging effects due to erosion of porous concrete is not required.

(8) Lock up due to Wear of Sliding Support Surfaces

Lubrite® (plates, bearings, or blocks) is provided to reduce friction for certain support assemblies in Davis-Besse in-scope structural components.

Aging degradation of supports designed with or without sliding connections is managed by the Inservice Inspection (ISI) Program – IWF and the Structures Monitoring Program. Therefore, further evaluation of Lubrite® aging effects is not required.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

3.5.2.2.2.2.1 Below-Grade Inaccessible Concrete Areas – Freeze-Thaw

Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.

Freeze-Thaw

Davis-Besse is located in an area in which weathering conditions are considered severe (weathering index over 500 day-inch/yr).

Concrete structures and components at Davis-Besse are designed in accordance with ACI 318-63 and constructed in accordance with ACI 301-66 using ingredients conforming to ACI and ASTM standards. Concrete constructed to these criteria has a low water-to-cement ratio of less than 0.45 and an air entrainment between 3 and 6% and provides a good quality, dense, low permeability concrete.

Loss of material and cracking due to freeze-thaw are aging effects requiring management for concrete components exposed to weather because isolated instances of freeze-thaw damage have been observed at the plant from operating experience.

As described above, the design and construction of the concrete for Groups 1, 3, and 5 structures are in accordance with ACI Standards that preclude significant loss of material (spalling, scaling) and cracking due to freeze-thaw. The inspection of exposed above-grade concrete of Groups 1, 3 and 5 structures is an indicator for inaccessible concrete and inspection of the above-grade concrete provides reasonable assurance that degradation of inaccessible structures will be detected before a loss of an intended function. Operating experience review has not identified significant loss of material and cracking due to freeze-thaw of below-grade structures concrete.

In the event inspection of above-grade concrete structures identifies significant concrete degradation due to freeze-thaw, corrective actions will be initiated to evaluate the condition of inaccessible portions of structures and determine if excavation of concrete for inspection is warranted.

Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw are not aging effects requiring management for Davis-Besse below-grade inaccessible concrete components.

However, the Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with NRC position on managing concrete, even though the aging management review did not identify aging effects requiring management. The Structures Monitoring Program will include examination of exposed concrete for age-related degradation when a below-grade in-scope concrete component becomes accessible through excavation.

3.5.2.2.2.2.2 Below-Grade Inaccessible Concrete Areas – Expansion and Reaction with Aggregates

Cracking due to expansion and reaction with aggregates could occur in below-grade inaccessible concrete areas for Groups 1-5 and 7-9 structures.

Reaction with Aggregates

Davis-Besse design specifications require that concrete aggregates conform to ASTM C 33 and that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method) (ASTM C 289).

Concrete structures and components at Davis-Besse are designed in accordance with ACI 318-63 and constructed in accordance with ACI 301-66 using ingredients conforming to ACI and ASTM standards thereby precluding the expansion and reaction with aggregate aging mechanism.

Therefore, cracking due to expansion and reaction with aggregates is not an aging effect requiring management for the below-grade inaccessible concrete components.

However, the Structures Monitoring Program is credited for aging management of these mechanisms and effect for the affected concrete structures and structural components, in accordance with the NRC position on managing concrete, even though the aging management review did not identify aging effects requiring management. The Structures Monitoring Program will include examination of exposed concrete for age-related degradation when a below-grade in-scope concrete component becomes accessible through excavation.

3.5.2.2.2.2.3 Below-Grade Inaccessible Concrete Areas – Settlement and Erosion

Cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.

Settlement

Cracking due to settlement is not an aging effect requiring management for concrete components below grade because based on settlement analyses, it is estimated that maximum settlements of Class I and major Class II structures founded on bedrock (i.e., Containment, Shield Building, Auxiliary Building, Turbine and Office Buildings, Intake Structure, and Valve Room No. 1) will be less than 1/8 inch and that settlements of Class I structures founded on till deposit and granular fill (Borated Water Storage Tank Foundation, SW Pipe Tunnel, and Valve Room No. 2) will be less than 1/4 inch. Therefore, further evaluation for the effects of settlement is not required.

However, the Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components, in accordance with the NRC position on managing concrete, even though the aging management review did not identify aging effects requiring management. The Structures Monitoring Program will include examination of exposed concrete for age-related degradation when a below-grade in-scope concrete component becomes accessible through excavation.

Porous Concrete Subfoundations

Davis-Besse does not have porous concrete subfoundations for Groups 1-3, 5 and 7-9 structures. Therefore, further evaluation for aging effects due to erosion of porous concrete is not required.

3.5.2.2.2.2.4 Below-Grade Inaccessible Concrete Areas – Aggressive Chemical Attack and Corrosion of Embedded Steel

Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.

Aggressive Chemical Attack and Corrosion of Embedded Steel

At Davis-Besse, concrete components below grade are exposed to an aggressive groundwater environment. In addition, portions of the structures at the plant are located below the normal groundwater level. The plant structures have been provided with waterproofing on the exterior portions of the below-grade structures. Water leakage (above and below grade) has been observed at the plant from operating experience. Once the concrete has cracked, a path is available for water to reach the reinforcing steel, initiating corrosion in rebar that can result in reduced available reinforcing area and spalling of concrete.

Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are aging effects requiring management for the below-grade inaccessible concrete components.

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components. Although there is no evidence that the aggressive groundwater has contributed to structural degradation, a special provision in the Structures Monitoring Program will be implemented to monitor below-grade inaccessible concrete components before and during the period of extended operation.

3.5.2.2.2.2.5 Below-Grade Inaccessible Concrete Areas – Leaching of Calcium Hydroxide

Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.

Leaching of Calcium Hydroxide

At Davis-Besse, change in material properties due to leaching of calcium hydroxide is an aging effect requiring management for concrete components below grade because water leakage (above and below grade) has been identified in the plant operating experience.

Therefore, increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide are aging effects requiring management for the below-grade inaccessible concrete components.

The Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components.

3.5.2.2.2.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR Group 1-5 concrete structures, and further evaluation is recommended if any portion of the safety-related and other concrete structures exceeds specified temperature limits, i.e., general area temperature greater than 66°C (150°F) and local area temperature greater than 93°C (200°F).

Elevated Temperatures

Davis-Besse in-scope Group 1, 3, and 5 concrete structures and concrete components are not exposed to temperatures that exceed the limits associated with aging degradation due to elevated temperature. The general air temperatures in safety-related and other structures are maintained below the 150ºF threshold for these aging effects to be applicable.

For the Group 4 structures, several localized areas in the upper regions of the Containment internal structures have maximum temperatures exceeding 150ºF. Only one of those areas exceeded 200ºF. The primary shield wall temperature calculations addressed the effect that a bounding temperature of up to 207ºF would have on the mechanical properties of reinforced concrete and quantified the impact to the upper portion of the primary shield wall during plant operation. The calculations concluded the elevated temperature will not influence the capacity of the primary shield wall to support mechanical loading due to low mechanical stresses in that area. Consistent with NUREG-1801, higher localized temperatures are allowed in the concrete if plant specific calculations are provided. Therefore, the conditions identified in NUREG-1801 are satisfied and loss of material, cracking, and change in material properties due to elevated temperature are not aging effects requiring management for concrete. High temperature piping penetrations contained in the Containment are not in direct contact with concrete and are insulated.

Therefore, reduction of strength and modulus of concrete due to elevated temperatures are not aging effects requiring management for the concrete components at Davis-Besse.

3.5.2.2.2.4 Aging Management of Inaccessible Areas for Group 6 Structures

3.5.2.2.2.4.1 Below-Grade Inaccessible Concrete Areas – Aggressive Chemical Attack and Corrosion of Embedded Steel

Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel could occur in below-grade inaccessible concrete areas of Group 6 structures.

Aggressive Chemical Attack and Corrosion of Embedded Steel

Davis-Besse concrete components below grade are exposed to an aggressive groundwater environment. In addition, portions of the structures at the plant are located below the normal groundwater level. The plant structures have been provided with waterproofing on the exterior portions of the below-grade structures. Water leakage (above and below grade) has been observed at the plant from operating experience. Once the concrete has cracked, a path is available for water to reach the reinforcing steel, initiating corrosion in rebar that can result in reduced available reinforcing area and spalling of concrete.

Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are aging effects requiring management for the water control structures' concrete.

The Water Control Structures Inspection is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components.

3.5.2.2.2.4.2 Below-Grade Inaccessible Concrete Areas – Freeze-Thaw

Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Group 6 structures.

Freeze-Thaw

At Davis-Besse, loss of material (spalling, scaling) and cracking due to freeze-thaw are aging effects requiring management for concrete components exposed to raw water because the concrete located in water control structures may become saturated and could be susceptible to freeze-thaw.

The Water Control Structures Inspection is credited for aging management of these effects and mechanism for the affected concrete structures and structural components.

3.5.2.2.2.4.3 Below-Grade Inaccessible Concrete Areas – Expansion and Reaction with Aggregate and Leaching of Calcium Hydroxide

Cracking due to expansion and reaction with aggregates and increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide could occur in below-grade inaccessible reinforced concrete areas of Group 6 structures.

Reaction with Aggregates

Davis-Besse design specifications require that concrete aggregates conform to ASTM C 33 and that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method) (ASTM C 289).

Concrete structures and components at Davis-Besse are designed in accordance with ACI 318-63 and constructed in accordance with ACI 301-66 using ingredients conforming to ACI and ASTM standards thereby precluding the expansion and reaction with aggregate aging mechanism.

Therefore, cracking due to expansion and reaction with aggregates is not an aging effect requiring management for the below-grade inaccessible concrete components.

Leaching of Calcium Hydroxide

Change in material properties due to leaching of calcium hydroxide is an aging effect requiring management for concrete components below grade because water leakage (above and below grade) has been observed at the plant from operating experience.

Therefore, increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide are aging effects requiring management for the below-grade inaccessible concrete components.

The Water Control Structures Inspection is credited for aging management of these effects and mechanisms for the affected concrete structures and structural components.

3.5.2.2.2.5 Cracking due to Stress Corrosion Cracking and Loss of Material due to Pitting and Crevice Corrosion

Cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion could occur for Group 7 and 8 stainless steel tank liners exposed to standing water.

At Davis-Besse, no tanks with stainless steel liners are included in the structural reviews for aging management. Tanks subject to aging management review are evaluated with the respective mechanical systems.

3.5.2.2.2.6 Aging of Supports Not Covered by Structures Monitoring Program

NUREG-1801 recommends further evaluation of certain component support/aging effect combinations if they are not covered by the structures monitoring program.

Each of the following is within the scope of the Structures Monitoring Program. Therefore, further evaluation is not required. In addition, loss of material due to corrosion is managed by the Boric Acid Corrosion Program within areas that contain borated systems.

- Building concrete around support anchorages
- HVAC duct supports
- Instrument supports
- Non-ASME mechanical equipment supports
- Non-ASME supports
- Electrical panels and enclosures

3.5.2.2.2.7 Cumulative Fatigue Damage Due to Cyclic Loading

Fatigue of component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports is a TLAA as defined in 10 CFR 54.3 only if a current licensing basis (CLB) fatigue analysis exists.

No Davis-Besse CLB fatigue analysis exists for component support members, anchor bolts, or welds for Groups B1.1, B1.2, and B1.3.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B, Section B.1.3, for a discussion of FirstEnergy Nuclear Operating Company quality assurance procedures and administrative controls for aging management programs.

3.5.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the Containment, Structures, and Component Supports commodities. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Metal Fatigue (Section 4.6, containment vessel shell, piping penetrations of the containment vessel, and the permanent reactor cavity seal plate (also known as, permanent canal seal plate (PCSP))

3.5.3 CONCLUSIONS

The Containment, Structures, and Component Supports subject to AMR have been identified in accordance with the criteria of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on structural components and commodities are identified in the following tables and Section 3.5.2.1. A description of the aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the Containment, Structures, and Component Supports will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
PWR Concrete (Reinforced and Prestressed) and Steel Containments BWR Concrete and Steel (Mark I, II, and III) Containments					
3.5.1-01	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment (as applicable)	Aging of accessible and inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	ISI (IWL) and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if the environment is aggressive	Not applicable. Aging of concrete containment elements exposed to weather is addressed in Item Numbers 3.5.1-23 and 3.5.1-24. Further evaluation is documented in Section 3.5.2.2.1.1.
3.5.1-02	Concrete elements; All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. Davis-Besse does not employ a de-watering system for any of the site structures. Cracking and distortion due to settlement are not aging effects requiring management for containment concrete components based on settlement analyses. Further evaluation is documented in Section 3.5.2.2.1.2.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-03	Concrete elements: foundation, sub-foundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program If a de-watering system is relied upon for control of erosion of cement from porous concrete subfoundations, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. The containment base foundation slabs are not constructed of porous concrete below-grade and are not subject to flowing water, thereby precluding these aging effects and mechanisms. Davis-Besse does not employ a de-watering system for any site structures. Further evaluation is documented in Section 3.5.2.2.1.2.
3.5.1-04	Concrete elements: dome, wall, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable)	Reduction of strength and modulus of concrete due to elevated temperature	A plant-specific aging management program is to be evaluated	Yes, plant-specific if temperature limits are exceeded	Not applicable. Elevated temperature for the Containment basemat is well below the allowable limits of 150°F general and 200°F local and therefore the aging effect for this mechanism is not applicable. Further evaluation is documented in Section 3.5.2.2.1.3.
3.5.1-05	BWR only—not used				

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-06	Steel elements: steel liner, liner anchors, integral attachments	Loss of material due to general, pitting and crevice corrosion	ISI (IWE), and 10 CFR Part 50, Appendix J.	Yes, if corrosion is significant for inaccessible areas	Consistent with NUREG-1801. Loss of material is managed by the Inservice Inspection (ISI) Program – IWE with Augmented Examination and the 10 CFR Part 50, Appendix J Programs. Further evaluation is documented in Section 3.5.2.2.1.4.
3.5.1-07	Prestressed containment tendons	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. This item applies to prestressed concrete containments. Davis-Besse Containment is a PWR steel containment. Refer to Section 3.5.2.2.1.5 for further information.
3.5.1-08	BWR only—not used				
3.5.1-09	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Consistent with NUREG-1801. This item is a TLAA. Further evaluation is documented in Section 3.5.2.2.1.6.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-10	Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds.	Yes, detection of aging effects is to be evaluated	Not applicable. These components are not exposed to an aggressive environment that would support stress corrosion cracking. Further evaluation is documented in Section 3.5.2.2.1.7.
3.5.1-11	BWR only—not used				
3.5.1-12	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J, and supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	Not applicable. Cumulative fatigue damage is a TLAA for some components as identified in Item Number 3.5.1-09. Further evaluation is documented in Section 3.5.2.2.1.8.
3.5.1-13	BWR only—not used				

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-14	Concrete elements: dome, wall, basemat ring girder, buttresses, containment (as applicable)	Loss of material (Scaling, cracking, and spalling) due to freeze-thaw	ISI (IWL). Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for inaccessible areas of plants located in moderate to severe weathering conditions	Not applicable. Davis-Besse containment is a PWR steel containment. The Shield Building which completely encloses the steel containment vessel is the only part of the containment structures that is exposed to weather. Further evaluation is documented in Section 3.5.2.2.1.9.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-15	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable)	Cracking due to expansion and reaction with aggregate; increase in porosity, permeability due to leaching of calcium hydroxide	ISI (IWL) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. Cracking due to expansion and reaction with aggregate, and increase in porosity is not an aging effect requiring management due to the quality of concrete used in construction. Davis-Besse Containment is a PWR steel containment. However, change in material properties due to leaching of calcium hydroxide is an aging effect requiring management for the Shield Building concrete. Cracking is managed by the Structures Monitoring Program for the affected concrete structures and structural components. Further evaluation is documented in Section 3.5.2.2.1.10.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-16	Seals, gaskets, and moisture barriers	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Consistent with NUREG-1801. The subject aging effects are a result of cracking and change in material properties. Seals and gaskets for the Personnel Air Lock, Emergency Air Lock, and Equipment Hatch are evaluated with the host component. See Item Number 3.5.1-17. Cracking and change in material properties which result in loss of sealing and leakage through containment are managed by the Inservice Inspection (ISI) Program – IWE and the 10 CFR Part 50, Appendix J Program.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-17	Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR Part 50, Appendix J and Plant Technical Specifications	No	Consistent with NUREG-1801. Locks, hinges and closure mechanisms are evaluated with the host component. Loss of leak tightness in closed position of the Personnel Air Lock and the Emergency Air Lock is managed by the Inservice Inspection (ISI) Program – IWE and the 10 CFR Part 50, Appendix J Program. Plant Technical Specifications ensures that access airlocks maintain leak tightness in the closed position.
3.5.1-18	Steel penetration sleeves and dissimilar metal welds; personnel airlock, equipment hatch and CRD hatch	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J.	No	Consistent with NUREG-1801. Loss of material for the applicable components is managed by the Inservice Inspection (ISI) Program – IWE and the 10 CFR Part 50, Appendix J Program.
3.5.1-19	BWR only—not used				
3.5.1-20	BWR only—not used				
3.5.1-21	BWR only—not used				

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-22	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion	ISI (IWL)	No	Not applicable. This item applies to prestressed concrete containments. Davis-Besse Containment is a PWR steel containment
Safety-Related and Other Structures; and Component Supports					
3.5.1-23	All Groups except Group 6: interior and above grade exterior concrete	Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Cracking and loss of material are managed by the Structures Monitoring Program for the affected concrete structural components. Further evaluation is documented in Section 3.5.2.2.2.1.
3.5.1-24	All Groups except Group 6: interior and above grade exterior concrete	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Cracking and loss of material are managed by the Structures Monitoring Program for the affected concrete structural components. Further evaluation is documented in Section 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-25	All Groups except Group 6: steel components: all structural steel	Loss of material due to corrosion	Structures Monitoring Program. If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include provisions to address protective coating monitoring and maintenance.	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Loss of material is managed by the Structures Monitoring Program for the affected steel structural components. Protective coatings are not relied upon to manage the effects of aging. Davis-Besse has provided responses to the NRC regarding Generic Letter 2004-02. Containment coating condition assessment inspections are performed each refueling outage to identify and correct degraded coating materials under the current licensing basis. Containment coatings are subject to ongoing oversight that addresses their current status, which will continue to address their status over the period of extended operation. Further evaluation is documented in Section 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-26	All Groups except Group 6: accessible and inaccessible concrete: foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, if not within the scope of the applicant's structures monitoring program or for inaccessible areas of plants located in moderate to severe weathering conditions	Consistent with NUREG-1801. Cracking and loss of material are managed by the Structures Monitoring Program for the affected concrete structural components. Further evaluation is documented in Section 3.5.2.2.2.1. The condition of exposed above grade concrete structures are an indicator for inaccessible concrete and provides reasonable assurance that degradation of inaccessible structures will be detected before a loss of an intended function. Operating experience review has not identified significant loss of material and cracking due to freeze-thaw of below-grade structures concrete. Further evaluation is documented in Section 3.5.2.2.2.2.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-27	All Groups except Group 6: accessible and inaccessible interior/exterior concrete	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if not within the scope of the applicant's structures monitoring program or concrete was not constructed as stated for inaccessible areas	Not applicable. Concrete aging is addressed by Item Number 3.5.1-26. In addition, the Structures Monitoring Program is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even though the AMR did not identify aging effects requiring management. Further evaluation is documented in Section 3.5.2.2.2.1 and Section 3.5.2.2.2.2.2.
3.5.1-28	Groups 1-3, 5-9: All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. The Structures Monitoring Program is used to monitor cracks and distortion. Further evaluation is documented in Section 3.5.2.2.2.1 and Section 3.5.2.2.2.2.3.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-29	Groups 1-3, 5-9: foundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. The concrete foundations at Davis-Besse are not constructed of porous concrete below-grade and are not subject to flowing water, thereby precluding these aging effects and mechanisms. Davis-Besse does not employ a de-watering system for any of the site structures. Further evaluation is documented in Section 3.5.2.2.2.1 and Section 3.5.2.2.2.2.3.
3.5.1-30	Group 4: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; Steam generator supports	Lock-up due to wear	ISI (IWF) or Structures monitoring Program	Yes, if not within the scope of ISI or structures monitoring program	Not applicable. Aging degradation of supports designed with sliding connections is addressed in Item Number 3.5.1-53 and is managed by the Inservice Inspection (ISI) Program – IWF and the Structures Monitoring Program. Further evaluation is documented in Section 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-31	Groups 1-3, 5, 7-9: below-grade concrete components, such as exterior walls below grade and foundation	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program; Examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if environment is aggressive	Consistent with NUREG-1801. Davis-Besse's area groundwater is aggressive and operating experience has shown that structural elements have experienced degradation. Although there is no evidence that the aggressive groundwater has contributed to structural degradation, a plant-specific provision in the Structures Monitoring Program will be implemented to monitor below-grade inaccessible concrete components before and during the period of extended operation. Further evaluation is documented in Section 3.5.2.2.2.2.4.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-32	Groups 1-3, 5, 7-9: exterior above and below grade reinforced concrete foundations	Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide	Structures monitoring Program for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Consistent with NUREG-1801. Change in material properties is managed by the Structures Monitoring Program for the affected concrete structural components. Further evaluation is documented in Section 3.5.2.2.2.2.5.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-33	Groups 1-5: concrete	Reduction of strength and modulus of concrete due to elevated temperature	A plant-specific aging management program is to be evaluated.	Yes, plant-specific if temperature limits are exceeded	Not applicable. Group 1, 3, and 5 concrete structures and concrete components are not exposed to temperatures that exceed the limits associated with aging degradation due to elevated temperature. For the Group 4 structures, one area in the upper regions of the Containment internal structures has maximum temperatures exceeding 200ºF. Plant-specific calculations have addressed this localized temperature during plant operation. Further evaluation is documented in Section 3.5.2.2.2.3.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-34	Group 6: Concrete; all	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack; cracking, loss of bond, loss of material due to corrosion of embedded steel	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific if environment is aggressive	Consistent with NUREG-1801. Cracking and loss of material are managed by the Water Control Structures Inspection for the affected concrete structural components. Further evaluation is documented in Section 3.5.2.2.2.4.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-35	Group 6: exterior above and below grade concrete foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for inaccessible areas of plants located in moderate to severe weathering conditions	Consistent with NUREG-1801. Cracking and loss of material are managed by the Water Control Structures Inspection for the affected concrete structural components. Further evaluation is documented in Section 3.5.2.2.2.4.2.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-36	Group 6: all accessible/ inaccessible reinforced concrete	Cracking due to expansion/ reaction with aggregates	Accessible areas: Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. Concrete aging is addressed by Item Numbers 3.5.1-34, 3.5.1-35 and 3.5.1-37. In addition, the Water Control Structures Inspection is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even though the AMR did not identify aging effects requiring management. Further evaluation is documented in Section 3.5.2.2.2.4.3.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-37	Group 6: exterior above and below grade reinforced concrete foundation interior slab	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide	For accessible areas, inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Consistent with NUREG-1801. Change in material properties is managed by the Water Control Structures Inspection for the affected concrete structural components. Further evaluation is documented in Section 3.5.2.2.2.4.3.
3.5.1-38	Groups 7, 8: Tank liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes, plant specific	Not applicable. No tanks with stainless steel liners are included in the structural reviews for aging management. Tanks subject to aging management review are evaluated with the respective mechanical systems. Further evaluation is documented in Section 3.5.2.2.2.5.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-39	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Loss of material for Groups B2-B5 supports is managed by the Structures Monitoring Program. Further evaluation is documented in Section 3.5.2.2.2.6.
3.5.1-40	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Not applicable. The Structures Monitoring Program is credited for aging management of this effect and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even though the AMR did not identify aging effects requiring management. Further evaluation is documented in Section 3.5.2.2.2.6.
3.5.1-41	Vibration isolation elements	Reduction or loss of isolation function/radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Not applicable. Davis-Besse has not identified non-metallic vibration isolator elements.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-42	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. A fatigue analysis does not exist in the current licensing basis for the applicable supports. Therefore, no TLAA evaluation is necessary as specified in NUREG-1801. Further evaluation is documented in Section 3.5.2.2.2.7.
3.5.1-43	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	No	Consistent with NUREG-1801. Cracking of masonry block walls is managed by the Masonry Wall Inspection. Masonry block walls with a fire barrier intended function are also managed by the Fire Protection Program. The Structures Monitoring Program encompasses and implements the Masonry Wall Inspection.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-44	Group 6 elastomer seals, gaskets, and moisture barriers	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	No	Consistent with NUREG-1801. Cracking and change in material properties for Groups 1-3, 5, 6 elastomeric components are managed by the Structures Monitoring Program, not just group 6. Seals with a fire barrier intended function are managed by the Fire Protection Program. See Item Number 3.3.1-61. NUREG-1801 lists loss of sealing as the aging effect for elastomers. Loss of sealing is not considered an aging effect, but rather a consequence of elastomer degradation. This effect may be caused by cracking and/or change in material properties for elastomeric material.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-45	Group 6: exterior above and below grade concrete foundation; interior slab	Loss of material due to abrasion, cavitation	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance	No	Not applicable. Concrete aging is addressed by Item Numbers 3.5.1-34, 3.5.1-35 and 3.5.1-37. In addition, the Water Control Structures Inspection is credited for aging management of these effects and mechanisms for the affected concrete structural components, in accordance with the current NRC position, even though the AMR did not identify aging effects requiring management.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-46	Group 5: Fuel pool liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Water Chemistry and monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	No	Consistent with NUREG-1801. Cracking due to SCC is not an applicable effect for this item, because, to be susceptible to SCC, stainless steel must be subjected to both high temperature (> 140°F) and an aggressive chemical environment. The stainless steel liner temperature is maintained < 140°F. Loss of material is managed by the PWR Water Chemistry Program. Spent fuel pool water level is maintained in accordance with an existing Technical Specification commitment. The Leak Chase Monitoring Program detects leakage from the leak chase channels during normal operation and refueling.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-47	Group 6: all metal structural members	Loss of material due to general (steel only), pitting and crevice corrosion	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	No	Consistent with NUREG-1801. Loss of material is managed by the Water Control Structures Inspection.
3.5.1-48	Group 6: earthen water control structures - dams, embankments, reservoirs, channels, canals, and ponds	Loss of material, loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs	No	Consistent with NUREG-1801. Loss of material and loss of form are managed by the Water Control Structures Inspection for the affected concrete and earthen structural components.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-49	Support members; welds; bolted connections; support anchorage to building structure	Loss of material/ general, pitting, and crevice corrosion	Water Chemistry and ISI(IWF)	No	Consistent with NUREG-1801, BWR row with the corresponding PWR programs assigned. Loss of material of structural components exposed to treated water is managed by the Structures Monitoring Program and the PWR Water Chemistry Program. Components are the stainless steel supports in the spent fuel pool which are not within the scope of the Inservice Inspection (ISI) Program – IWF.
3.5.1-50	Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801. Loss of material of the listed structural components is managed by the Structures Monitoring Program.
3.5.1-51	Group B1.1: high strength low-alloy bolts	Cracking due to stress corrosion cracking; loss of material due to general corrosion	Bolting Integrity	No	Consistent with NUREG-1801. Cracking of the listed structural components is managed by the Bolting Integrity Program. Loss of material is addressed in Item Number 3.5.1-53.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-52	Groups B2, and B4: sliding support bearings and sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program	No	Not applicable. Davis-Besse did not identify sliding support surfaces for Groups B2 and B4. Groups B2 and B4 support aging is addressed by Item Numbers 3.5.1-39 and 3.5.1-50.
3.5.1-53	Groups B1.1, B1.2, and B1.3: support members: welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	ISI (IWF)	No	Consistent with NUREG-1801. Loss of material of the listed structural components is managed by the Inservice Inspection (ISI) Program – IWF.
3.5.1-54	Groups B1.1, B1.2, and B1.3: Constant and variable load spring hangers; guides; stops	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Not applicable. Davis-Besse addressed aging of these component types in Item Number 3.5.1-53. Aging degradations on Groups B1.1, B1.2, and B1.3 constant and variable load spring hangers; guides; stops are managed by the Inservice Inspection (ISI) Program – IWF. The inspection criteria for supports within the program effectively envelope misalignment and accumulation of debris.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-55	Steel, galvanized steel, and aluminum support members; welds; bolted connections; support anchorage to building structure	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion is managed by the Boric Acid Corrosion Program.
3.5.1-56	Groups B1.1, B1.2, and B1.3: Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Consistent with NUREG-1801. Loss of mechanical function of Groups B1.1, B1.2, and B1.3 supports designed with sliding surfaces are managed by the Inservice Inspection (ISI) Program – IWF.
3.5.1-57	Groups B1.1, B1.2, and B1.3: Vibration isolation elements	Reduction or loss of isolation function/radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF)	No	Not applicable. Davis-Besse has not identified non-metallic vibration isolator elements for Groups B1.1, B1.2, and B1.3 vibration isolation elements.
3.5.1-58	Galvanized steel and aluminum support members; welds; bolted connections; support anchorage to building structure exposed to air - indoor uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-59	Stainless steel support members; welds; bolted connections; support anchorage to building structure	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Containment Emergency Sump Recirculation Valve Enclosure Bellows	EN, SPB, SSR	Stainless Steel	Air-indoor	None	ISI Program-IWE 10 CFR Part 50, Appendix J	N/A	N/A	I 0501 0502
2	Containment Emergency Sump Recirculation Valve Enclosures	EN, SPB, SSR	Stainless Steel	Air-indoor	None	ISI Program-IWE 10 CFR Part 50, Appendix J	N/A	N/A	I 0501 0502
3	Containment Normal Sump Liners	SNS	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
4	Containment Normal Sump Liners	SNS	Stainless Steel	Raw water	Loss of material	Structures Monitoring	N/A	N/A	J 0503
5	Containment Vessel	EN, FLB, HELB, SHD, SPB, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	ISI Program-IWE 10 CFR Part 50, Appendix J	II.A2-9	3.5.1-06	A
6	Containment Vessel	EN, FLB, HELB, SHD, SPB, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-14	3.5.1-55	C 0504
7	Containment Vessel	EN, FLB, HELB, SHD, SPB, SRE, SSR	Carbon Steel	Air-indoor	Cumulative fatigue damage/ fatigue	TLAA	II.A3-4	3.5.1-09	C 0513

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
8	Containment Vessel Emergency Sump (including sump liner, antivortexing gratings, perforated plates, and trash racks)	DF, SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
9	Cranes, including Bridge, Trolley, Rails, and Girders	SNS, SSR	Carbon Steel	Air-indoor	Loss of material	Cranes and Hoists Inspection	VII.B-3	3.3.1-73	A
10	Cranes, including Bridge, Trolley, Rails, and Girders	SNS, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
11	Emergency Air Lock (including flange gaskets and closure mechanisms)	EN, SPB, SSR	Carbon Steel/ Elastomer	Air-indoor	Loss of material	ISI Program-IWE 10 CFR Part 50, Appendix J Plant Technical Specification	II.A3-6 II.A3-7 II.A3-5 II.A3-6 II.A3-7 II.A3-5	3.5.1-18 3.5.1-16 3.5.1-17 3.5.1-18 3.5.1-16 3.5.1-17	A A A A A A 0505
12	Emergency Air Lock (including flange gaskets and closure mechanisms)	EN, SPB, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
13	Equipment Hatch (including flange gaskets and closure mechanisms)	EN, SPB, SSR	Carbon Steel/ Elastomer	Air-indoor	Loss of material	ISI Program-IWE 10 CFR Part 50, Appendix J	II.A3-6 II.A3-7	3.5.1-18 3.5.1-16	A A
14	Equipment Hatch (including flange gaskets and closure mechanisms)	EN, SPB, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
15	Floor Decking	SNS	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
16	Floor Decking	SNS	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
17	LOCA Restraint Rings	SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A4-5	3.5.1-25	C
18	LOCA Restraint Rings	SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
19	LOCA Restraint Ring Cooling Fins	SSR	Stainless Steel	Air-indoor	None	None	III.B1.2-7	3.5.1-59	C
20	Neutron Streaming Shield Panels	SHD, SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A4-5	3.5.1-25	C 0506
21	Neutron Streaming Shield Panels	SHD, SNS	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504 0506

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Nuclear Instrumentation Shielding	SHD, SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A4-5	3.5.1-25	C 0510
23	Nuclear Instrumentation Shielding	SHD, SNS	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504 0510
24	Nuclear Instrumentation Support	SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A4-5	3.5.1-25	C
25	Nuclear Instrumentation Support	SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
26	Nuclear Instrumentation Support	SSR	Aluminum	Air-indoor	None	None	III.B4-4	3.5.1-58	C
27	Nuclear Instrumentation Support	SSR	Aluminum	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
28	Penetration Bellows	EN, SPB, SSR	Stainless Steel	Air-indoor	None	ISI Program-IWE 10 CFR Part 50, Appendix J	N/A	N/A	I 0501
29	Penetrations (Mechanical and Electrical, containment boundary)	EN, SPB, SSR	Carbon Steel/ Elastomer	Air-indoor	Loss of material	ISI Program-IWE 10 CFR Part 50, Appendix J	II.A3-1	3.5.1-18	A 0507

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
30	Penetrations (Mechanical and Electrical, containment boundary)	EN, SPB, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.2-11	3.5.1-55	C 0504 0507
31	Penetrations (Mechanical and Electrical, containment boundary)	EN, SPB, SSR	Stainless Steel	Air-indoor	None	ISI Program-IWE 10 CFR Part 50, Appendix J	N/A	N/A	I 0501
32	Permanent Reactor Cavity Seal Plate	FLB, SSR	Stainless Steel	Air-indoor	None	None	III.B1.2-7	3.5.1-59	C
33	Permanent Reactor Cavity Seal Plate	FLB, SSR	Stainless Steel	Air-indoor	Cumulative fatigue damage/ fatigue	TLAA	II.A3-4	3.5.1-09	C 0514
34	Personnel Air Lock (including gaskets, hatch locks, hinges and closure mechanisms)	EN, SPB, SSR	Carbon Steel / Elastomer	Air-indoor	Loss of material	ISI Program-IWE 10 CFR Part 50, Appendix J Plant Technical Specifications	II.A3-6 II.A3-7 II.A3-5 II.A3-6 II.A3-7 II.A3-5	3.5.1-18 3.5.1-16 3.5.1-17 3.5.1-18 3.5.1-16 3.5.1-17	A A A A A A 0505

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
35	Personnel Air Lock (including gaskets, hatch locks, hinges and closure mechanisms)	EN, SPB, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
36	Pressurizer Supports	SSR	Carbon Steel	Air-indoor	Loss of material	ISI Program-IWF	III.B1.1-13	3.5.1-53	A
37	Pressurizer Supports	SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-14	3.5.1-55	A 0504
38	Reactor Closure Head and CRD Service Structure	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A4-5	3.5.1-25	A
39	Reactor Closure Head and CRD Service Structure	SNS	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
40	Reactor Coolant Pressure Boundary Thermal Insulation	SNS	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
41	Reactor Head Storage Stand	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A4-5	3.5.1-25	A
42	Reactor Head Storage Stand	SNS	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
43	Reactor Head Storage Stand	SNS	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
44	Reactor Shield Wall Liner	SHD, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A4-5	3.5.1-25	A
45	Reactor Shield Wall Liner	SHD, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
46	Reactor Vessel Supports	SSR	Carbon Steel	Air-indoor	Loss of material	ISI Program-IWF	III.B1.1-13	3.5.1-53	A
47	Reactor Vessel Supports	SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-14	3.5.1-55	A 0504
48	Reactor Vessel Thermal Insulation	EN, SNS	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
49	Refueling Canal Fuel Storage Rack	SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
50	Refueling Canal Liner	FLB, SSR	Stainless Steel	Air-indoor	None	Structures Monitoring Boric Acid Corrosion	N/A	N/A	I 0501 0508
51	Station Vent Stack Supports	SNS	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A
52	Steam Generator Supports	SSR	Carbon Steel	Air-indoor	Loss of material	ISI Program-IWF	III.B1.1-13	3.5.1-53	A
53	Steam Generator Supports	SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-14	3.5.1-55	A 0504
54	Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A4-5	3.5.1-25	A

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
55	Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
56	Trash Rack Gates	SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
57	Trisodium Phosphate Baskets	SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
58	Containment Normal Sump	SNS	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
59	Containment Vessel Emergency Sump	DF, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
60	Foundations	EN, EXP, FLB, SRE, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A1-4	3.5.1-31	A
61	Foundations	EN, EXP, FLB, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A1-5	3.5.1-31	A
62	Foundations	EN, EXP, FLB, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A1-7	3.5.1-32	A 0509
63	Incore Tunnel	DF, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
64	Primary Shield Wall	EN, MB, SHD, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
65	Reactor Cavity Missile Shield	EN, MB, SHD, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
66	Refueling Canal	SHD, SSR	Concrete	Air-indoor	Loss of material	Structures Monitoring Boric Acid Corrosion	III.A5-9	3.5.1-23	A 0508
67	Refueling Canal	SHD, SSR	Concrete	Air-indoor	Loss of material Change in material properties	Structures Monitoring Boric Acid Corrosion	III.A5-10	3.5.1-24	A 0508
68	Refueling Canal	SHD, SSR	Concrete	Air-indoor	Change in material properties	Structures Monitoring Boric Acid Corrosion	III.A5-7	3.5.1-32	A 0508 0509
69	Reinforced Concrete: Walls, floors, and ceilings	EN, FLB, HELB, MB, PW, SHD, SNS, SPB, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
70	Secondary Shield Wall	EN, HELB, MB, SHD, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
71	Shield Building Emergency Air Lock Enclosure	EN, MB, SSR	Concrete	Air-indoor	None	Structures Monitoring 10 CFR Part 50, Appendix J	N/A	N/A	I 0501 0511

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
72	Shield Building Emergency Air Lock Enclosure	EN, MB, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-9	3.5.1-23	A 0511
73	Shield Building Emergency Air Lock Enclosure	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-10	3.5.1-24	A 0511
74	Shield Building Emergency Air Lock Enclosure	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-6	3.5.1-26	A 0511
75	Shield Building Emergency Air Lock Enclosure	EN, MB, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-7	3.5.1-32	A 0509 0511
76	Shield Building Dome	EN, MB, SPB, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring 10 CFR Part 50, Appendix J	N/A	N/A	I 0501 0511
77	Shield Building Dome	EN, MB, SPB, SRE, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-9	3.5.1-23	A 0511

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
78	Shield Building Dome	EN, MB, SPB, SRE, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-10	3.5.1-24	A 0511
79	Shield Building Dome	EN, MB, SPB, SRE, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-6	3.5.1-26	A 0511
80	Shield Building Dome	EN, MB, SPB, SRE, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-7	3.5.1-32	A 0509 0511
81	Shield Building Walls (above grade)	EN, FB, MB, SHD, SPB, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring 10 CFR Part 50, Appendix J Fire Protection	N/A	N/A	I 0501 0511 0512
82	Shield Building Walls (above grade)	EN, FB, MB, SHD, SPB, SRE, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring 10 CFR Part 50, Appendix J Fire Protection	III.A1-9	3.5.1-23	A 0511 0512

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
83	Shield Building Walls (above grade)	EN, FB, MB, SHD, SPB, SRE, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring 10 CFR Part 50, Appendix J Fire Protection	III.A1-10	3.5.1-24	A 0511 0512
84	Shield Building Walls (above grade)	EN, FB, MB, SHD, SPB, SRE, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring 10 CFR Part 50, Appendix J Fire Protection	III.A1-6	3.5.1-26	A 0511 0512
85	Shield Building Walls (above grade)	EN, FB, MB, SHD, SPB, SRE, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring 10 CFR Part 50, Appendix J Fire Protection	III.A1-7	3.5.1-32	A 0509 0511 0512
86	Shield Building Walls (below grade)	EN, FB, SPB, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring 10 CFR Part 50, Appendix J Fire Protection	N/A	N/A	I 0501 0511 0512
87	Shield Building Walls (below grade)	EN, SPB, SRE, SSR	Concrete	Soil	Loss of material	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-4	3.5.1-31	A 0511

Table 3.5.2-1 Aging Management Review Results - Containment

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
88	Shield Building Walls (below grade)	EN, SPB, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-5	3.5.1-31	A 0511
89	Shield Building Walls (below grade)	EN, SPB, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring 10 CFR Part 50, Appendix J	III.A1-7	3.5.1-32	A 0509 0511
90	Lubrite® sliding supports	SSR	Lubrite®	Air-indoor	Loss of Mechanical Function	ISI Program-IWF	III.B1.1-5 III.B1.2-3	3.5.1-56	A

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Battery Rack	SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
2	Blowoff Roof Vents	EN, PR, SSR	Aluminum	Air-indoor	None	None	III.B4-4	3.5.1-58	C
3	Blowoff Roof Vents	EN, PR, SSR	Aluminum	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
4	Blowout Panels	PR, SSR	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
5	Blowout Panels	PR, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B4-6	3.5.1-55	C 0504
6	Blowout Panels	PR, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
7	Cask Pit Liner	FLB, SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
8	Cask Pit Liner	FLB, SSR	Stainless Steel	Treated borated water	Loss of material	PWR Water Chemistry Leak Chase Monitoring	VII.A2-1	3.3.1-91	C 0521
9	Control Room Ceiling	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
10	Cranes, including Bridge, Trolley, Rails, and Girders	SNS, SSR	Carbon Steel	Air-indoor	Loss of material	Cranes and Hoists Inspection	VII.B-3	3.3.1-73	A

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
11	Floor Decking	SNS	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
12	Floor Decking	SNS	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B4-6	3.5.1-55	C 0504
13	Fuel Transfer Pit Liner	FLB, SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
14	Fuel Transfer Pit Liner	FLB, SSR	Stainless Steel	Treated borated water	Loss of material	PWR Water Chemistry Leak Chase Monitoring	VII.A2-1	3.3.1-91	C 0521
15	Fuel Transfer Pit Struts	SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
16	Fuel Transfer Tubes	SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
17	Louvered Penthouses	EN, SSR	Aluminum	Air-indoor	None	None	III.B4-4	3.5.1-58	C
18	Louvered Penthouses	EN, SSR	Aluminum	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
19	Masonry Block Wall Bracings and Frames	SNS, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
20	Masonry Block Wall Bracings and Frames	SNS, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
21	New Fuel Storage Racks	SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
22	Roof Decking	SNS	Aluminum	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
23	Roof Decking	SNS	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
24	Shield Panels	SHD, SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A 0515
25	Shield Panels	SHD, SNS	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504 0515
26	Spent Fuel Pool Bulkhead Gates	SSR	Stainless Steel	Air-indoor	None	None	III.B5-5	3.5.1-59	C
27	Spent Fuel Pool Bulkhead Gates	SSR	Stainless Steel	Treated borated water	Loss of material	PWR Water Chemistry	VII.A2-1	3.3.1-91	C
28	Spent Fuel Pool Liner	FLB, SSR	Stainless Steel	Treated borated water	Loss of material	PWR Water Chemistry Spent Fuel Pool water level monitoring per Tech Spec Leak Chase Monitoring	III.A5-13	3.5.1-46	A 0516 0521
29	Spent Fuel Storage Racks	SSR	Stainless Steel	Treated borated water	Loss of material	PWR Water Chemistry	VII.A2-1	3.3.1-91	C
30	Station Vent Stack	RP, SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
31	Station Vent Stack	RP, SNS	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
32	Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
33	Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
34	Auxiliary Building Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
35	Auxiliary Building Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
36	Auxiliary Building Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
37	Auxiliary Building Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
38	Auxiliary Building Exterior Walls (below grade)	EN, FLB, SNS, SRE, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Auxiliary Building Exterior Walls (below grade)	EN, FLB, SNS, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
40	Auxiliary Building Exterior Walls (below grade)	EN, FLB, SNS, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
41	Auxiliary Feedpump Turbine Exhaust	EN, MB, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
42	Auxiliary Feedpump Turbine Exhaust	EN, MB, SRE, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
43	Auxiliary Feedpump Turbine Exhaust	EN, MB, SRE, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
44	Auxiliary Feedpump Turbine Exhaust	EN, MB, SRE, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
45	Auxiliary Feedpump Turbine Exhaust	EN, MB, SRE, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
46	Auxiliary Feedpump Turbine Exhaust	EN, MB, SRE, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
47	Auxiliary Feedpump Turbine Exhaust	EN, MB, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
48	Auxiliary Feedpump Turbine Exhaust	EN, MB, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
49	Cask Pit	SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
50	Foundations	EN, EXP, FLB, SNS, SRE, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
51	Foundations	EN, EXP, FLB, SNS, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
52	Foundations	EN, EXP, FLB, SNS, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
53	Fuel Transfer Pit	SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
54	Masonry Block Walls	EN, FB, FLB, SHD, SNS, SRE, SSR	Concrete Blocks	Air-indoor	Cracking	Masonry Wall Inspection Fire Protection	III.A3-11	3.5.1-43	A 0515 0517

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
55	Missile Shield Walls	MB, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
56	Missile Shield Walls	MB, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
57	Missile Shield Walls	MB, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
58	Missile Shield Walls	MB, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
59	Missile Shield Walls	MB, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
60	Missile Shield Walls	MB, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
61	Missile Shield Walls	MB, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
62	New Fuel Storage Pit	EN, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
63	Pipe Tunnel	EN, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
64	Pipe Tunnel	EN, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
65	Pipe Tunnel	EN, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
66	Pipe Tunnel	EN, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
67	Reinforced Concrete: Walls, floors, and ceilings	EN, FB, FLB, HELB, MB, PW, SHD, SNS, SPB, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Fire Protection	N/A	N/A	I 0501 0512 0515
68	Roof Penthouses	EN, MB, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
69	Roof Penthouses	EN, MB, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
70	Roof Penthouses	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
71	Roof Penthouses	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
72	Roof Penthouses	EN, MB, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
73	Roof Slabs	EN, MB, SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501 0518
74	Spent Fuel Pool	SHD, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
75	Sump	SNS	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
76	Sump	SNS	Concrete	Raw water	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A 0519
77	Sump	SNS	Concrete	Raw water	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0519
78	Sump	SNS	Concrete	Raw water	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A 0519
79	Spent Fuel Rack Neutron Absorbers	ABN, SSR	Boral®	Treated borated water	Loss of material	Boral® Monitoring PWR Water Chemistry	VII.A2-5	3.3.1-13	J 0520

Table 3.5.2-2 Aging Management Review Results - Auxiliary Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-3 Aging Management Review Results – Intake Structure, Forebay, and Service Water Discharge Structure

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Battery Rack	SRE	Carbon Steel	Air-indoor	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
2	Cranes, including Bridge, Trolley, Rails, and Girders	SNS	Carbon Steel	Air-outdoor	Loss of material	Cranes and Hoists Inspection	VII.B-3	3.3.1-37	A 0529
3	Louvered Penthouse	EN, SSR	Galvanized Steel	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
4	Metal Siding	SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
5	Metal Siding	SNS, SRE	Carbon Steel	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
6	Roof Decking	SNS, SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
7	Roof Decking	SNS, SRE	Galvanized Steel	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
8	Sheet Pilings (includes Support Braces and Rock Anchors)	FLB, SNS, SSR	Carbon Steel	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
9	Sheet Pilings (includes Support Braces and Rock Anchors)	FLB, SNS, SSR	Carbon Steel	Water-flowing	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522 0528

Table 3.5.2-3 Aging Management Review Results – Intake Structure, Forebay, and Service Water Discharge Structure

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
10	Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
11	Trash Rack Guides	SNS	Galvanized Steel	Water-flowing	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
12	Trash Racks	SNS	Carbon steel	Water-flowing	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
13	Traveling Screen Casing and Associated Framing	SNS	Carbon Steel	Air-indoor	Loss of material	Water Control Structures Inspection	III.A6-11	3.5.1-47	B 0522
14	Fan Enclosure	EN, MB, SSR	Concrete	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522
15	Fan Enclosure	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522 0525
16	Fan Enclosure	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Cracking	Water Control Structures Inspection	III.A6-5	3.5.1-35	B 0522
17	Fan Enclosure	EN, MB, SSR	Concrete	Air-outdoor	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509

Table 3.5.2-3 Aging Management Review Results – Intake Structure, Forebay, and Service Water Discharge Structure

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
18	Forebay Retaining Walls	FLB, SSR	Concrete	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522
19	Forebay Retaining Walls	FLB, SSR	Concrete	Soil	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522 0524
20	Forebay Retaining Walls	FLB, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522 0525
21	Forebay Retaining Walls	FLB, SSR	Concrete	Soil	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522
22	Forebay Retaining Walls	FLB, SSR	Concrete	Air-outdoor	Loss of material Cracking	Water Control Structures Inspection	III.A6-5	3.5.1-35	B 0522
23	Forebay Retaining Walls	FLB, SSR	Concrete	Water-flowing	Loss of material Cracking	Water Control Structures Inspection	III.A6-5	3.5.1-35	B 0522 0523
24	Forebay Retaining Walls	FLB, SSR	Concrete	Air-outdoor	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509

Table 3.5.2-3 Aging Management Review Results – Intake Structure, Forebay, and Service Water Discharge Structure

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
25	Forebay Retaining Walls	FLB, SSR	Concrete	Soil	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509
26	Foundations	EN, EXP, FLB, SNS, SRE, SSR	Concrete	Soil	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522 0524
27	Foundations	EN, EXP, FLB, SNS, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522
28	Foundations	EN, EXP, FLB, SNS, SRE, SSR	Concrete	Soil	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509
29	Intake Structure Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522
30	Intake Structure Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522 0525
31	Intake Structure Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Cracking	Water Control Structures Inspection	III.A6-5	3.5.1-35	B 0522

Table 3.5.2-3 Aging Management Review Results – Intake Structure, Forebay, and Service Water Discharge Structure

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Intake Structure Exterior Walls (above grade)	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509
33	Intake Structure Exterior Walls (below grade)	EN, FLB, SNS, SRE, SSR	Concrete	Soil	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522 0524
34	Intake Structure Exterior Walls (below grade)	EN, FLB, SNS, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522
35	Intake Structure Exterior Walls (below grade)	EN, FLB, SNS, SRE, SSR	Concrete	Soil	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509
36	Louvered Penthouse	EN, MB, SSR	Concrete	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522
37	Louvered Penthouse	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522 0525
38	Louvered Penthouse	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Cracking	Water Control Structures Inspection	III.A6-5	3.5.1-35	B 0522
39	Louvered Penthouse	EN, MB, SSR	Concrete	Air-outdoor	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509

Table 3.5.2-3 Aging Management Review Results – Intake Structure, Forebay, and Service Water Discharge Structure

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
40	Masonry Block Walls	EN, FB, FLB, SRE, SSR	Concrete Blocks	Air-indoor	Cracking	Masonry Wall Inspection Fire Protection	III.A6-10	3.5.1-43	A 0517
41	Pump Intake Cells	HS, SRE, SSR	Concrete	Water-flowing	Loss of material Cracking	Water Control Structures Inspection	III.A6-5	3.5.1-35	B 0522 0523
42	Reinforced Concrete: Walls, floors, and ceilings	EN, FB, FLB, MB, SNS, SRE, SSR	Concrete	Air-indoor	None	Water Control Structures Inspection Fire Protection	N/A	N/A	I 0501 0522 0512
43	Roof Slabs	EN, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522
44	Roof Slabs	EN, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522 0525
45	Roof Slabs	EN, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Cracking	Water Control Structures Inspection	III.A6-5	3.5.1-35	B 0522
46	Roof Slabs	EN, MB, SNS, SRE, SSR	Concrete	Air-outdoor	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509

Table 3.5.2-3 Aging Management Review Results – Intake Structure, Forebay, and Service Water Discharge Structure

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
47	Service Water Discharge Pipe Sleeve	EN, SSR	Concrete	Soil	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522 0526
48	Service Water Discharge Pipe Sleeve	EN, SSR	Concrete	Soil	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509 0526
49	Service Water Discharge Structure	EN, SSR	Concrete	Soil	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522 0526
50	Service Water Discharge Structure	EN, SSR	Concrete	Soil	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522 0526
51	Service Water Discharge Structure	EN, MB, SSR	Concrete	Air-outdoor	Loss of material	Water Control Structures Inspection	III.A6-1	3.5.1-34	B 0522 0526
52	Service Water Discharge Structure	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522 0525

Table 3.5.2-3 Aging Management Review Results – Intake Structure, Forebay, and Service Water Discharge Structure

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
53	Service Water Discharge Structure	EN, MB, SSR	Concrete	Air-outdoor	Loss of material Cracking	Water Control Structures Inspection	III.A6-5	3.5.1-35	B 0522
54	Service Water Discharge Structure	EN, MB, SSR	Concrete	Air-outdoor	Change in material properties	Water Control Structures Inspection	III.A6-6	3.5.1-37	B 0522 0509
55	Sump	SNS	Concrete	Air-indoor	None	Water Control Structures Inspection	N/A	N/A	I 0501 0522
56	Sump	SNS	Concrete	Raw Water	Loss of material Change in material properties	Water Control Structures Inspection	III.A6-3	3.5.1-34	B 0522 0527
57	Forebay (including riprap)	HS, SRE, SSR	Earthen	Air-outdoor	Loss of material Loss of Form	Water Control Structures Inspection	N/A	N/A	G
58	Forebay (including riprap)	HS, SRE, SSR	Earthen	Water-flowing	Loss of material Loss of Form	Water Control Structures Inspection	III.A6-9	3.5.1-48	B 0522

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-4 Aging Management Review Results – Borated Water Storage Tank Level Transmitter Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Metal Roof	EN, SNS	Aluminized Steel (Aluminum)	Air-indoor	None	None	III.B4-4	3.5.1-58	C
2	Metal Roof	EN, SNS	Aluminized Steel (Aluminum)	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
3	Metal Roof	EN, SNS	Aluminized Steel (Aluminum)	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
4	Metal Siding	EN, SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
5	Metal Siding	EN, SNS	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
6	Metal Siding	EN, SNS	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
7	Metal Siding	EN, SNS	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
8	Structural Steel: Beams, Columns, Plates, and Trusses	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
9	Structural Steel: Beams, Columns, Plates, and Trusses	SNS	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504

Table 3.5.2-4 Aging Management Review Results – Borated Water Storage Tank Level Transmitter Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
10	Foundation Piers	SNS	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
11	Foundation Piers	SNS	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
12	Foundation Piers	SNS	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-5 Aging Management Review Results – Miscellaneous Diesel Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Structural Steel: Beams, Columns, Plates, and Trusses	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
2	Exterior Walls (above grade)	SRE	Concrete Blocks	Air-outdoor	Cracking	Masonry Wall Inspection	III.A3-11	3.5.1-43	A
3	Foundations	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
4	Foundations	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
5	Foundations	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
6	Masonry Block Walls	FB, SRE	Concrete Blocks	Air-indoor	Cracking	Masonry Wall Inspection Fire Protection	III.A3-11	3.5.1-43	A 0517
7	Reinforced Concrete: Walls, floors, and ceilings	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
8	Roof	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A

Table 3.5.2-5 Aging Management Review Results – Miscellaneous Diesel Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Roof	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
10	Roof	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
11	Roof	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-6 Aging Management Review Results – Office Building (Condensate Storage Tanks)

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Structural Steel: Beams, Columns, Plates, and Trusses	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
2	Wall Panel Support Frames	SRE	Aluminum	Air-indoor	None	None	III.B4-4	3.5.1-58	C
3	Wall Panel Support Frames	SRE	Aluminum	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
4	Condensate Storage Tanks Foundation	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
5	Exterior Walls (above grade)	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
6	Exterior Walls (above grade)	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
7	Exterior Walls (above grade)	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
8	Exterior Walls (above grade)	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A

Table 3.5.2-6 Aging Management Review Results – Office Building (Condensate Storage Tanks)

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Foundations (including caissons)	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
10	Foundations (including caissons)	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
11	Foundations (including caissons)	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
12	Masonry Block Walls	FB, SRE	Concrete Blocks	Air-indoor	Cracking	Masonry Wall Inspection Fire Protection	III.A3-11	3.5.1-43	A 0517
13	Reinforced Concrete: Walls and floors	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
14	Reinforced Concrete: Ceilings	FB, SRE	Concrete	Air-indoor	None	Structures Monitoring Fire Protection	N/A	N/A	I 0501
15	Window Wall Panels	SRE	Porcelain	Air-indoor	None	None	N/A	N/A	I 0549
16	Window Wall Panels	SRE	Porcelain	Air-outdoor	None	None	N/A	N/A	I 0549

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-7 Aging Management Review Results – Personnel Shop Facility Passageway (Missile Shield Area)

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Metal Floor Deck	SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
2	Metal Roof Decking	SNS	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
3	Metal Siding	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
4	Metal Siding	SNS	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
5	Structural Steel: Beams, Columns, Plates, and Trusses	SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
6	Exterior Walls (above grade)	MB, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
7	Exterior Walls (above grade)	MB, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
8	Exterior Walls (above grade)	MB, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A

Table 3.5.2-7 Aging Management Review Results – Personnel Shop Facility Passageway (Missile Shield Area)

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Exterior Walls (above grade)	MB, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
10	Foundations	SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
11	Foundations	SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
12	Foundations	SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
13	Roof	MB, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501 0518
14	Reinforced Concrete: Walls, floors, and ceilings	MB, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-8 Aging Management Review Results – Service Water Pipe Tunnel and Valve Rooms

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Foundations	SNS, SRE, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
2	Foundations	SNS, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
3	Foundations	SNS, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
4	Reinforced Concrete: Walls, floors, and ceilings	EN, FB, FLB, MB, SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Fire Protection	N/A	N/A	I 0501 0512
5	Reinforced Concrete: Walls, floors, and ceilings	EN, FLB, MB, SNS, SRE, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
6	Reinforced Concrete: Walls, floors, and ceilings	EN, FLB, MB, SNS, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A

Table 3.5.2-8 Aging Management Review Results – Service Water Pipe Tunnel and Valve Rooms

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Reinforced Concrete: Walls, floors, and ceilings	EN, FLB, MB, SNS, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
8	Sumps	SNS	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
9	Sumps	SNS	Concrete	Raw water	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A 0530
10	Sumps	SNS	Concrete	Raw water	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0530
11	Sumps	SNS	Concrete	Raw water	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A 0530

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-9 Aging Management Review Results – Station Blackout Diesel Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Battery Rack	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
2	Metal Roof	SRE	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
3	Metal Roof	SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
4	Metal Siding	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
5	Metal Siding	SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
6	Structural Steel: Beams, Columns, Plates, and Trusses	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
7	Foundations	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
8	Foundations	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
9	Foundations	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509

Table 3.5.2-9 Aging Management Review Results – Station Blackout Diesel Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
10	Masonry Block Walls	SRE	Concrete Blocks	Air-indoor	Cracking	Masonry Wall Inspection	III.A3-11	3.5.1-43	A
11	Radiator Skid Foundation	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
12	Radiator Skid Foundation	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
13	Radiator Skid Foundation	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
14	Radiator Skid Foundation	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
15	Radiator Skid Foundation	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
16	Radiator Skid Foundation	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
17	Radiator Skid Foundation	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509

Table 3.5.2-9 Aging Management Review Results – Station Blackout Diesel Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
18	Reinforced Concrete: Floors and ceilings	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
19	Sumps	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
20	Sumps	SRE	Concrete	Raw water	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A 0530
21	Sumps	SRE	Concrete	Raw water	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0530
22	Sumps	SRE	Concrete	Raw water	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A 0530
23	Transformer Foundation	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
24	Transformer Foundation	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
25	Transformer Foundation	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A

Table 3.5.2-9 Aging Management Review Results – Station Blackout Diesel Generator Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
26	Transformer Foundation	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
27	Transformer Foundation	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
28	Transformer Foundation	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
29	Transformer Foundation	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-10 Aging Management Review Results – Turbine Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Metal Roof Decking	EN, SNS, SRE	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
2	Metal Siding	EN, SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
3	Metal Siding	EN, SNS, SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
4	Structural Steel: Beams, Columns, Plates, and Trusses	SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
5	Foundations	EN, EXP, FLB, SNS, SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
6	Foundations	EN, EXP, FLB, SNS, SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
7	Foundations	EN, EXP, FLB, SNS, SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
8	Masonry Block Walls	FB, SRE	Concrete Blocks	Air-indoor	Cracking	Masonry Wall Inspection Fire Protection	III.A3-11	3.5.1-43	A 0517

Table 3.5.2-10 Aging Management Review Results – Turbine Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Reinforced Concrete: Walls, floors, and ceilings	EN, FB, SNS, SRE	Concrete	Air-indoor	None	Structures Monitoring Fire Protection	N/A	N/A	I 0501 0512
10	Sumps	SNS	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
11	Sumps	SNS	Concrete	Raw water	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A 0530
12	Sumps	SNS	Concrete	Raw water	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0530
13	Sumps	SNS	Concrete	Raw water	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A 0530
14	Turbine Generator Pedestal	SNS	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-11 Aging Management Review Results – Water Treatment Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Metal Roof Decking	SRE	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
2	Metal Siding	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
3	Metal Siding	SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
4	Structural Steel: Beams, Columns, Plates, and Trusses	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
5	Foundations	EXP, SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
6	Foundations	EXP, SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
7	Foundations	EXP, SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
8	Masonry Block Walls	FB, SRE	Concrete Blocks	Air-indoor	Cracking	Masonry Wall Inspection Fire Protection	III.A3-11	3.5.1-43	A 0517

Table 3.5.2-11 Aging Management Review Results – Water Treatment Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
9	Reinforced Concrete: Walls, floors, and ceilings	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
10	Sumps	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
11	Sumps	SRE	Concrete	Raw water	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A 0530
12	Sumps	SRE	Concrete	Raw water	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0530
13	Sumps	SRE	Concrete	Raw water	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A 0530

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	BWST Pipe Trench Cover Plates	EN, SNS	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
2	BWST Pipe Trench Cover Plates	EN, SNS	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
3	BWST Pipe Trench Cover Plates	EN, SNS	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
4	BWST Pipe Trench Cover Plates	EN, SNS	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
5	Cable Trench Cover Plates	SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
6	Cable Trench Cover Plates	SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
7	EDG Fuel Oil Storage Tank Hold Down Restraints	SSR	Carbon Steel	Concrete	None	None	VII.J-21	3.3.1-96	C
8	EDG Fuel Oil Storage Tank Hold Down Restraints	SSR	Carbon Steel	Structural backfill	None	Structures Monitoring	N/A	N/A	H 0531
9	Fire Hydrant Hose Houses	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
10	Fire Hydrant Hose Houses	SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
11	Manhole Covers and Frames	EN, SNS, SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
12	Metal Roof Decking (Nitrogen Storage Building)	SNS	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C 0536
13	SBO Component Support Structures	SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
14	SBO Component Support Structures	SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
15	Structural Steel: Beams, Columns, Plates, and Trusses (BWST trench cover support)	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
16	Structural Steel: Beams, Columns, Plates, and Trusses (BWST trench cover support)	SNS	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
17	Structural Steel: Beams, Columns, Plates, and Trusses (Diesel Oil Pump House)	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
18	Structural Steel: Beams, Columns, Plates, and Trusses (Nitrogen Storage Building)	SNS	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A 0536
19	Structural Steel: Beams, Columns, Plates, and Trusses (Relay House)	SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.A3-12	3.5.1-25	A
20	Wave Protection Dike Corrugated Pipe Casings	EN, SNS	Galvanized Steel	Structural backfill	Loss of material	Structures Monitoring	N/A	N/A	H 0532
21	Wave Protection Dike Piles	SNS	Carbon Steel	Structural backfill	Loss of material	Structures Monitoring	N/A	N/A	H 0532
22	BWST Foundation	EN, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
23	BWST Foundation	EN, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	BWST Foundation	EN, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
25	BWST Foundation	EN, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
26	BWST Foundation	EN, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
27	BWST Foundation	EN, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
28	BWST Foundation	EN, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
29	BWST Pipe Trench	EN, SNS, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
30	BWST Pipe Trench	EN, SNS, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
31	BWST Pipe Trench	EN, SNS, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	BWST Pipe Trench	EN, SNS, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
33	BWST Pipe Trench	EN, SNS, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
34	BWST Pipe Trench	EN, SNS, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
35	BWST Pipe Trench	EN, SNS, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
36	BWST Pipe Trench	EN, SNS, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
37	BWST Pipe Trench Hatch Covers	EN, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
38	BWST Pipe Trench Hatch Covers	EN, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
39	BWST Pipe Trench Hatch Covers	EN, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
40	BWST Pipe Trench Hatch Covers	EN, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
41	BWST Pipe Trench Hatch Covers	EN, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
42	Cable Trench Top Slabs	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
43	Cable Trench Top Slabs	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
44	Cable Trench Top Slabs	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
45	Cable Trench Top Slabs	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
46	Cable Trench Top Slabs	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
47	Cable Trenches	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
48	Cable Trenches	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
49	Cable Trenches	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
50	Cable Trenches	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
51	Diesel Oil Pump House Foundation	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
52	Diesel Oil Pump House Foundation	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
53	Diesel Oil Pump House Foundation	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
54	Diesel Oil Storage Tank Foundation	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
55	Diesel Oil Storage Tank Foundation	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
56	Diesel Oil Storage Tank Foundation	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
57	Diesel Oil Storage Tank Foundation	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
58	Diesel Oil Storage Tank Foundation	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
59	Diesel Oil Storage Tank Foundation	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
60	Diesel Oil Storage Tank Foundation	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
61	Diesel Oil Storage Tank Retaining Area and Dike	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
62	Diesel Oil Storage Tank Retaining Area and Dike	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
63	Diesel Oil Storage Tank Retaining Area and Dike	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
64	Diesel Oil Storage Tank Retaining Area and Dike	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
65	Diesel Oil Storage Tank Retaining Area and Dike	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
66	Diesel Oil Storage Tank Retaining Area and Dike	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
67	Diesel Oil Storage Tank Retaining Area and Dike	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
68	Duct Banks	EN, SNS, SRE, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
69	Duct Banks	EN, SNS, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
70	Duct Banks	EN, SNS, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
71	EDG Fuel Oil Storage Tanks Foundation (tank manhole)	SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
72	EDG Fuel Oil Storage Tanks Foundation (tank manhole)	SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
73	EDG Fuel Oil Storage Tanks Foundation (tank manhole)	SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
74	EDG Fuel Oil Storage Tanks Foundation (tank manhole)	SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
75	EDG Fuel Oil Storage Tanks Foundation	SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
76	EDG Fuel Oil Storage Tanks Foundation	SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
77	EDG Fuel Oil Storage Tanks Foundation	SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
78	Fire Hydrant Hose House Foundations	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
79	Fire Hydrant Hose House Foundations	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
80	Fire Hydrant Hose House Foundations	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
81	Fire Hydrant Hose House Foundations	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
82	Fire Hydrant Hose House Foundations	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
83	Fire Hydrant Hose House Foundations	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
84	Fire Hydrant Hose House Foundations	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
85	Fire Water Piping Thrust Blocks	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	C
86	Fire Water Piping Thrust Blocks	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	C
87	Fire Water Piping Thrust Blocks	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	C 0509
88	Fire Walls (transformers)	FB, SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring Fire Protection	III.A3-6	3.5.1-26	A 0533
89	Fire Walls (transformers)	FB, SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring Fire Protection	III.A3-7	3.5.1-32	A 0509 0533
90	Fire Walls (transformers)	FB, SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring Fire Protection	III.A3-9	3.5.1-23	A 0533

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
91	Fire Walls (transformers)	FB, SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring Fire Protection	III.A3-10	3.5.1-24	A 0533
92	Fire Water Storage Tank Foundation	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
93	Fire Water Storage Tank Foundation	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
94	Fire Water Storage Tank Foundation	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
95	Fire Water Storage Tank Foundation	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
96	Fire Water Storage Tank Foundation	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
97	Fire Water Storage Tank Foundation	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
98	Fire Water Storage Tank Foundation	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
99	Manhole Missile Shields	MB, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
100	Manhole Missile Shields	MB, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
101	Manhole Missile Shields	MB, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
102	Manhole Missile Shields	MB, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
103	Manhole Missile Shields	MB, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
104	Manholes	EN, SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
105	Manholes	EN, SNS, SRE, SSR	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
106	Manholes	EN, SNS, SRE, SSR	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
107	Manholes	EN, SNS, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
108	Masonry Block Walls (Relay House)	SRE	Concrete Blocks	Air-indoor	Cracking	Masonry Wall Inspection	III.A3-11	3.5.1-43	A
109	Nitrogen Storage Building Foundation	SNS	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
110	Nitrogen Storage Building Foundation	SNS	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
111	Nitrogen Storage Building Foundation	SNS	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
112	Nitrogen Storage Building Foundation	SNS	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
113	Nitrogen Storage Building Foundation	SNS	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
114	Nitrogen Storage Building Foundation	SNS	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
115	Nitrogen Storage Building Foundation	SNS	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
116	Precast Panels (Relay House)	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
117	Precast Panels (Relay House)	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
118	Precast Panels (Relay House)	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
119	Precast Panels (Relay House)	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
120	Reinforced Concrete: Walls, Floors, and Ceilings (Diesel Oil Pump House)	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
121	Reinforced Concrete: Walls, Floors, and Ceilings (Diesel Oil Pump House)	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
122	Reinforced Concrete: Walls, Floors, and Ceilings (Diesel Oil Pump House)	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
123	Reinforced Concrete: Walls, Floors, and Ceilings (Diesel Oil Pump House)	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
124	Reinforced Concrete: Walls, Floors, and Ceilings (Diesel Oil Pump House)	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
125	Reinforced Concrete: Walls, Floors, and Ceilings (Nitrogen Storage Building)	MB, SNS	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A 0536
126	Reinforced Concrete: Walls, Floors, and Ceilings (Nitrogen Storage Building)	MB, SNS	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
127	Reinforced Concrete: Walls, Floors, and Ceilings (Nitrogen Storage Building)	MB, SNS	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
128	Reinforced Concrete: Walls, Floors, and Ceilings (Nitrogen Storage Building)	MB, SNS	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
129	Reinforced Concrete: Walls, Floors, and Ceilings (Relay House)	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
130	Relay House Foundation	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
131	Relay House Foundation	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
132	Relay House Foundation	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
133	Roof (Diesel Oil Pump House)	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501 0518
134	Roof (Nitrogen Storage Building)	MB, SNS	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
135	Roof (Nitrogen Storage Building)	MB, SNS	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
136	Roof (Nitrogen Storage Building)	MB, SNS	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
137	Roof (Nitrogen Storage Building)	MB, SNS	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
138	Roof (Relay House)	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501 0518

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
139	SBO Component Foundations	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
140	SBO Component Foundations	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
141	SBO Component Foundations	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
142	SBO Component Foundations	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
143	SBO Component Foundations	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
144	SBO Component Foundations	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
145	SBO Component Foundations	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
146	Sumps (Diesel Oil Pump House)	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
147	Sumps (Diesel Oil Storage Tank Retaining Area)	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
148	Sumps (Diesel Oil Pump House and Diesel Oil Storage Tank Retaining Area)	SRE	Concrete	Raw water	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A 0534
149	Sumps (Diesel Oil Pump House and Diesel Oil Storage Tank Retaining Area)	SRE	Concrete	Raw water	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0534
150	Sumps (Diesel Oil Pump House and Diesel Oil Storage Tank Retaining Area)	SRE	Concrete	Raw water	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A 0534
151	Sumps (Manholes)	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A 0535
152	Sumps (Manholes)	SRE	Concrete	Raw water	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A 0534

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
153	Sumps (Manholes)	SRE	Concrete	Raw water	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0534
154	Sumps (Manholes)	SRE	Concrete	Raw water	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A 0534
155	Sumps (Relay House)	SRE	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
156	Sumps (Relay House)	SRE	Concrete	Raw water	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A 0534
157	Sumps (Relay House)	SRE	Concrete	Raw water	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0534
158	Sumps (Relay House)	SRE	Concrete	Raw water	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A 0534
159	Sumps (Transformer Foundations)	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A 0535
160	Sumps (Transformer Foundations)	SRE	Concrete	Raw water	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A 0534

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
161	Sumps (Transformer Foundations)	SRE	Concrete	Raw water	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0534
162	Sumps (Transformer Foundations)	SRE	Concrete	Raw water	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A 0534
163	Transformer Foundations	SRE	Concrete	Soil	Loss of material	Structures Monitoring	III.A3-4	3.5.1-31	A
164	Transformer Foundations	SRE	Concrete	Soil	Loss of material Change in material properties	Structures Monitoring	III.A3-5	3.5.1-31	A
165	Transformer Foundations	SRE	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
166	Transformer Foundations	SRE	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
167	Transformer Foundations	SRE	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
168	Transformer Foundations	SRE	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
169	Transformer Foundations	SRE	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A
170	Wave Protection Dikes (including riprap)	FLB, SNS	Earthen	Air-outdoor	Loss of form	Structures Monitoring	N/A	N/A	G
171	EDG Fuel Oil Storage Tanks Backfill	EN, MB, SSR	Earthen	Air-outdoor	Loss of form	Structures Monitoring	N/A	N/A	G

1 Refer to Table 2.0-1 for intended function descriptions.

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
Steel and Other Metals									
1	Anchorage / Embedments	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
2	Anchorage / Embedments	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-14 III.B1.2-11 III.B2-11 III.B3-8 III.B4-11 III.B5-8	3.5.1-55	A 0504
3	Anchorage / Embedments	SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-8 III.B1.2-6 III.B1.3-6 III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	A 0504
4	Anchorage / Embedments	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5	3.5.1-59	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
5	Anchorage / Embedments	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
6	Anchorage / Embedments	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B1.2-11 III.B2-11 III.B3-8 III.B4-11 III.B5-8	3.5.1-55	A 0504
7	Anchorage / Embedments	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	A
8	Anchorage / Embedments	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B1.2-6 III.B1.3-6 III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	A 0504
9	Anchorage / Embedments	SNS, SRE, SSR	Stainless Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	A
10	Cable Tray and Conduit Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A
11	Cable Tray and Conduit Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	A 0504
12	Cable Tray and Conduit Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6	3.5.1-55	A 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
13	Cable Tray and Conduit Supports	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8	3.5.1-59	A
14	Cable Tray and Conduit Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A
15	Cable Tray and Conduit Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	A 0504
16	Cable Tray and Conduit Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	A
17	Cable Tray and Conduit Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-6	3.5.1-55	A 0504
18	Cable Tray and Conduit Supports	SNS, SRE, SSR	Stainless Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	A
19	Cable Trays and Conduits	EN, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	C
20	Cable Trays and Conduits	EN, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	A 0504
21	Cable Trays and Conduits	EN, SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6	3.5.1-55	A 0504
22	Cable Trays and Conduits	EN, SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B3-5	3.5.1-59	A
23	Cable Trays and Conduits	EN, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
24	Cable Trays and Conduits	EN, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	A 0504
25	Cable Trays and Conduits	EN, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	C
26	Cable Trays and Conduits	EN, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-6	3.5.1-55	A 0504
27	Cable Trays and Conduits	EN, SNS, SRE, SSR	Stainless Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	A
28	Cable Trays and Conduits	EN, SNS, SRE, SSR	Aluminum	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	A
29	Component and Piping Supports (ASME Class 1, 2, and 3)	SRE, SSR	Carbon Steel	Air-indoor	Loss of material	ISI Program-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10	3.5.1-53	A
30	Component and Piping Supports (ASME Class 1, 2, and 3)	SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-14 III.B1.2-11 III.B1.3-11	3.5.1-55	A 0504
31	Component and Piping Supports (ASME Class 1, 2, and 3)	SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-8 III.B1.2-6 III.B1.3-6	3.5.1-55	A 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
32	Component and Piping Supports (ASME Class 1, 2, and 3)	SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B1.1-9 III.B1.2-7 III.B1.3-7	3.5.1-59	A
33	Component and Piping Supports (ASME Class 1, 2, and 3)	SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	ISI Program-IWF	III.B1.2-10 III.B1.3-10	3.5.1-53	A
34	Component and Piping Supports (ASME Class 1, 2, and 3)	SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B1.2-11 III.B1.3-11	3.5.1-55	A 0504
35	Component and Piping Supports (ASME Class 1, 2, and 3)	SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	ISI Program-IWF	III.B1.2-10 III.B1.3-10	3.5.1-53	A
36	Component and Piping Supports (ASME Class 1, 2, and 3)	SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B1.2-6 III.B1.3-6	3.5.1-55	A 0504
37	Damper Framing (in-wall)	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A
38	Damper Framing (in-wall)	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5	3.5.1-58	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
39	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B3-7	3.5.1-39	C
40	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B3-8	3.5.1-55	C 0504
41	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B3-4	3.5.1-55	C 0504
42	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B3-5	3.5.1-59	C
43	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B3-7	3.5.1-39	C
44	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B3-8	3.5.1-55	C 0504
45	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	C
46	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B3-4	3.5.1-55	C 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
47	Electrical and Instrument Panels & Enclosures	EN, SNS, SRE, SSR	Stainless Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	C
48	Electrical Cable Bus Ducts	EN, SRE, SSR	Aluminum	Air-indoor	None	None	III.B3-2	3.5.1-58	C
49	Electrical Cable Bus Ducts	EN, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	VI.A-13	3.6.1-9	A
50	Electrical Cable Bus Ducts	EN, SRE, SSR	Aluminum	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	A
51	Electrical Cable Bus Ducts	EN, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	VI.A-13	3.6.1-9	A
52	Equipment Component Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
53	Equipment Component Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11 III.B3-8 III.B4-11 III.B5-8	3.5.1-55	A 0504
54	Equipment Component Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	A 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
55	Equipment Component Supports	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5	3.5.1-59	A
56	Equipment Component Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
57	Equipment Component Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-11 III.B3-8 III.B4-11 III.B5-8	3.5.1-55	A 0504
58	Equipment Component Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	A
59	Equipment Component Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	A 0504
60	Equipment Component Supports	SNS, SRE, SSR	Stainless Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	A
61	Flood, Pressure, and Specialty Doors	FLB, MB, SPB, SHD, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B4-10	3.5.1-39	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
62	Flood, Pressure, and Specialty Doors	FLB, MB, SPB, SHD, SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B4-5	3.5.1-58	C
63	Flood, Pressure, and Specialty Doors	FLB, MB, SPB, SHD, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B4-10	3.5.1-39	C
64	Flood, Pressure, and Specialty Doors	FLB, MB, SPB, SHD, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
65	HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B5-7	3.5.1-39	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
66	HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
67	HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
68	HELB Barriers (includes pipe restraints, whip restraints, and jet/missile impingement shields/plate barriers)	HELB, PW, SNS, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
69	HVAC Duct Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
70	HVAC Duct Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	A 0504
71	HVAC Duct Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6	3.5.1-55	A 0504
72	HVAC Duct Supports	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8	3.5.1-59	A
73	Instrument Line Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A
74	Instrument Line Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	A 0504
75	Instrument Line Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6	3.5.1-55	A 0504
76	Instrument Line Supports	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8	3.5.1-59	A
77	Instrument Line Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A
78	Instrument Line Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	A 0504
79	Instrument Line Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	A
80	Instrument Line Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-6	3.5.1-55	A 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
81	Instrument Line Supports	SNS, SRE, SSR	Stainless Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	A
82	Instrument Racks and Frames	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B3-7	3.5.1-39	C
83	Instrument Racks and Frames	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B3-8	3.5.1-55	A 0504
84	Instrument Racks and Frames	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B3-7	3.5.1-39	C
85	Missile Barriers	MB, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B5-7	3.5.1-39	C
86	Missile Barriers	MB, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
87	Missile Barriers	MB, SSR	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C
88	Missile Barriers	MB, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
89	Missile Barriers	MB, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B5-7	3.5.1-39	C
90	Missile Barriers	MB, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
91	Monorails, Hoists and Miscellaneous Cranes	SNS	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B5-7	3.5.1-39	A
92	Penetrations (Mechanical and Electrical)	EN, FB, FLB, SPB, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring Fire Protection	III.B2-10	3.5.1-39	C 0547
93	Pipe Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10 III.B4-10	3.5.1-39	A
94	Pipe Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11 III.B4-11	3.5.1-55	A 0504
95	Pipe Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B4-6	3.5.1-55	A 0504
96	Pipe Supports	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B4-8	3.5.1-59	A
97	Pipe Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B4-10	3.5.1-39	A
98	Pipe Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-11 III.B4-11	3.5.1-55	A 0504
99	Pipe Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
100	Pipe Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B4-6	3.5.1-55	A 0504
101	Pipe Supports	SNS, SRE, SSR	Stainless Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	A
102	Pipe Supports	SNS, SRE, SSR	Stainless Steel	Treated water	Loss of material	Structures Monitoring PWR Water Chemistry	III.B1.1-11	3.5.1-49	J 0545
103	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Aluminum	Air-indoor	None	None	III.B5-2	3.5.1-58	C
104	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Aluminum	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
105	Stairs, Ladders, Platforms, and Gratings	FLB, SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B5-7	3.5.1-39	C 0548
106	Stairs, Ladders, Platforms, and Gratings	FLB, SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504 0548
107	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
108	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
109	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Aluminum	Air-outdoor	Loss of material	Structures Monitoring	III.B4-7	3.5.1-50	C
110	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Aluminum	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
111	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B5-7	3.5.1-39	C
112	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B5-8	3.5.1-55	C 0504
113	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	C
114	Stairs, Ladders, Platforms, and Gratings	SNS, SRE	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	C 0504
115	Tube Track Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A
116	Tube Track Supports	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	A 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
117	Tube Track Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B5-3	3.5.1-58	A
118	Tube Track Supports	SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6	3.5.1-55	A 0504
119	Tube Track Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A
120	Tube Track Supports	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	A 0504
121	Tube Track Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	A
122	Tube Track Supports	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-6	3.5.1-55	A 0504
123	Tube Tracks	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	C
124	Tube Tracks	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	C
125	Tube Tracks	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	C
126	Tube Tracks	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-11	3.5.1-55	C 0504
127	Vents and Louvers	SNS, SRE, SSR	Aluminum	Air-indoor	None	None	III.B2-4	3.5.1-58	C

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
128	Vents and Louvers	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	C
129	Vents and Louvers	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5	3.5.1-58	C
130	Vents and Louvers	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8	3.5.1-59	C
131	Vents and Louvers	SNS, SRE, SSR	Aluminum	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	C
132	Vents and Louvers	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	C
133	Vents and Louvers	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	C
134	Vents and Louvers	SNS, SRE, SSR	Stainless Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7	3.5.1-50	C
135	Vibration Isolators	SNS, SRE	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10	3.5.1-39	A
Threaded Fasteners									
136	Anchor Bolts	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
137	Anchor Bolts	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11 III.B3-8 III.B4-11 III.B5-8	3.5.1-55	A 0504
138	Anchor Bolts	SNS, SRE, SSR	Carbon Steel	Air-indoor	Cracking	Bolting Integrity	III.B1.1-3	3.5.1-51	C 0537 0544
139	Anchor Bolts	SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	A 0504
140	Anchor Bolts	SNS, SRE, SSR	Stainless Steel	Air-indoor	Cracking	Bolting Integrity	III.B1.1-3	3.5.1-51	C 0537 0544
141	Anchor Bolts	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
142	Anchor Bolts	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-11 III.B3-8 III.B4-11 III.B5-8	3.5.1-55	A 0504
143	Anchor Bolts	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
144	Anchor Bolts	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	A 0504
145	Anchor Bolts	SNS, SRE, SSR	Stainless Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	A
146	Anchor Bolts	SNS, SRE, SSR	Stainless Steel	Air-outdoor	Cracking	Bolting Integrity	III.B1.1-3	3.5.1-51	C 0537 0544
147	Anchor Bolts (ASME Class 1, 2, and 3 Supports Bolting)	SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring ISI Program-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10	3.5.1-53	A
148	Anchor Bolts (ASME Class 1, 2, and 3 Supports Bolting)	SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-14 III.B1.2-11	3.5.1-55	A 0504
149	Anchor Bolts (ASME Class 1, 2, and 3 Supports Bolting)	SRE, SSR	Carbon Steel	Air-indoor	Cracking	Bolting Integrity	III.B1.1-3	3.5.1-51	A
150	Anchor Bolts (ASME Class 1, 2, and 3 Supports Bolting)	SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B1.1-8 III.B1.2-6	3.5.1-55	A 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
151	Anchor Bolts (ASME Class 1, 2, and 3 Supports Bolting)	SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B1.1-9	3.5.1-59	A
152	Anchor Bolts (ASME Class 1, 2, and 3 Supports Bolting)	SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring ISI Program-IWF	III.B1.2-10 III.B1.3-10	3.5.1-53	A
153	Anchor Bolts (ASME Class 1, 2, and 3 Supports Bolting)	SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring ISI Program-IWF	III.B1.2-10 III.B1.3-10	3.5.1-53	A
154	Blowout Panel Release Fasteners	PR, SSR	Aluminum	Air-indoor	None	Structures Monitoring	III.B4-4	3.5.1-58	C
155	Blowout Panel Release Fasteners	PR, SSR	Aluminum	Air-indoor	Loss of material	Boric Acid Corrosion	III.B5-4	3.5.1-55	A 0504
156	Expansion Anchors	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
157	Expansion Anchors	SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-11 III.B3-8 III.B4-11 III.B5-8	3.5.1-55	A 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
158	Expansion Anchors	SNS, SRE, SSR	Carbon Steel	Air-indoor	Cracking	Bolting Integrity	III.B1.1-3	3.5.1-51	C 0544
159	Expansion Anchors	SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3	3.5.1-58	A
160	Expansion Anchors	SNS, SRE, SSR	Galvanized Steel	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	A 0504
161	Expansion Anchors	SNS, SRE, SSR	Stainless Steel	Air-indoor	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5	3.5.1-59	A
162	Expansion Anchors	SNS, SRE, SSR	Stainless Steel	Air-indoor	Cracking	Bolting Integrity	III.B1.1-3	3.5.1-51	C 0544
163	Expansion Anchors	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7	3.5.1-39	A
164	Expansion Anchors	SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-11 III.B3-8 III.B4-11 III.B5-8	3.5.1-55	A 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
165	Expansion Anchors	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	A
166	Expansion Anchors	SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	A 0504
Concrete									
167	Equipment Pads	SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
168	Equipment Pads	SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
169	Equipment Pads	SNS, SRE, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
170	Equipment Pads	SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
171	Equipment Pads	SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
172	Equipment Pads	SNS, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
173	Flood Curbs	FLB, SNS	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
174	Hatches & Hatch Plugs	EN, FB, FLB, MB, SPB, SHD, SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring Fire Protection	N/A	N/A	I 0501 0547
175	Hatches & Hatch Plugs	EN, FB, FLB, MB, SPB, SHD, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring Fire Protection	III.A3-6	3.5.1-26	A 0547
176	Hatches & Hatch Plugs	EN, FB, FLB, MB, SPB, SHD, SNS, SRE, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring Fire Protection	III.A3-7	3.5.1-32	A 0509 0547
177	Hatches & Hatch Plugs	EN, FB, FLB, MB, SPB, SHD, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring Fire Protection	III.A3-9	3.5.1-23	A 0547

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
178	Hatches & Hatch Plugs	EN, FB, FLB, MB, SPB, SHD, SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring Fire Protection	III.A3-10	3.5.1-24	A 0547
179	Support Pedestals	SNS, SRE, SSR	Concrete	Air-indoor	None	Structures Monitoring	N/A	N/A	I 0501
180	Support Pedestals	SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Cracking	Structures Monitoring	III.A3-6	3.5.1-26	A
181	Support Pedestals	SNS, SRE, SSR	Concrete	Air-outdoor	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
182	Support Pedestals	SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material	Structures Monitoring	III.A3-9	3.5.1-23	A
183	Support Pedestals	SNS, SRE, SSR	Concrete	Air-outdoor	Loss of material Change in material properties	Structures Monitoring	III.A3-10	3.5.1-24	A

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
184	Support Pedestals	SNS, SRE, SSR	Concrete	Soil	Change in material properties	Structures Monitoring	III.A3-7	3.5.1-32	A 0509
Elastomers									
185	Compressible Joints and Seals	EXP, FLB, SNS, SSR	Elastomer	Air-indoor	Cracking Change in material properties	Structures Monitoring	III.A6-12	3.5.1-44	C 0538 0539
186	Compressible Joints and Seals	EXP, FLB, SNS, SSR	Elastomer	Air-outdoor	Cracking Change in material properties	Structures Monitoring	III.A6-12	3.5.1-44	C 0538 0540
187	Expansion Boots	EXP, FLB, SNS, SRE, SSR	Elastomer	Air-outdoor	Cracking Change in material properties	Structures Monitoring	III.A6-12	3.5.1-44	C 0538 0540
188	Expansion Boots	EXP, FLB, SNS, SRE, SSR	Elastomer	Soil	None	Structures Monitoring	N/A	N/A	J 0543

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
189	Flexible Conduit Fittings	EN, SNS, SRE, SSR	Elastomer	Air-indoor	Cracking Change in material properties	Structures Monitoring	III.A6-12	3.5.1-44	C 0538 0539
190	Flexible Conduit Fittings	EN, SNS, SRE, SSR	Elastomer	Air-outdoor	Cracking Change in material properties	Structures Monitoring	III.A6-12	3.5.1-44	C 0538 0540
191	Roof Membrane	EN, FLB, SNS, SRE, SSR	Elastomer / Built-up Roofing	Air-outdoor	Cracking Change in material properties	Structures Monitoring	III.A6-12	3.5.1-44	C 0538 0540
192	Waterproofing Membrane	FLB, SNS, SSR	Elastomer	Soil	None	Structures Monitoring	N/A	N/A	J 0543
193	Waterstops	FLB, SNS, SSR	Elastomer	Air-indoor (within walls, floors, or foundations)	None	Structures Monitoring	N/A	N/A	J 0543
194	Waterstops	FLB, SNS, SSR	Elastomer	Soil	None	Structures Monitoring	N/A	N/A	J 0543

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
Fire Barriers									
195	Fire Doors	FB, SNS, SRE, SSR	Carbon Steel	Air-indoor	Loss of material	Fire Protection	VII.G-3	3.3.1-63	B 0541 0546
						Structures Monitoring	III.B4-10	3.5.1-39	C
196	Fire Doors	FB, SNS, SRE, SSR	Galvanized Steel	Air-indoor	None	Fire Protection	N/A	N/A	I 0501
						Structures Monitoring	N/A	N/A	I 0501
197	Fire Doors	FB, SNS, SRE, SSR	Carbon Steel	Air-outdoor	Loss of material	Fire Protection	VII.G-4	3.3.1-63	B 0541 0546
						Structures Monitoring	III.B4-10	3.5.1-39	C
198	Fire Doors	FB, SNS, SRE, SSR	Galvanized Steel	Air-outdoor	Loss of material	Fire Protection	VII.G-4	3.3.1-63	B 0541 0546
						Structures Monitoring	III.B4-7	3.5.1-50	C
199	Fire Stops	FB, FLB, SPB, SNS, SRE, SSR	Silicone Elastomer	Air-indoor	Cracking/ Delamination/ Separation	Fire Protection	VII.G-1	3.3.1-61	B 0541 0542

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
200	Fire Stops	FB, FLB, SPB, SNS, SRE, SSR	Silicone Elastomer	Air-outdoor	Cracking/ Delamination/ Separation	Fire Protection	VII.G-1	3.3.1-61	B 0541 0542
201	Fire Stops	FB, FLB, SPB, SNS, SRE, SSR	Silicone Elastomer	Air-indoor	Change in material properties	Fire Protection	VII.G-1	3.3.1-61	B 0541 0542
202	Fireproofing	FB, SNS, SRE, SSR	Isolatek Mandoseal/ Monokote	Air-indoor	Loss of material Cracking/ Delamination	Fire Protection	N/A	N/A	J
203	Fire Wraps	FB, SNS, SRE, SSR	Ceramic fiber/ 3M Interam	Air-indoor	Loss of material Cracking/ Delamination	Fire Protection	N/A	N/A	J
					Miscellaneous Materials				
204	Containment Penetration Insulation	SNS	Fiberglass	Air-indoor	None	None	N/A	N/A	J

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
205	Piping and Mechanical Equipment Insulation	SNS	Aluminum jacketing	Air-indoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	J 0504
206	Piping and Mechanical Equipment Insulation	SNS	Calcium Silicate	Air-indoor	None	None	N/A	N/A	J
207	Piping and Mechanical Equipment Insulation	SNS	Fiberglass	Air-indoor	None	None	N/A	N/A	J
208	Piping and Mechanical Equipment Insulation	SNS	Stainless Steel Mirror insulation	Air-indoor	None	None	N/A	N/A	J
209	Piping and Mechanical Equipment Insulation	SNS	Aluminum jacketing	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	J
210	Piping and Mechanical Equipment Insulation	SNS	Aluminum jacketing	Air-outdoor	Loss of material	Boric Acid Corrosion	III.B2-6 III.B3-4 III.B4-6 III.B5-4	3.5.1-55	J 0504

Table 3.5.2-13 Aging Management Review Results – Bulk Commodities

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
211	Piping and Mechanical Equipment Insulation	SNS	Calcium Silicate	Air-outdoor	None	None	N/A	N/A	J
212	Piping and Mechanical Equipment Insulation	SNS	Fiberglass	Air-outdoor	None	None	N/A	N/A	J
213	Piping and Mechanical Equipment Insulation	SNS	Stainless Steel Mirror insulation	Air-outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7	3.5.1-50	J

Generic Notes:	
A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0501	No applicable aging effects have been identified for the component type. However, the identified AMP or AMPs will be used to confirm the absence of significant aging effects for the period of extended operation.
0502	The containment emergency sump recirculation valve enclosures and bellows are extensions of the containment pressure boundary and provide an essentially leak tight barrier. They are locally leak tested similar to containment penetration bellows that serve as containment pressure boundaries.
0503	The containment normal sump is assumed to have a raw water environment for license renewal evaluation because system leakages can be from various sources and may contain contaminants. It is assumed that the waste liquid collected in the stainless steel lined sump can be aggressive. Therefore, loss of material is an aging effect requiring management for the sump. The material and environment combination is not evaluated in NUREG-1801 civil chapters II or III.
0504	Aging mechanism applies to the areas that contain borated systems.
0505	Elastomeric seals, gaskets, or o-rings are sub-parts of the host component and their leak tightness is monitored by the 10 CFR Part 50, Appendix J Program. Plant Technical Specifications ensure that access airlocks maintain leak tightness in the closed position.
0506	Neutron shielding material is used for radiation shielding only and is not relied upon as a structural element. Neutron shielding material is enclosed within steel covering. Therefore, neutron shielding material does not require aging effects evaluation. Aging effects evaluation is performed on the outer steel panels.
0507	The process line penetrations are of welded steel construction without gaskets, or sealing compounds. Electrical penetration assembly internal o-rings are sub-components of each electrical penetration and are included in this commodity group. Insulation for hot penetrations is addressed in bulk commodities.
0508	The refueling canal has experienced leakage through the refueling canal liner. The repair of the refueling canal leakage is processed by the Corrective Action Program. The identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.
0509	The NUREG-1801 item for leaching of calcium hydroxide does not list exposed to soil, air-indoor or air-outdoor environments. Water leakages through concrete (above and below grade) have been observed at the plant from operating experience. The environment is considered a match since the degradation initiation mechanism is the same. The identified AMP is used to manage aging effects for the period of extended operation.
0510	Lead is used for radiation shielding only and is not relied upon as a structural element. Lead shielding material is enclosed within steel covering. Therefore, lead does not require aging effects evaluation. Aging effects evaluation is performed on the outer steel covering.

Plant-Specific Notes:	
0511	In addition to aging management by the Structures Monitoring Program, the Shield Building concrete is also managed by the 10 CFR Part 50, Appendix J Program's Containment Vessel and Shield Building Visual Inspection.
0512	Concrete walls, floors, and ceilings with a fire barrier (FB) intended function receive additional inspection as part of the Fire Protection Program.
0513	The TLAAs excluding the Containment Vessel from fatigue analysis per Section N415-1 of the ASME Code will remain valid through the period of extended operation (See Section 4.6.1).
0514	The effects of fatigue on the intended functions of the Permanent Reactor Cavity Seal Plate seal membrane will be managed for the period of extended operation by the Fatigue Monitoring Program.
0515	Lead is used for radiation shielding only and is not relied upon as a structural element. Lead is protected within steel panels, masonry walls, or concrete plugs. As such, aging management is performed on the covering material. Radiation shielding panels have lead bricks or lead panels protected with steel plates. Lead bricks are sandwiched within reinforced masonry walls. Temporary lead blankets are hung on steel supports. Lead plates are installed between concrete hatch plugs. Lead shot, covered with steel panels, is used to fill trenches containing radioactive piping.
0516	The PWR Water Chemistry Program manages loss of material due to crevice and pitting corrosion. Cracking due to SCC is not applicable. Spent fuel pool water level monitoring is per Technical Specifications. The Leak Chase Monitoring Program detects leakage from the leak chase channels.
0517	Masonry Walls are inspected by the Masonry Wall Inspection implemented as part of the Structures Monitoring Program. Masonry walls with a fire barrier (FB) intended function receive additional inspection as part of the Fire Protection Program.
0518	The roof has built-up roofing. Therefore, the environment for this concrete roof slab is air-indoor for the underside of the slab. The roof membrane is evaluated and addressed in bulk commodities.
0519	The Auxiliary Building sump is assumed to have a raw water environment for license renewal evaluation because system leakages can be from various sources and may contain contaminants. It is assumed that the waste liquid collected in the sump can be aggressive. Therefore, loss of material and change in material properties are aging effects requiring management for the sump. The NUREG-1801 items for aggressive chemical attack, corrosion of embedded steel and steel reinforcement, and leaching of calcium hydroxide do not list a raw water environment. The environment is considered a match since the degradation initiation mechanism is the same. The identified AMP is used to manage aging effects for the period of extended operation.
0520	The listed AMP is a plant-specific program for this item. Davis-Besse plant-specific AMR concluded Boral® does not require aging management for the period of extended operation for its neutron absorbing function. However, because of recent industry experience, a new Boral® Monitoring Program will be instituted at Davis-Besse for the period of extended operation. Aging management for loss of material of its aluminum constituent is required.

Plant-Specific Notes:	
0521	The Leak Chase Monitoring Program detects leakage from the leak chase channels during normal operation and refueling.
0522	Davis-Besse is not committed to Regulatory Guide 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants, Revision 1. However, the Water Control Structures Inspection as implemented by the Structures Monitoring Program will be enhanced to include applicable inspection elements delineated in Regulatory Guide 1.127, Revision 1 per NUREG-1801 Chapter XI.S7.
0523	The NUREG-1801 item for freeze-thaw does not list exposed to raw water environment. Freeze-thaw can be possible near the water line. This environment is both exposed to air-outdoor and exposed to raw water; therefore environment is considered a match. The identified AMP is used to manage aging effects for the period of extended operation.
0524	The NUREG-1801 item for corrosion of embedded steel and steel reinforcement does not list exposed to soil environment. Concrete components below grade are exposed to an aggressive groundwater environment. The environment is considered a match since the degradation initiation mechanism is the same. The identified AMP is used to manage aging effects for the period of extended operation.
0525	The NUREG-1801 item for aggressive chemicals does not list exposed to air-outdoor environment. Concrete components in an air-outdoor environment are exposed to an aggressive rainwater environment. Their external surfaces may be wetted for a period of time due to moderate precipitation and snowfall. The environment is considered a match since the degradation initiation mechanism is the same. The identified AMP is used to manage aging effects for the period of extended operation.
0526	The service water discharge pipe sleeve and the buried portion of the Service Water Discharge Structure do not contain steel reinforcement therefore the corrosion of embedded steel and steel reinforcement aging mechanism is not applicable. The Service Water Discharge Structure end-wall, slab, and spillway do contain steel reinforcement and are exposed to air-outdoor on the top sides, soil on the bottom sides. The corrosion of embedded steel and steel reinforcement aging mechanism is applicable.
0527	The Intake Structure sump is assumed to have a raw water environment for license renewal evaluation because system leakages can be from various sources and may contain contaminants. It is assumed that the waste liquid collected in the sump can be aggressive. Therefore, loss of material and change in material properties due to aggressive chemicals are aging effects requiring management for the sump. The identified AMP is used to manage aging effects for the period of extended operation.
0528	Rock anchors provide rock stability in the vicinity of sheet piling anchors. Rock anchors are grouted into bedrock. The Structural Tools does not list a concrete or grouted environment for steel components. Steel embedded in concrete does not require aging management. This conclusion is consistent with NUREG-1801 item VII.J-21 and the Mechanical Tools.
0529	The Intake Structure gantry crane is located in an air-outdoor environment. The NUREG-1801 item for crane VII.B-3 only listed an air-indoor (uncontrolled) environment. The identified AMP is used to manage aging effects for the period of extended operation.

Plant-Specific Notes:	
0530	Building sumps are assumed to have a raw water environment for license renewal evaluation because system leakages can be from various sources and may contain contaminants. It is assumed that the waste liquid collected in the sump can be aggressive. Therefore, loss of material and change in material properties are aging effects requiring management for the sump. The NUREG-1801 items for aggressive chemical, corrosion of embedded steel and steel reinforcement, and leaching of calcium hydroxide do not list a raw water environment. The environment is considered a match since the degradation initiation mechanism is the same. The identified AMP is used to manage aging effects for the period of extended operation.
0531	NUREG-1801 does not list a structural backfill environment for steel components. No aging effects requiring management were identified for the EDG Fuel Oil Storage Tank hold down wire rope in a structural backfill environment. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation. The structural backfill is above grade and the elevation location of the wire rope is above the site's groundwater elevation.
0532	The Wave Protection Dike corrugated pipe casings and Wave Protection Dike piles buried in the wave protection dikes can be exposed to groundwater since the corrugated pipe casings are located below site groundwater elevation. Since these buried steel components can be in direct contact with groundwater, a raw water environment is conservatively used for aging evaluation.
0533	Walls with a fire barrier (FB) intended function receive additional inspection as part of the Fire Protection Program.
0534	Structure sumps are assumed to have a raw water environment for license renewal evaluation because system leakages can be from various sources and may contain contaminants. It is assumed that the waste liquid collected in the sump can be aggressive. Therefore, loss of material and change in material properties are aging effects requiring management for the sump. The NUREG-1801 items for aggressive chemical attack, corrosion of embedded steel and steel reinforcement, and leaching of calcium hydroxide do not list a raw water environment. The environment is considered a match since the degradation initiation mechanism is the same. The identified AMP is used to manage aging effects for the period of extended operation.
0535	Structure sumps are assumed to have a raw water environment for license renewal evaluation because system leakages can be from various sources and may contain contaminants. Loss of material and cracking due to freeze-thaw are aging effects requiring management for concrete components exposed to raw water because Yard Structure sumps are located within outdoor structures. This is conservative since the transformer sumps and manhole sumps are located below grade elevation.
0536	The north and west sides of the Nitrogen Storage Building do not have reinforced concrete walls. Instead, they have a chain link fence. Therefore an air-outdoor environment was assigned inside the building.
0537	Applicable to low-alloy high strength bolts with yield strength (Sy) greater than 150 ksi, Low-alloy Quenched and Tempered (LAQT), and high-nickel managing steel bolting with high tensile stresses in a corrosive environment.

Plant-Specific Notes:	
0538	The NUREG-1801 item lists loss of sealing as an aging effect for elastomer. Loss of sealing is not considered as an aging effect but rather as a consequence of elastomer degradation. This effect may be caused by cracking or change in material properties for elastomeric material. Note C is used since the NUREG-1801 item is intended for Group 6 – water-control structures' components; the line item covers all in-scope structures.
0539	Ionizing radiation is an applicable aging mechanism for elastomers inside Containment and portions of the Auxiliary Building where the radiation exceeds the threshold. The ionizing radiation mechanism does not apply to elastomers located in mild radiation areas.
0540	Cracking and change in material properties due to ultra-violet radiation and ozone are applicable aging effects for rubber only.
0541	The Fire Protection Program does not contain any exceptions which are applicable to structural components.
0542	The NUREG-1801 item lists aging effects as increased hardness, shrinkage, and loss of strength. The applicable aging effects identified are cracking/ delamination and change in material properties. The aging effect is a match since increased hardness, shrinkage and loss of strength are consequences of a change in material properties. Gamma irradiation mechanism does not apply to elastomeric fire stops located in mild radiation areas.
0543	No applicable aging effects have been identified for the component type. However, Davis-Besse operating experience indicates groundwater in-leakage. Therefore, elastomer seals below grade and waterstops require aging management when accessible.
0544	Aging effect applies to expansion anchors because of the use of moly-sulfide based lubricant. Aging effect applies to non-Class 1 anchor bolts because of Davis-Besse operating experience with boric acid wastage which is a corrosive environment.
0545	Components are the stainless steel supports in the spent fuel pool which are not within the scope of ISI-IWF. The identified AMPs will be used to manage the aging effects for the period of extended operation.
0546	The aging mechanism loss of material due to wear is not an aging effect for fire doors since wear of the hardware, appurtenances and closure mechanisms is a consequence of frequent or rough usage. The aging mechanism loss of material due to general corrosion was not specified in the corresponding NUREG-1801 item as an aging effect requiring management. Generic Note "A" was used to align to the NUREG-1801 item since the material, environment, aging effect, and program (MEAP) match. The identified AMP will be used to manage loss of material due to general corrosion and will confirm the absence of significant wear of fire doors for the period of extended operation. The Fire Protection Program inspects for excessive wear of latches, strike plates, hinges, sills, and closing devices, and proper clearances (gaps) between the door, frame, and threshold.
0547	Components with a fire barrier (FB) intended function receive additional inspection as part of the Fire Protection Program.
0548	There are sections of checkered plate flooring installed over the heater bay grating in the Turbine Building at elevation 603'-0". This flooring is installed to protect the auxiliary feedwater pumps from flooding.

Plant-Specific Notes:	
0549	Porcelain window wall panels are an architectural feature that serve a shelter intended function for the Condensate Storage Tank room. A review of the site-specific operating experience and industry operating experience has not identified any aging effects that can affect or challenge the intended function provided by porcelain window wall panels.

3.6 AGING MANAGEMENT OF ELECTRICAL AND INSTRUMENTATION AND CONTROL SYSTEMS

3.6.1 INTRODUCTION

Section 3.6 provides the results of the aging management reviews (AMRs) for those components and commodities identified in Section 2.5, Scoping and Screening Results – Electrical and Instrumentation and Control Systems, subject to AMR. The components and commodity groups subject to AMR are:

- Non-Environmentally Qualified Insulated Cables and Connections (Section 2.5.5.1)
- Switchyard Bus and Connections (Section 2.5.5.2)
- Transmission Conductors and Connections (Section 2.5.5.3)
- High-Voltage Insulators (Section 2.5.5.4)

Table 3.6.1, Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component and commodity groups in this section. Text addressing summary items requiring further evaluation is provided in Section 3.6.2.2.

3.6.2 RESULTS

The following table summarizes the results of the AMR for the components and commodity groups in the Electrical and Instrumentation and Control Systems area:

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

3.6.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The materials from which specific components and commodity groups are fabricated, the environments to which they are exposed, the aging effects requiring management, and the aging management programs (AMPs) used to manage these aging effects are provided for each component and commodity group in the following sections.

3.6.2.1.1 Non-Environmentally Qualified Insulated Cables and Connections

The Non-Environmentally Qualified Insulated Cables and Connections commodity group is subdivided for AMR into the following categories:

- Non-Environmentally Qualified Insulated Cables and Connections
- Non-Environmentally Qualified Electrical and I&C Penetration Assemblies (electrical insulation)
- Non-Environmentally Qualified Sensitive, High-Voltage, Low-Level Signal Instrument Cables and Connections
- Non-Environmentally Qualified Medium-Voltage Power Cables
- Cable Connections (Metallic Parts)

Materials

The materials of construction for the Non-Environmentally Qualified Insulated Cables and Connections are:

- Various metals
- Various organic polymers

Environments

The Non-Environmentally Qualified Insulated Cables and Connections are exposed to the following environments:

- Adverse localized environments
- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage

Aging Effects Requiring Management

The aging effects requiring management for the Non-Environmentally Qualified Cables and Connections exposed to adverse localized environments are the following:

- Increased connection resistance
- Reduced insulation resistance

Aging Management Programs

The following aging management programs manage the aging effects for the Non-Environmentally Qualified Cables and Connections components:

- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection
- Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program
- Boric Acid Corrosion Program (for the metallic cable connections exposed to air with borated water leakage)

3.6.2.1.2 Switchyard Bus and Connections

The Switchyard Bus and Connections commodity group is evaluated for aging management as follows:

Materials

The materials of construction for the Switchyard Bus and Connections are:

- Aluminum
- Galvanized steel
- Stainless steel

Environments

The Switchyard Bus and Connections are exposed to the following environment:

- Air - outdoor

Aging Effects Requiring Management

There are no aging effects identified as requiring management for the Switchyard Bus and Connections components (See Section 3.6.2.2.3).

Aging Management Programs

There are no aging effects identified as requiring management; therefore, no aging management programs are required for the Switchyard Bus and Connections components.

3.6.2.1.3 Transmission Conductors and Connections

The Transmission Conductors and Connections commodity group is evaluated for aging management as follows:

Materials

Transmission conductors are aluminum conductor aluminum reinforced (ACAR). The materials of construction for the Transmission Conductor and Connection components are:

- Aluminum
- Galvanized steel
- Stainless steel

Environments

The Transmission Conductor and Connection components are exposed to the following environment:

- Air - outdoor

Aging Effects Requiring Management

There are no aging effects identified as requiring management for the Transmission Conductor and Connection components (See Section 3.6.2.2.3).

Aging Management Programs

There are no aging effects identified as requiring management; therefore, no aging management programs are required for the Transmission Conductors and Connections components.

3.6.2.1.4 High-Voltage Insulators

The High-Voltage Insulators commodity group is evaluated for aging management as follows:

Materials

The materials of construction for the High-Voltage Insulators are:

- Cement
- Galvanized metal
- Malleable iron
- Porcelain

Environments

The High-Voltage Insulators are exposed to the following environment:

- Air - outdoor

Aging Effects Requiring Management

There are no aging effects identified as requiring management for the High-Voltage Insulator components (See Section 3.6.2.2.2 and Section 3.6.2.2.3).

Aging Management Programs

There are no aging effects identified as requiring management; therefore, no aging management programs are required for the High-Voltage Insulator components.

3.6.2.2 Aging Management Review Results for Which Further Evaluation is Recommended by NUREG-1801

For the electrical and instrumentation and control (I&C) components, the items that require further evaluation are addressed in the following sections.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental qualification (EQ) is a time-limited aging analysis as defined in 10 CFR 54.3. Time-limited aging analyses are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of the environmental qualification time-limited aging analysis is addressed separately in Section 4.

3.6.2.2.2 Degradation of Insulator Quality due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear

Degradation of insulator quality due to presence of any salt deposits and surface contamination could occur in high voltage insulators.

The high-voltage insulators evaluated for license renewal at Davis-Besse include those used to support and insulate high-voltage electrical components (i.e., transmission conductors and connections, and switchyard bus). The in-scope power pathway involves the transmission conductors and connections associated with Startup Transformers 01 and 02, and the in-scope transmission conductors and connections located in the 345-kV switchyard adjacent to the plant.

Various airborne contaminants such as dust and industrial effluents can contaminate the insulator surfaces. The rural location of Davis-Besse on the shore of Lake Erie provides for minimal contamination from industrial effluents, and the city of Toledo is more than 20 miles away. The regular rainfall at the site is sufficient to wash the insulators. There have been no incidents of insulator contamination causing flashover or other insulator failures at Davis-Besse.

Loss of material due to mechanical wear is an aging effect for certain strain insulators if they are subject to significant movement. Such movement of the insulators can be caused by wind blowing the supported transmission conductor, causing it to sway from side to side. If this swinging motion occurs frequently enough, it could cause wear on the metallic contact points of the insulator string and between an insulator and the supporting hardware. Although this aging mechanism is possible, industry experience has shown that transmission conductors do not normally swing unless subjected to a substantial wind, and they stop swinging shortly after the wind subsides. Wind loading that can result in conductor sway is considered in the transmission system design. In addition, the sections of transmission conductor that are within the license renewal evaluation boundary at Davis-Besse are relatively short (from Startup Transformers 01 and 02 into the plant switchyard in lengths of about 200 feet, and then in increments of about 70 feet within the switchyard itself). Therefore, loss of material due to mechanical wear is not an aging effect requiring management for the high voltage insulators at Davis-Besse.

3.6.2.2.3 Loss of Material due to Wind Induced Abrasion and Fatigue, Loss of Conductor Strength due to Corrosion, and Increased Resistance of Connection due to Oxidation or Loss of Pre-Load

At Davis-Besse, there are relatively short lengths of switchyard bus in scope for license renewal, located in the plant switchyard. This bus is fabricated of 4-inch and 5-inch aluminum tube. The switchyard bus is connected to flexible connections that do not normally vibrate and are supported by insulators and ultimately by static structural components such as concrete footings and structural steel.

The aluminum bus will form a thin surface layer of oxidation but the conductor properties are not degraded by this thin surface oxidation layer. The galvanized and aluminum bolted connections are exposed to the same service conditions (in the plant switchyard) and do not experience any aging effects, except for minor oxidation of the exterior surfaces, which does not impact their ability to perform their intended function.

For the transmission conductors and connections and the switchyard bus and connections, subject to aging management review, there are no aging effects identified that require aging management.

Wind-induced abrasion and fatigue are not aging effects applicable to the in-scope transmission conductors. Industry experience has shown that transmission conductors do not normally swing unless subjected to substantial winds and they stop swinging after a short period once the wind subsides. Because the transmission conductors are not normally moving, the loss of material due to wind-induced abrasion and fatigue is not an aging effect requiring management. In addition, wind loading that can result in conductor sway is considered in the transmission system design.

Loss of conductor strength due to corrosion of the transmission conductor is not identified as an aging effect due to the ample design margin and a minimal corrosion process at Davis-Besse. Connection resistance is not identified as a stressor based on the use of good bolting practices and review of the site operating experience.

In the industry, transmission conductors are generally aluminum conductor steel reinforced (ACSR). The transmission conductor at Davis-Besse is ACAR.

Aluminum is more corrosion-resistant than steel. Aluminum quickly forms an oxide layer which protects the material underneath and this layer will re-form if damaged (in the absence of environmental stress). Aluminum is lighter than steel and provides a much higher strength-to-weight ratio. The ACAR conductor therefore is more resistant to corrosion and to loss of conductor strength than the ACSR conductor.

Corrosion in ACSR conductors is a very slow-acting mechanism and the corrosion rates depend on the air quality, which is affected by suspended particles chemistry, sulfur dioxide concentration in the air, precipitation, fog, air chemistry, and general meteorological conditions. For ACSR conductors, degradation begins as a loss of zinc from the galvanized steel core wires. Air quality in rural areas generally contains low concentrations of suspended particles and sulfur dioxide, which keeps the corrosion rate to a minimum. Davis-Besse is located in a rural area with no other industries in the immediate area.

As described in the EPRI Electrical Handbook, testing performed by Ontario Hydroelectric showed a 30% loss of composite conductor strength of an 80-year-old ACSR conductor due to corrosion. The Ontario Hydroelectric test report is available from the Institute of Electrical and Electronic Engineers (IEEE). The report is documented in two parts, which present the test methods and results on both field and laboratory tests on samples of ACSR conductors from Ontario Hydroelectric's older transmission lines. The field testing involved detection of steel core galvanizing loss via the use of an overhead line conductor corrosion detector. The laboratory tests involved examination of fatigue, tensile strength, torsional ductility, and electrical performance. The report also addressed metallurgical data and analysis of potential environmental contributors.

The Davis-Besse transmission conductors for the 345-kV offsite power recovery path are 1024.5 MCM ACAR, Type T-2614, Bare Cable, 24/13, overhead transmission conductors. The Ontario Hydroelectric test did not include this specific conductor type, but these types are bounded because of the conductor size, configuration, and support strand material. The Ontario Hydroelectric example discussed in the EPRI Electrical Handbook uses a 4/0 ACSR conductor while the Davis-Besse ACAR conductor has 13 aluminum-alloyed conductors wrapped by a 24-strand aluminum wire (24/13). The rated strength of the ACAR configuration is 23,100 lbs. The Davis-Besse conductors have aluminum reinforcing strands, so the Ontario Hydroelectric ACSR transmission conductors would bound the corrosion evaluation for the ACAR conductors at Davis-Besse. The aluminum conductors in the Ontario Hydroelectric test showed very little evidence of corrosion.

The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the ultimate conductor strength. The NESC also sets the maximum tension to which a conductor must be designed to withstand under heavy load conditions, which includes the consideration of ice, wind, and temperature. The NESC requirements and the guidance of the EPRI Electrical Handbook and the Ontario Hydroelectric study were applied to evaluate the in-scope Davis-Besse transmission conductors.

The ultimate strength and NESC heavy load strength of the Davis-Besse ACAR conductors are 23,100 lbs. and 13,860 lbs., respectively. The margin between the NESC heavy load and the ultimate strength is 9,240 lbs. The Ontario Hydroelectric study showed a 30% loss of composite conductor strength in the 80 year-old sample. In the case of the Davis-Besse ACAR conductor, a 30% reduction in strength would reduce the ultimate strength from 23,100 lbs. to 16,170 lbs., which still exceeds the NESC heavy load limit of 13,860 lbs. by 2,310 lbs. Therefore, the Davis-Besse ACAR transmission conductors will have an ample margin regarding conductor strength through the period of extended operation.

The bolted connections of the transmission conductors are associated with the field connections of transmission conductor to high-voltage insulators and to switchyard bus. The bolting hardware is chosen to be compatible with the transmission conductor. Stainless steel Belleville washers are specified for use with the transmission conductors. These methods of assembly are consistent with EPRI 1003471.

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety Related Components

See Appendix B, Section B.1.3, for a discussion of FENOC quality assurance procedures and administrative controls for aging management programs.

3.6.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the electrical and I&C components. The section of the application that contains the time-limited aging analysis review results is indicated in parentheses.

- Analyses for Environmental Qualification of components with a qualified life of 40 years or greater (Section 4.4, Environmental Qualification of Electrical Equipment)

3.6.3 CONCLUSIONS

The electrical and I&C components and commodities subject to aging management review have been identified in accordance with 10 CFR 54.21. The aging management programs selected to manage the effects of aging for the electrical components and commodities are identified in the following tables and Section 3.6.2.1. A description of the aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the electrical and I&C components and commodities will be managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-01	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental Qualification of Electrical Components	Yes, TLAA	Evaluation of the EQ time-limited aging analyses (TLAAs) is documented in Section 4.4. Further evaluation is documented in Section 3.6.2.2.1.
3.6.1-02	Electrical cables, connections, and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	No	Consistent with NUREG-1801.
3.6.1-03	Conductor insulation for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (IR)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables and Connections Used in Instrumentation Circuits Not Subject to 10 CFR 50.49 EQ Requirements	No	Consistent with NUREG-1801.
3.6.1-04	Conductor insulation for inaccessible medium voltage (2-kV to 35-kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Localized damage and breakdown of insulation leading to electrical failure due to moisture intrusion, water trees	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements	No	Consistent with NUREG-1801.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-05	Connector contacts for electrical connectors exposed to borated water leakage	Corrosion of connector contact surfaces due to intrusion of borated water	Boric Acid Corrosion	No	Consistent with NUREG-1801. Davis-Besse manages the aging effect with the Boric Acid Corrosion Program.
3.6.1-06	Fuse Holders (Not Part of a Larger Assembly): Fuse Holders – metallic clamp	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse Holders	No	Not applicable for Davis-Besse. A review of Davis-Besse documents indicated that fuse holders utilizing metallic clamps are either part of an active electrical panel or are located in circuits that perform no license renewal intended function. Therefore, fuse holders with metallic clamps at Davis-Besse are not subject to aging management review.
3.6.1-07	Metal-enclosed bus – Bus/connections	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal-Enclosed Bus	No	Not applicable to Davis-Besse. There is no metal-enclosed bus within the license renewal evaluation boundary at Davis-Besse.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-08	Metal-enclosed bus – Insulation/insulators	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Metal-Enclosed Bus	No	Not applicable to Davis-Besse. There is no metal-enclosed bus within the license renewal evaluation boundary at Davis-Besse.
3.6.1-09	Metal-enclosed bus – Enclosure assemblies	Loss of material due to general corrosion	Structures Monitoring Program	No	Not applicable to Davis-Besse. There is no metal-enclosed bus within the license renewal evaluation boundary at Davis-Besse.
3.6.1-10	Metal-enclosed bus – Enclosure Assemblies	Hardening and loss of strength due to elastomer degradation	Structures Monitoring Program	No	Not applicable to Davis-Besse. There is no metal-enclosed bus within the license renewal evaluation boundary at Davis-Besse.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-11	High-Voltage Insulators	Degradation of insulation quality due to the presence of any salt deposits and surface contamination; Loss of material caused by mechanical wear due to wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Degradation of insulator quality due to the deposition of contaminants on the insulator surface is not an applicable aging effect at Davis-Besse. Further evaluation is documented in Section 3.6.2.2.2.
3.6.1-12	Transmission conductors and connections; Switchyard bus and connections	Loss of material due to wind-induced abrasion and fatigue; Loss of conductor strength due to corrosion, increased resistance of connection due to oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes, plant-specific	No aging effects are identified as requiring aging management. Further evaluation is documented in Section 3.6.2.2.3.

Table 3.6.1 Summary of Aging Management Programs for Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-13	Cable connections – Metallic parts	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	No	Consistent with NUREG-1801, with exceptions. See Appendix B Section B.2.11 for details regarding this AMP.
3.6.1-14	Fuse Holders (Not Part of a Larger Assembly) – Insulation Material	None	None	N/A – No AEM or AMP	Consistent with NUREG-1801.

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
1	Cable Connections (metallic parts)	Conduct electricity	Various Metals (used for electrical contact)	Air-indoor uncontrolled and Air-outdoor	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Inspection	VI.A-1	3.6.1-13	B

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
2	Non-Environmentally Qualified Insulated Cables and Connections	Conduct electricity	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (thermal/ thermoxidative) radiolysis and photolysis (UV-sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	VI.A-2	3.6.1-02	A

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
3	Non-Environmentally Qualified Sensitive, High-Voltage, Low-Level Signal Instrument Cables and Connections	Conduct electricity	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (thermal/ thermoxidative) radiolysis and photolysis (UV-sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits	VI.A-3	3.6.1-03	A

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
4	Non-Environmentally Qualified Medium-Voltage Power Cables	Conduct electricity	Various Organic Polymers	Adverse localized environment caused by exposure to moisture and voltage	Localized damage and breakdown of insulation leading to electrical failure / moisture intrusion, water trees	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements	VI.A-4	3.6.1-04	A
5	Cable Connections (metallic parts)	Conduct electricity	Various Metals	Air with borated water leakage	Corrosion of connector surfaces / intrusion of borated water	Boric Acid Corrosion	VI.A-5	3.6.1-05	A

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
6	Fuse Holders (insulation)	Insulation (and support)	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (thermal/ thermoxidative) radiolysis and photolysis (UV-sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	VI.A-6	3.6.1-02	A

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	Fuse Holders (insulation)	Insulation (and support)	Various Organic Polymers	Air-indoor uncontrolled	None	None	VI.A-7	3.6.1-14	A
8	High-Voltage Insulators	Insulation (and support)	Porcelain, Malleable Iron, Galvanized Metal, Cement	Air-outdoor	None	None	VI.A-9	3.6.1-11	I 0601
9	High-Voltage Insulators	Insulation (and support)	Porcelain, Malleable Iron, Galvanized Metal, Cement	Air-outdoor	None	None	VI.A-10	3.6.1-11	I 0602
10	Switchyard Bus and Connections	Conduct electricity	Aluminum, Galvanized Steel	Air-outdoor	None	None	VI.A-15	3.6.1-12	I 0603
11	Transmission Conductors and Connections	Conduct electricity	Aluminum, Galvanized Steel, Stainless Steel	Air-outdoor	None	None	VI.A-16	3.6.1-12	I 0604

Table 3.6.2-1 Aging Management Review Results - Electrical Component Commodity Groups

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
12	Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements	Conduct electricity	Various organic polymers and metallic materials	Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage	Various degradations / various mechanisms	TLAA	VI.B-1	3.6.1-01	A

Generic Notes:	
A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes:	
0601	Degradation of insulator quality due to the deposition of contaminants on the insulator surface is not an applicable aging effect for Davis-Besse. See Section 3.6.2.2.2 for evaluation.
0602	Loss of material due to wear is not an applicable aging effect for the in-scope high-voltage insulators at Davis-Besse. See Section 3.6.2.2.2 for evaluation.
0603	For the switchyard bus and connections, no aging effects are identified that require aging management - refer to Section 3.6.2.2.3 for evaluation. An aging management program is not required for the switchyard bus and connections that are within the scope of license renewal.
0604	The transmission conductors within the license renewal scope are those that connect Start-up transformers 01 and 02 to circuits in the plant switchyard. These segments of transmission conductor and associated connections do not exhibit significant aging mechanisms or effects. An aging management program is not required for the segment of transmission conductor that is within the scope of license renewal. See Section 3.6.2.2.3 for details.

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4.0 TIME-LIMITED AGING ANALYSES

The License Renewal Rule, 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," governs the issuance of renewed operating licenses for nuclear power plants and includes requirements for the performance of an integrated plant assessment and for the review of time-limited aging analyses (TLAAs). The results of the integrated plant assessment and TLAA evaluations form the technical bases upon which the License Renewal Application for Davis-Besse Nuclear Power Station, Unit 1 (Davis-Besse) is built.

10 CFR 54.21(c) requires a list of TLAAs as part of the application for a renewed license. 10 CFR 54.21(c)(2) requires a list of current exemptions to 10 CFR Part 50 based on time-limited aging analyses as part of the application for a renewed license.

§54.21 Contents of application -- technical information.

(c) An evaluation of time-limited aging analyses.

1. *A list of time-limited aging analyses, as defined in §54.3, must be provided. The applicant shall demonstrate that -*
   - *(i) The analyses remain valid for the period of extended operation;*
   - *(ii) The analyses have been projected to the end of the period of extended operation; or*
   - *(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.*
2. *A list must be provided of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on time-limited aging analyses as defined in §54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.*

This section (Section 4) describes the TLAAs and Exemptions applicable to Davis-Besse in accordance with 10 CFR 54.

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4.1 TIME-LIMITED AGING ANALYSES AND EXEMPTIONS

4.1.1 TIME-LIMITED AGING ANALYSES

Time-limited aging analyses (TLAAs) are defined in 10 CFR 54.3 as those licensee calculations and analyses that:

(1) Involve systems, structures, and components within the scope of license renewal, as delineated in §54.4(a);

(2) Consider the effects of aging;

(3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;

(4) Were determined to be relevant by the licensee in making a safety determination;

(5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in §54.4(b); and

(6) Are contained or incorporated by reference in the CLB.

The major emphasis in the License Renewal Rule (10 CFR 54) is that the current licensing basis (CLB) must be maintained during the period of extended operation. By definition, TLAAs are contained or incorporated by reference in the CLB. Therefore, the documentation that describes the CLB at Davis-Besse was searched to identify TLAAs.

The CLB documentation searched to identify potential TLAAs includes the following:

- Updated Safety Analysis Report (USAR)
- Fire Hazards Analysis Report (incorporated by reference in the USAR)
- Quality Assurance program
- In-Service Inspection program
- In-Service Testing program
- Operating License (including Technical Specifications)
- Exemptions and Inspection Relief Requests
- Docketed Licensing Correspondence
- Design Calculations and Reports (incorporated in the CLB, e.g., by reference)

Industry documents that list generic TLAAs were also consulted to ensure the completeness of the plant-specific evaluations. These documents include:

- NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," Revision 1
- NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR 54 – The License Renewal Rule," Revision 6
- EPRI Report TR-105090, "Guidelines to Implement the License Renewal Technical Requirements of 10 CFR 54 for Integrated Plant Assessments and Time-Limited Aging Analyses" [Reference 4.8-9]
- License renewal applications for Babcock & Wilcox (B&W) pressurized water reactor (PWR) designs and those other PWR designs which utilize B&W reactor vessels, and the associated safety evaluation reports
- Recent license renewal applications for PWRs

Table 4.1-1 provides a summary listing of the Davis-Besse TLAAs along with reference to the section where each TLAA is reviewed.

Table 4.1-2 provides a summary of the results of a review of potential TLAAs identified in NUREG-1800 Tables 4.1-2 and 4.1-3, and identifies the section where each TLAA is reviewed, if applicable.

4.1.2 EXEMPTIONS

In order to identify exemptions in effect for Davis-Besse, a keyword search was conducted of the following documents:

- USAR
- Fire Hazards Analysis Report
- Operating License (including Technical Specifications)
- Initial Davis-Besse Safety Evaluation Report (NUREG-1036, including Supplement 1)
- Docketed Licensing Correspondence

This review involved a search to identify exemptions that were granted pursuant to 10 CFR 50.12, as well as those related to 10 CFR 50 Appendix R. The search criteria utilized key words and phrases, including: "50.12," "deviation," "exception," "exempt," "exemption," and "relief request". As a result of the review, there were no exemptions identified as granted pursuant to 10 CFR 50.12 and in effect that are based on a TLAA.

Table 4.1-1 Time-Limited Aging Analyses

Results of TLAA Evaluation by Category	54.21(c)(1) Paragraph	LRA Section
Reactor Vessel Neutron Embrittlement		4.2
Neutron Fluence	Not a TLAA	4.2.1
Upper-Shelf Energy	(ii)	4.2.2
Pressurized Thermal Shock	(ii)	4.2.3
Pressure-Temperature Limits	(iii)	4.2.4
Low Temperature Overpressure Protection Limits	(iii)	4.2.5
Intergranular Separation (Underclad Cracking) – reactor vessel shell	(ii)	4.2.6
Intergranular Separation (Underclad Cracking) – reactor vessel head	Not a TLAA	4.2.6
Reduction in Fracture Toughness of Reactor Vessel Internals	(iii)	4.2.7
Metal Fatigue		4.3
Class 1 Fatigue		4.3.2
Reactor Vessel	(iii)	4.3.2.2.1
Reactor Vessel internals – low cycle fatigue	(iii)	4.3.2.2.2.1
Reactor Vessel internals – flow induced vibration	(i)	4.3.2.2.2.2
Incore Instrumentation Nozzles and Surveillance Capsule Holder Tubes – flow induced vibration	(ii)	4.3.2.2.2.3
Control rod drive housings	(iii)	4.3.2.2.3
Reactor coolant pump casings	(iii)	4.3.2.2.4
Pressurizer	(iii)	4.3.2.2.5
Once Through Steam Generators (OTSGs)	(iii)	4.3.2.2.6.1
OTSGs tube sleeves	(i)	4.3.2.2.6.2
OTSGs AFW modification	(iii)	4.3.2.2.6.3
OTSGs tubes and tube stabilizers – flow induced vibration	(ii)	4.3.2.2.6.4
Class 1 piping	(iii)	4.3.2.3.1
Class 1 valves	Not a TLAA	4.3.2.3.2
High Energy Line Break Postulations	(iii)	4.3.2.3.3

Table 4.1-1 Time-Limited Aging Analyses (continued)

Results of TLAA Evaluation by Category	54.21(c)(1) Paragraph	LRA Section
Non-class 1 Fatigue		4.3.3
Non-class 1 Piping and In-Line Components	(i)	4.3.3.1
Non-class 1 Major Components	Not a TLAA	4.3.3.2
Effects of reactor water environment on fatigue	(iii)	4.3.4
Environmental Qualification of Electrical Equipment	(iii)	4.4
Concrete Containment Tendon Prestress	Not a TLAA	4.5
Containment Fatigue		4.6
Containment Vessel	(i)	4.6.1
Containment Penetrations	Not a TLAA	4.6.2
Permanent Reactor Cavity Seal Plate (also known as Permanent Canal Seal Plate (PCSP))	(iii)	4.6.3
Other Plant-Specific Time-Limited Aging Analyses		4.7
Leak-Before-Break	(iii)	4.7.1
Metal Corrosion Allowance for Pressurizer Instrument Nozzles	(ii)	4.7.2
Reactor Vessel Thermal Shock due to Borated Water Storage Tank water injection	(ii)	4.7.3
High Pressure Injection / Makeup Nozzle Thermal Sleeves – life prediction	(iii)	4.7.4
RCS Loop 1 Cold Leg drain line weld overlay repair	(iii)	4.7.5.1
OTSG 1-2 flaw evaluations	(iii)	4.7.5.2

Table 4.1-2 Review of Generic TLAAs Listed in NUREG-1800

NUREG-1800 Generic TLAAs	Applicable to Davis-Besse (Y/N?)	LRA Section
NUREG-1800, Table 4.1-2		
Reactor vessel neutron embrittlement	Yes	4.2
Concrete containment tendon prestress	No – Davis-Besse does not have pre-stressed containment tendons	4.5
Metal fatigue	Yes	4.3
Environmental qualification of electrical equipment	Yes	4.4
Metal corrosion allowance	Yes	4.7.2
Inservice flaw growth analyses that demonstrate structure stability for 40 years	Yes	4.7.5
Inservice local metal containment corrosion analyses	No – No TLAA identified	--
High-energy line-break postulation based on fatigue cumulative usage factor	Yes	4.3.2.3.3
NUREG-1800, Table 4.1-3		
Intergranular separation in the heat-affected zone (HAZ) of reactor vessel low-alloy steel under austenitic stainless steel cladding	Yes	4.2.6
Low-temperature overpressure protection (LTOP) analyses	Yes	4.2.5
Fatigue analysis for the main steam supply lines to the turbine-driven auxiliary feedwater pump turbines	Yes	4.3.3.1
Fatigue analysis of the reactor coolant pump flywheels	No – No TLAA identified	--
Fatigue analysis of the polar crane	No – No TLAA identified	--
Flow-induced vibration endurance limit for the reactor vessel internals	Yes	4.3.2.2.2
Transient cycle count assumptions for the reactor vessel internals	Yes	4.3.2.2.2
Ductility reduction of fracture toughness for the reactor vessel internals	Yes	4.2.7
Leak-Before-Break	Yes	4.7.1
Fatigue analysis for the containment liner plate	No – Davis-Besse does not have a containment liner plate	--
Containment penetration pressurization cycles	No – No TLAA identified	4.6
Reactor vessel circumferential weld inspection relief (BWR)	No – Davis-Besse is a PWR.	--

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4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

Neutron embrittlement is the term used to describe changes in mechanical properties of reactor vessel materials that result from exposure to fast neutron flux, energy greater than 1.0 million electron volts (E > 1.0 MeV), within the vicinity of the reactor core, called the beltline region. The most pronounced material change is a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases. The rate of neutron exposure is neutron flux ($n/cm^2/sec$) and the cumulative neutron exposure over time is neutron fluence (n/cm^2).

Fracture toughness can be expressed in terms of the reference temperature for nil-ductility transition (RT_{NDT}). RT_{NDT} is the temperature above which the material behaves in a ductile manner and below which the material behaves in a brittle manner. As fluence increases, RT_{NDT} increases. This means higher temperatures are required for the material to continue to act in a ductile manner. Determining the projected reduction in fracture toughness as a function of fluence affects the following analyses used to support the operation of Davis-Besse:

- Neutron Fluence
- Upper-Shelf Energy
- Pressurized Thermal Shock
- Pressure-Temperature Limits
- Low-Temperature Overpressure Protection Limits
- Intergranular Separation (Underclad Cracking)
- Reduction in Fracture Toughness of Reactor Vessel Internals

These analyses include time dependent parameters that must be investigated with respect to the fracture toughness of Davis-Besse reactor vessel materials. USAR Table 5.2-15 gives the properties of reactor vessel materials, including identification of the beltline materials.

10 CFR 50.60 requires that fracture toughness and material surveillance program requirements for the reactor coolant pressure boundary be satisfied in accordance with 10 CFR 50, Appendix G and Appendix H. 10 CFR 50, Appendix G specifies upper-shelf energy and pressure-temperature limits that account for neutron irradiation effects for the life of the plant. 10 CFR 50, Appendix H requires a reactor vessel material surveillance program; the Reactor Vessel Surveillance Program is discussed in Appendix B.

The following sections address reactor vessel embrittlement analyses, and related topics, for extended operation of the plant. The data differs somewhat from the information currently in the NRC's Reactor Vessel Integrity Database (RVID2). This later data have either been previously submitted to the NRC, or are submitted herein, as described in the subsections below.

4.2.1 NEUTRON FLUENCE

4.2.1.1 Effective Full Power Years (EFPY) Projection

End-of-life fluence is based on a projected value of EFPY over the licensed life of the plant. For the current term of operation, end-of-life for Davis-Besse is 40 years and reactor vessel embrittlement calculations are based on fluence projections at 32 EFPY. The Davis-Besse operating license was issued in April 22, 1977 and the plant lifetime capacity factor through April 2006 is 0.622. The plant capacity factor between 2006 and 2008 is ~0.90. Assuming a plant capacity factor of 98.5% beyond 2008, Davis-Besse is expected to conservatively accrue approximately 50.3 EFPY by April 22, 2037. Therefore, projection of fluence based on 52 EFPY at 60 years is conservative for the period of extended operation for Davis-Besse. In 1977 Davis-Besse was licensed for a maximum thermal power of 2772 MWt. In 2008 the maximum thermal power was increased to 2817 MWt through a measurement uncertainty recapture power uprate. However, calculation of EFPY is independent of plant maximum thermal power.

4.2.1.2 Fluence Projection

The fluence analysis methodology from BAW-2241P-A [Reference 4.8-6] was used to calculate the fast neutron fluence (E > 1.0 MeV) of the reactor vessel welds and forgings of interest. The fast neutron fluence at each location was calculated in accordance with the requirements of U.S. Nuclear Regulatory Guide 1.190.

Fluence results were calculated for Cycles 13-14 irradiation using a computer model that extends from below the core to the vessel mating surface. The sum of the end of cycle (EOC) 12 and Cycles 13-14 fluence results in the EOC 14 cumulative fluence. This data was benchmarked against cavity dosimetry data for Cycles 13-14. To extrapolate the fluence values to end of life, Cycle 15 design information was utilized to develop flux projections at each location. These Cycle 15 flux values were used to extrapolate the EOC 14 fluence to 52 EFPY assuming 100% power at 2,817 MWt and a partial low leakage core design whereby High Thermal Performance fuel assemblies (a total of 12) were introduced on the periphery.

A summary of all inner surface fluence values over 1E+17 n/cm^2 at 52 EFPY for the Davis-Besse reactor vessel is shown in Table 4.2-1.

4.2.1.3 Beltline Evaluation

10 CFR 50.61 defines the reactor vessel beltline as the region of the reactor vessel (shell materials including welds, heat affected zones, and plates or forgings) that directly surrounds the effective height of the active core and adjacent regions of the reactor vessel that are predicted to experience sufficient neutron radiation damage to be considered in the selection of the most controlling material with regard to radiation damage. 10 CFR 50, Appendix G, Section II.F identifies the beltline as the regions of the reactor vessel "that are predicted to experience sufficient neutron radiation damage to be considered in the selection of the most controlling material with regard to radiation damage."

The Davis-Besse beltline for the first 40 years of operation includes the nozzle belt forging (ADB 203), the nozzle belt forging to upper shell forging circumferential weld (WF-232/233), the upper shell forging (AKJ 233), the upper shell forging to lower shell forging circumferential weld (WF-182-1), and the lower shell forging (BCC 241).

For the period of extended operation, the beltline will include all items with 52 EFPY surface fluence greater than 1.0E+17 n/cm^2, as shown in Table 4.2-1. Upper-shelf energy (USE), reference temperature for pressurized thermal shock (RT_{PTS}) and adjusted reference temperature (ART) values are provided in Table 4.2-2, Table 4.2-3, and Table 4.2-4. The limiting weld with regard to USE, ART, and RT_{PTS} is the upper shell to lower shell weld, WF-182-1, as was the case at 40 years. The limiting forging with regard to ART and RT_{PTS} is lower shell forging BCC 241 as was the case at 40 years. Both of these materials are included in the Reactor Vessel Surveillance Vessel Program and no additional materials are required for irradiation and testing.

Disposition:	Not a TLAA	Neutron fluence is an assumption used in various neutron embrittlement TLAAs evaluated below.

Table 4.2-1 Fluence Values at 52 EFPY

	Reactor Vessel Location	Material ID. / (Heat Number)	52 EFPY Peak Fluence (inside wetted surface unless otherwise noted) (n/cm^2) (E>1MeV)
Forgings -Top to Bottom of Reactor Vessel			
1	Reactor Vessel Closure Flange Forging	NA	2.57E+16[1]
2	Reactor Vessel Inlet Nozzle Forgings	BSS 270 / (A13315)	1.17E+17
3	Reactor Vessel Outlet Nozzle Forgings	ATS 239 / (2V1520)	2.30E+17
4	Nozzle Belt Forging	ADB 203 / (123Y317)	2.29E+18
5	Upper Shell Forging	AKJ 233 / (123X244)	1.69E+19
6	Lower Shell Forging	BCC 241 / (5P4086)	1.70E+19
7	Dutchman Forging	122Y384VA1 / (122Y384VA1)	2.33E+17
8	Lower Head	NA	3.86E+16[2]
Welds -Top to Bottom of Reactor Vessel			
9	Reactor Vessel Flange to Nozzle Belt Forging Circumferential Weld	NA	2.57E+16[1]
10	Nozzle Belt Forging to Bottom of Reactor Vessel Inlet Nozzle Forging	WF-233 / WF-232 (T29744 / 8T3914)	1.17E+17
11	Nozzle Belt Forging to Bottom of Reactor Vessel Outlet Nozzle Forging	WF-233 (T29744)	2.30E+17
12	Nozzle Belt Forging to Upper Shell Forging Circumferential Weld (Inside 9%), Outside 91% is WF-233	WF-232 (9%) / (8T3914) WF-233 (91%) / (T29744)	2.29E+18
13	Upper Shell Forging to Lower Shell Forging Circumferential Weld	WF-182-1 / (821T44)	1.69E+19
14	Lower Shell Forging to Dutchman Forging Circumferential Weld (inside 12%), Outside 88% is WF-233	WF-232 (12%) / (8T3914) WF-233 (88%) / (T29744)	2.33E+17
15	Dutchman Forging to Lower Head Circumferential Weld	WF-182 / (821T44)	3.86E16[2]

[1] Peak fluence is located at the outer diameter of the reactor vessel at this location. Location is conservatively chosen as nozzle belt forging (NBF) to top of inlet nozzle forging weld.

[2] Peak fluence is located at the outer diameter of the reactor vessel at this location. Location is conservatively chosen as the dutchman to lower head weld.

4.2.2 UPPER-SHELF ENERGY

4.2.2.1 Background

10 CFR 50 Appendix G requires the USE of the reactor vessel beltline materials to be no less than 50 ft-lb at all times during plant operation, including the effects of neutron radiation. If USE cannot be shown to remain above this limit, then an equivalent margin analysis must be performed to show that the margins of safety against fracture are equivalent to those required by Appendix G of ASME Section XI.

Initial (unirradiated) USE values for the Davis-Besse reactor vessel base metal are recorded in USAR Table 5.2-15. As no initial USE is available for the beltline welds (Linde80 welds), operation for 32 EFPY was justified based on an equivalent margins analysis (fracture mechanics analysis) [References 4.8-2 and 4.8-3].

USE was re-evaluated for the measurement uncertainty recapture power uprate [Reference 4.8-3]. An equivalent margin analysis was performed for the controlling weld, WF-182-1. The equivalent margin analysis demonstrated that the controlling reactor vessel beltline weld satisfies the acceptance criteria of ASME Section XI, Appendix K. An equivalent margin analysis was not required for the reactor vessel beltline forging materials since all applicable materials were predicted to have upper-shelf Charpy energy levels in excess of 50 ft-lb at 32 EFPY.

4.2.2.2 USE Projections

For license renewal, the initial USE values are projected to 52 EFPY using Regulatory Guide 1.99, Revision 2, Position 1.2. Position 2.2, use of surveillance data, was also used for weld WF-182-1 and lower shell forging BCC 241. Note that since there is only one capsule that has been tested that includes upper shell forging (AKJ 233), there is insufficient data to conduct surveillance data credibility assessments relative to Regulatory Guide 1.99, Revision 2 for forging AKJ 233. Fluence is from Table 4.2-1. All locations are above 50 ft-lb with the exception of weld WF-182-1. The predicted USE is conservatively calculated based on a ¼ T fluence of 1.0E+18 n/cm^2 (the lowest fluence in Regulatory Guide 1.99, Revision 2, Figure 2), for the RV inlet nozzle forging and attachment weld, RV outlet nozzle forging and attachment weld, and dutchman forging and weld that connects the lower shell forging to the dutchman forging. The results are presented in Table 4.2-2.

4.2.2.3 Equivalent Margins Analyses

The limiting Davis-Besse reactor vessel beltline weld WF-182-1 is the only 60-year (52 EFPY) beltline location with a projected Charpy impact energy level below 50 ft-lbs. The fracture mechanics evaluation of weld WF-182-1 at Davis-Besse was extended from 40-years (32 EFPY) to 60-years (52 EFPY) based on the projected 52 EFPY neutron fluence values. The analysis demonstrates that the limiting reactor vessel beltline weld at Davis-Besse satisfies the ASME Code requirements of Appendix K for ductile flaw extensions and tensile stability using projected upper-shelf Charpy impact energy levels for the weld material at 52 EFPY.

The 52 EFPY fracture mechanics analysis addresses ASME Levels A, B, C, and D Service Loadings and is performed using the procedures and acceptance criteria in Appendix K to Section XI of the ASME Code. Levels C and D Service Loadings are evaluated using the one-dimensional, finite element, thermal and stress models and linear elastic fracture mechanics methodology of the PCRIT computer code to determine stress intensity factors for a worst case pressurized thermal shock transient.

In order to extend the 32 EFPY analysis to 52 EFPY, the calculations that are time dependent were identified and updated accordingly. It was confirmed that the analytical methodology and applied loadings have not changed. Key points of the analysis are summarized below.

> Initial RT_{NDT} was revised from +2 ºF to -80.2 ºF and margin from +56 ºF to +59 ºF (Revised initial RT_{NDT} and margins for weld WF-182-1 were obtained from BAW-2308, Revision 1-A)[1]. All other mechanical properties are unchanged. The ASME transition region fracture toughness curve K_{Ic}, used to define the beginning of the upper-shelf toughness region, is indexed by the initial RT_{NDT} of the weld material. The existing transition region fracture toughness curve evaluation is conservative for 52 EFPY since the initial RT_{NDT} has decreased.

> Projected inside surface fluence at 52 EFPY has increased, affecting the J-integral resistance of the material. Fluence at the crack tip is determined using the attenuation equation from Regulatory Guide 1.99, Revision 2.

The Hot Leg Large Break Loss of Coolant Accident (LOCA) is the limiting transient at 32 EFPY and 52 EFPY since it most closely approaches the KJc limit of the weld. In the upper-shelf toughness range, the KI curve is closest to the lower bound KJc curve at 5.60 minutes into the transient. This time is selected as the critical time in the transient at which to perform the flaw evaluation for Levels C and D Service Loadings.

Summary of Results for Level A, B, C and D Service Loadings at 52 EFPY

Evidence that the ASME Code, Section XI, Appendix K acceptance criteria have been satisfied for Levels A and B Service Loadings is provided by the following:

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[1] FENOC submitted a request (FENOC Letter L-09-225 [Reference 4.8-16]) for exemption to use an alternate method, as described in approved-topical report BAW-2308, Revision 1-A, for determining initial RT_{NDT} values of the Linde 80 weld materials present in the beltline region of the Davis-Besse reactor pressure vessel.

(1) With factors of safety of 1.15 on pressure and 1.0 on thermal loading, the applied *J*-integral (J_1) is less than the *J*-integral of the material at a ductile flaw extension of 0.10 in. ($J_{0.1}$). The ratio $J_{0.1}/J_1$ = 3.69 which is significantly greater than the required value of 1.0.

(2) With factors of safety of 1.25 on pressure and 1.0 on thermal loading, flaw extensions are ductile and stable since the slope of the applied *J*-integral curve is less than the slope of the lower bound *J-R* curve at the point where the two curves intersect.

Evidence that the ASME Code, Section XI, Appendix K acceptance criteria have been satisfied for Levels C and D Service Loadings is provided by the following:

(1) With a factor of safety of 1.0 on loading, the applied *J*-integral (J_1) is less than the *J*-integral of the material at a ductile flaw extension of 0.10 in. ($J_{0.1}$). The ratio $J_{0.1}/J_1$ = 2.16, which is significantly greater than the required value of 1.0.

(2) With a factor of safety of 1.0 on loading, flaw extensions are ductile and stable since the slope of the applied *J*-integral curve is less than the slopes of both the lower bound and mean *J-R* curves at the points of intersection.

(3) Flaw growth is stable at much less than 75% of the vessel wall thickness. It has also been shown that the remaining ligament is sufficient to preclude tensile instability by a large margin.

The limiting reactor vessel beltline weld at Davis-Besse satisfies the ASME Code requirements of Appendix K for ductile flaw extensions and tensile stability using projected upper-shelf Charpy impact energy levels for the weld material at 32 EFPY and 52 EFPY.

Disposition: 10 CFR 54.21(c)(1)(ii) Reactor vessel USE and equivalent margin analyses have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Table 4.2-2 USE Values at 52 EFPY for Davis-Besse Reactor Vessel Beltline Materials

(RG 1.99 Position 1.2, Unless Otherwise Noted)

Item	Material Type	Material ID.	USE @ 52 EFPY at ¼T, ft-lbs	¼T Neutron Fluence, n/cm^2, E>1MeV	Unirradiated USE, ft-lbs	% Drop in USE @ EOL 1/4T	Cu, %
Reactor Vessel Forgings							
Reactor Vessel Inlet Nozzle Forgings	A508-2	BSS 270	51.2	1.00E+18[1]	61.5	16.8	0.20
Reactor Vessel Outlet Nozzle Forgings	A508-2	ATS 239	64.6	1.00E+18[1]	75.5	14.5	0.16
Nozzle Belt Forging	A508-2	ADB 203	123.2	1.34E+18	134	8.1	0.04
Upper Shell Forging	A508-2	AKJ 233	125.3	9.87E+18	144	13	0.04
Lower Shell Forging	A508-2	BCC 241	105	9.93E+18	118	11	0.02
			95.6[2]	9.93E+18	118	19.0[2]	0.02
Dutchman Forging	A508-2	122Y384VA1	96.4	1.00E+18[1]	109	11.6	0.11
Reactor Vessel Welds							
Nozzle Belt Forging to Bottom of Reactor Vessel Inlet Nozzle Forging	Linde 80	WF-233 / 232	55.8	1.00E+18[1]	70	20.3	0.21
Nozzle Belt Forging to Bottom of Reactor Vessel Outlet Nozzle Forging	Linde 80	WF-233	55.8	1.00E+18[1]	70	20.3	0.21
Nozzle Belt Forging to Upper Shell Forging Circumferential Weld (inner 9%)	Linde 80	WF-232	NA[3]	NA[3]	70	NA[3]	0.18
Nozzle Belt Forging to Upper Shell Forging Circumferential Weld (outer 91%)	Linde 80	WF-233	54.8	1.34E+18	70	21.7	0.21
Upper Shell Forging to Lower Shell Forging Circumferential Weld	Linde 80	WF-182-1	43.5 43.4[2]	9.87E+18 9.87E+18	70 70	37.9 38.0[2]	0.24 0.24
Lower Shell Forging to Dutchman Forging Circumferential Weld (inner 12%)	Linde 80	WF-232	NA[3]	NA[3]	70	NA[3]	0.18
Lower Shell Forging to Dutchman Forging Circumferential Weld (outer 88%)	Linde 80	WF-233	55.8	1.00E+18[1]	70	20.3	0.21

1 In accordance with Regulatory Guide 1.99, Revision 2, Figure 2, the lowest 1/4T fluence is 1E+18 n/cm^2. The predicted USE is conservatively calculated based on a fluence of 1E+18 n/cm^2 for this material, which is higher than the projected peak fluence at 52 EFPY for this location (see Table 4.2-4).

2 Regulatory Guide 1.99 Position 2.2, Use of Surveillance data

3 Location does not extend to 1/4T

4.2.3 PRESSURIZED THERMAL SHOCK

10 CFR 50.61(a)(2) defines pressurized thermal shock (PTS) as an event or transient in a pressurized water reactor causing severe overcooling (thermal shock) concurrent with or followed by significant pressure in the reactor vessel. 10 CFR 50.61(b)(2) defines screening criteria for embrittlement of reactor vessel materials in pressurized water reactors, and required actions if the screening criteria are exceeded. The screening criteria are based on the RT_{PTS}. The screening criterion for circumferential welds is 300°F maximum, and the screening criterion for forgings is 270°F maximum. If the projected RT_{PTS} values remain below the applicable screening temperature, no corrective action is required.

For license renewal, a 52 EFPY RT_{PTS} evaluation was performed for the reactor vessel beltline materials. In accordance with 10 CFR 50.61, RT_{PTS} values were calculated by adding the initial RT_{NDT} to the predicted radiation-induced ΔRT_{NDT} plus a margin to cover uncertainties, as prescribed by Regulatory Guide 1.99 Revision 2, "Radiation Embrittlement of Reactor Vessel Materials". The predicted radiation induced ΔRT_{NDT} was calculated using the 52 EFPY neutron fluence at the clad-low alloy steel interface. Table 4.2-3 includes 52 EFPY RT_{PTS} values for all 60-year beltline materials using Position 1.1. Surveillance data was not used since there are not two credible sets of RT_{PTS} surveillance data for any Davis-Besse location. Initial RT_{NDT} and margins for welds WF-182-1 and WF-232 (Nozzle Belt Forging to Upper Shell Forging Circumferential Weld) were obtained from BAW-2308, Revision 1-A [Reference 4.8-14][2]. Using Regulatory Guide 1.99 Revision 2, Table 1, the Chemistry Factor for weld WF-232 is 157.3. However, when initial RT_{NDT} values from BAW-2308, Revision 1-A are used, the Chemistry Factor cannot be less than 167.0. Thus the Chemistry Factor shown in Table 4.2-3 for weld WF-232 is 167.0.

All RT_{PTS} values are below the screening criteria at 60 years. The beltline weld WF-182-1 is the limiting material relative to RT_{PTS}.

Disposition: 10 CFR 54.21(c)(1)(ii) Reactor vessel RT_{PTS} TLAAs have been projected to the end of the period of extended operation.

[2] FENOC submitted a request (FENOC Letter L-09-225 [Reference 4.8-16]) for exemption to use an alternate method, as described in approved-topical report BAW-2308, Revision 1-A, for determining initial RT_{NDT} values of the Linde 80 weld materials present in the beltline region of the Davis-Besse reactor pressure vessel.

Table 4.2-3 RT_{PTS} Values for 52 EFPY for Davis-Besse Reactor Vessel Beltline Materials (RG 1.99 Position 1.1)

Item	Material ID.	RT_{PTS} / Acceptance Criterion, °F	Fluence at clad-low alloy steel interface, n/cm^2, E>1MeV	$RT_{NDT}(u)$, °F	ΔRT_{NDT}, °F	Fluence Factor	Chemistry Factor	Margin, °F	Copper (wt%)	Nickel (wt%)
Reactor Vessel Forgings										
Reactor Vessel Inlet Nozzle Forging	BSS 270	86.2 / 270	1.14E+17	3	18.5	0.120	154.5	64.7	0.20	0.71
Reactor Vessel Outlet Nozzle Forging	ATS 239	91.7 / 270	2.24E+17	3	22.7	0.184	123.0	66.0	0.16	0.80
Nozzle Belt Forging	ADB 203	81.2 / 270	2.27E+18	50	15.6	0.600	26.0	15.6	0.04	0.68
Upper Shell Forging	AKJ 233	79.4 / 270	1.68E+19	20	29.7	1.143	26.0	29.7	0.04	0.77
Lower Shell Forging	BCC 241	95.7 / 270	1.68E+19	50	22.9	1.143	20.0	22.9	0.02	0.81
Dutchman Forging	122Y384VA1	80.8 / 270	2.28E+17	3	14.2	0.186	76.1	63.6	0.11	0.74
Reactor Vessel Welds										
Nozzle Belt Forging to Bottom of Reactor Vessel Inlet Nozzle Forging	WF-233 / 232	60.1 / 270	1.14E+17	-5	20.6	0.120	172.3	44.5	0.21	0.65
Nozzle Belt Forging to Bottom of Reactor Vessel Outlet Nozzle Forging	WF-233	77.4 / 270	2.24E+17	-5	31.8	0.184	172.3	50.6	0.21	0.65
Nozzle Belt Forging to Upper Shell Forging Circumferential Weld (ID 9%)	WF-232	118.3 / 300	2.27E+18	-47.6[1]	100.2	0.600	167[1]	65.7[1]	0.18	0.62
Nozzle Belt Forging to Upper Shell Forging Circumferential Weld (OD 91%)	WF-233	NA[3]	NA[3]	-5	NA[3]	NA[3]	NA[3]	NA[3]	0.21	0.65
Upper Shell Forging to Lower Shell Forging Circumferential Weld	WF-182-1	182.2[2]/ 300	1.68E+19	-80.2[1]	203.4	1.143	178.0	59.0[1]	0.24	0.63
Lower Shell Forging to Dutchman Forging Circumferential Weld (ID 12%)	WF-232	73.4 / 300	2.28E+17	-5	29.3	0.186	157.3	49.1	0.18	0.62
Lower Shell Forging to Dutchman Forging Circumferential Weld (OD 88%)	WF-233	NA[3]	NA[3]	-5	NA[3]	NA[3]	NA[3]	NA[3]	0.21	0.65

[1] - Value based on BAW-2308 Rev. 1A
[2] - Limiting location
[3] - Location does not extend to the clad base interface

4.2.4 PRESSURE-TEMPERATURE LIMITS

10 CFR 50 Appendix G requires the establishment of pressure and temperature (P-T) limits for material fracture toughness requirements of the reactor coolant pressure boundary materials. Appendix G mandates the use of the ASME Section III, Appendix G to determine the stresses and fracture toughness at locations within the reactor coolant pressure boundary.

One measure of the fracture toughness of a material is the reference temperature for nil-ductility transition (RT_{NDT}). RT_{NDT} will increase with cumulative exposure to neutron irradiation resulting in an ART. This ART is used in the development of P-T limit curves.

Table 4.2-4 includes 52 EFPY ART at the 1/4T and 3/4T locations for all 60-year beltline materials using Regulatory Guide 1.99, Revision 2, Position 1.1. Minimum cladding thickness is 0.125 inches and the vessel low alloy steel thickness for the upper shell and lower shell forgings is 8.44 inches, 8.563 inches for the nozzle belt forging, and 12.0 inches for the inlet and outlet nozzle forgings. Using these vessel wall depths and the neutron fluence at the inner wetted surface of the vessel, the ¼T and ¾T fluence values for the Davis-Besse reactor vessel materials are calculated in accordance with Equation 1 of Regulatory Guide 1.99 Revision 2. Fluence values at the 1/4T and 3/4T locations for the RV inlet and outlet nozzle and associated welds that connect the nozzles to the nozzle belt forging were obtained by adding the attenuation from both the inside and outside surface. Position 2.1 was not used since two sets of credible ART surveillance data were not available. Initial RT_{NDT} and margins for weld WF-182-1 and WF-233 are obtained from BAW-2308, Revision 1-A [Reference 4.8-14].[3]

The current P-T limits, generated consistent with the requirements of 10 CFR 50 Appendix G and Regulatory Guide 1.99 Revision 2, are valid until 21 EFPY. A revised pressure and temperature limits report will be submitted to the NRC, in accordance with Technical Specification 5.6.4, before Davis-Besse operates beyond 21 EFPY, in accordance with the requirements of 10 CFR 50, Appendix G. The P-T limit curves, as contained in the pressure-temperature limit report and providing the information required by Technical Specification 5.6.4, will be updated as necessary through the period of extended operation as part of the Reactor Vessel Surveillance Program.

Disposition: 10 CFR 54.21(c)(1)(iii) Reactor vessel P-T limits will be managed, as part of the Reactor Vessel Surveillance Program for the period of extended operation.

[3] FENOC submitted a request (FENOC Letter L-09-225 [Reference 4.8-16]) for exemption to use an alternate method, as described in approved-topical report BAW-2308, Revision 1-A, for determining initial RT_{NDT} values of the Linde 80 weld materials present in the beltline region of the Davis-Besse reactor pressure vessel.

Table 4.2-4 ARTs at 52 EFPY for Davis-Besse Reactor Vessel Beltline Materials
(RG 1.99 Position 1.1)

Item	Material ID	ART, °F		Fluence n/cm² 10E18		$RT_{NDT(u)}$, °F	ΔRT_{NDT}, °F		Fluence Factor		Chem. Factor	Margin, °F		Cu %	Ni %
		¼T	¾ T	¼T	¾T		¼T	¾T	¼T	¾T		¼T	¾T		
Reactor Vessel Forgings															
Reactor Vessel Inlet Nozzle Forgings SA-580 Class 2	BSS 270	78.6	76.1	0.064	0.0494	3	12.4	10.3	0.080	0.066	154.5	63.2	62.8	0.20	0.71
Reactor Vessel Outlet Nozzle Forgings SA-580 Class 2	ATS 239	82.0	76.3	0.119	0.0688	3	15.1	10.4	0.123	0.084	123.0	63.8	62.9	0.16	0.80
Nozzle Belt Forging SA-580 Class 2	ADB 203	74.8	64.8	1.33	0.476	50	12.4	7.4	0.476	0.285	26.0	12.4	7.4	0.04	0.68
Upper Shell Forging SA-580 Class 2	AKJ 233	71.8	57.3	9.89	3.59	20	25.9	18.6	0.997	0.717	26.0	25.9	18.6	0.04	0.77
Lower Shell Forging SA 580 Class 2	BCC 241	89.9	78.8	9.94	3.61	50	20.0	14.4	0.998	0.719	20.0	20.0	14.4	0.02	0.81
Dutchman Forging SA-580 Class 2	122Y384VA1	76.1	70.3	0.136	0.0495	3	10.3	5.1	0.135	0.067	76.1	62.8	62.2	0.11	0.74
Reactor Vessel Welds															
Nozzle Belt Forging to Bottom of Reactor Vessel Inlet Nozzle Forging	WF-233 / 232	50.6	47.5	0.064	0.0494	-5	13.8	11.4	0.080	0.066	172.3	41.7	41.0	0.21	0.65
Nozzle Belt Forging to Bottom of Reactor Vessel Outlet Nozzle Forging	WF-233	61.0	51.6	0.119	0.0688	-5	21.2	14.6	0.123	0.084	172.3	44.7	42.0	0.21	0.65
Nozzle Belt Forging to Upper Shell Forging Circumferential Weld (ID 9%)	WF-232	NA[2]	NA[2]	NA[2]	NA[2]	-5	NA[2]	NA[2]	NA[2]	NA[2]	157.3	NA[2]	NA[2]	0.18	0.62
Nozzle Belt Forging to Upper Shell Forging Circumferential Weld (OD 91%)	WF-233	100.4	67.8	1.34	0.487	-47.6[1]	82.3	49.7	0.478	0.288	172.3	65.7[1]	65.7[1]	0.21	0.65
Upper Shell Forging to Lower Shell Forging Circumferential Weld	WF-182-1	156.2	106.4	9.89	3.59	-80.2[1]	177.4	127.6	0.997	0.717	178.0	59.0[1]	59.0[1]	0.24	0.63
Lower Shell Forging to Dutchman Forging Circumferential Weld (ID 12%)	WF-232	NA[2]	NA[2]	NA[2]	NA[2]	-5	NA[2]	NA[2]	NA[2]	NA[2]	157.3	NA[2]	NA[2]	0.18	0.62
Lower Shell Forging to Dutchman Forging Circumferential Weld (OD 88%)	WF-233	63.9	47.5	0.136	0.0495	-5	23.2	11.5	0.135	0.067	172.3	45.7	41.0	0.21	0.65

[1] - BAW-2308 Revision 1 A for initial RT_{NDT} and margin
[2] - Location does not extend to ¼ T or ¾ T.

4.2.5 LOW-TEMPERATURE OVERPRESSURE PROTECTION LIMITS

Appendix G of ASME Section XI establishes procedures and limits for Reactor Coolant System (RCS) pressure under low temperature conditions to provide protection against non-ductile failure of the reactor vessel.

Low-temperature overpressure protection (LTOP) is provided in two ways at Davis-Besse.

1. Administrative controls are used to assure protection within the existing pressure-temperature limits when the pressurizer power-operated relief valve and the safety valves are not providing over-pressure protection,
2. A relief valve in the Decay Heat Removal System suction piping is placed into service when the RCS temperature is below 280°F.

The current technical specifications for LTOP are valid through 21 EFPY. These technical specifications used an improved methodology to calculate LTOP limits in accordance with generically approved topical report BAW-10046A [Reference 4.8-8].

Maintaining the LTOP limits in accordance with Appendix G of ASME Section XI, as required by Appendix G of 10 CFR 50, assures that the effects of aging on the intended functions will be adequately managed for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(iii) LTOP limits will be managed, as part of the Reactor Vessel Surveillance Program, for the period of extended operation.

4.2.6 INTERGRANULAR SEPARATION (UNDERCLAD CRACKING)

Underclad cracking (UCC) refers to intergranular separation in the heat-affected zone of low-alloy steel under austenitic stainless steel cladding in SA-508, Class 2 reactor vessel forgings manufactured to a coarse grain practice, and clad by high-heat-input submerged arc processes. BAW-10013-A [Reference 4.8-7] contains a fracture mechanics analysis that demonstrates the critical crack size required to initiate fast fracture is several orders of magnitude greater than the assumed maximum flaw size plus predicted flaw growth due to design fatigue cycles. The flaw growth analysis was performed for a 40 year cyclic loading, and an end-of-life assessment of radiation embrittlement (i.e., fluence at 32 EFPY) was used to determine fracture toughness properties. The report concluded that the intergranular separations found in B&W vessels would not lead to vessel failure. This report was accepted by the Atomic Energy Commission.

In May 1973, the AEC issued Regulatory Guide 1.43, "Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components." The guide states that intergranular separation "has been reported only in forgings and plate material of SA-508 Class 2 composition made to coarse grain practice when clad using high-deposition-rate welding processes identified as ‘high-heat-input’ processes such as the submerged-arc wide-strip and the submerged-arc 6-wire processes. Cracking was not observed in clad SA-508 Class 2 materials clad by ‘low-heat-input’ processes controlled to minimize heating of the base metal. Further, cracking was not observed in clad SA-533 Grade B Class 1 plate material, which is produced to fine grain practice. Characteristically, the cracking occurs only in the grain-coarsened region of the base-metal heat-affected zone at the weld bead overlap." The guide also notes that the maximum observed dimensions of these subsurface cracks is 0.5 inch x 0.165 inch.

The methodology used to evaluate intergranular separations in the Davis-Besse SA-508 Class 2 forgings is consistent with the methodology reported in the update of BAW-10013 included as Appendix C of BAW-2251A [Reference 4.8-15]. The Davis-Besse specific analysis was performed for 60-years using the current fracture toughness information, applied stress intensity factor solutions, and fatigue crack growth correlations for SA-508 Class 2 material.

The analysis was applied to two relevant regions of the RV: the beltline and the nozzle belt. Both axial and circumferential oriented flaws were considered in the evaluation; however, the detailed flaw evaluation was only performed for the bounding axially oriented flaws. All the significant normal and upset condition transients and emergency and faulted condition transients were evaluated in the analysis. The fatigue crack growth analysis considered all the normal and upset condition transients with associated 60-year projected cycles for the period of extended operation.

As provided in Confirmatory Action Letter, Number 3-10-001, FENOC has voluntarily committed to shutdown the Davis-Besse plant no later than October 1, 2011, and replace the RV closure head. Therefore, the current head (purchased from the Midland Plant and installed during the Cycle 13 refueling outage) is not considered in the underclad cracking evaluation. The replacement RV closure head/head flange, to be installed during the October 2011 outage, was fabricated using SA-508 Class 3 material, which is not susceptible to intergranular separations. Therefore, this replacement closure head/head flange is not considered in the underclad cracking evaluation.

An axially oriented, semi-elliptical surface flaw with an initial flaw size of 0.353-inch deep (approximately twice that which has been observed) and 2.12-inch long (approximately four times that which has been observed) with a 6:1 aspect ratio was conservatively assumed at each of the two regions. This is contrasted to the observed flaws which are subsurface with a maximum size of 0.165 inch deep by 0.5 inch long.

For an axially oriented flaw, the limiting location for satisfying the requirements of IWB-3612 is at the lower end of the nozzle belt forging where the thickness transitions from 8.438 to 12.0 inches. The maximum crack growth, considering normal/upset condition transients with associated 60-year projected cycles for the period of extended operation was determined to be 0.043 inches, which results in a final flaw depth of 0.396 inches. The maximum applied stress intensity factor for the normal and upset condition results in a fracture toughness margin of 3.67 which is greater than the acceptance criterion of √10 (3.16). The maximum applied stress intensity factor for the emergency and faulted conditions results in a fracture toughness margin of 1.43, which is greater than the acceptance criterion of √2 (1.41). Therefore, the postulated underclad cracks in the Davis-Besse reactor vessel are acceptable for continued safe operation through the period of extended operation.

Disposition:	10 CFR 54.21(c)(1)(ii)	For the reactor vessel shell, including the flange, UCC TLAA have been projected to the end of the period of extended operation.
Disposition:	Not a TLAA	The replacement reactor vessel head is not susceptible to UCC.

4.2.7 Reduction in Fracture Toughness of Reactor Vessel Internals

Reduction of fracture toughness of (stainless steel) reactor vessel internals is an aging effect caused by exposure to neutron irradiation. Prolonged exposure to high-energy neutrons results in changes to the mechanical properties, such as an increase in tensile and yield strength, and decreases in ductility and fracture toughness. The extent of loss of fracture toughness is a function of the material, irradiation temperature, and neutron fluence. The reactor vessel internals components most susceptible to reduction in fracture toughness are those nearest to the reactor core.

USAR Appendix 4A describes the detailed stress analysis of the internals under accident conditions for the current term of operation. The analysis shows that although there is some internals deflection, the internals will not fail because the stresses are within established limits. The effect of irradiation on the mechanical properties and deformation limits for the reactor vessel internals was also evaluated for the current term of operation. That analysis concluded that the reactor internals will have adequate ductility to absorb local strain at the regions of maximum stress intensity, and that irradiation will not adversely affect deformation limits.

The impact of the measurement uncertainty recapture (MUR) power uprate on the structural integrity of the reactor vessel internals components was evaluated. It was concluded that the temperature changes due to the MUR power uprate are bounded by those used in the existing analyses, and the existing analyses remain valid. As part of MUR uprate, FENOC provided the following commitment:

> "As appropriate, FENOC commits to incorporate recommendations from EPRI's MRP inspection guidelines into the reactor vessel internals program at Davis-Besse Nuclear Power Station, Unit, No. 1."

The disposition of the fracture toughness of reactor vessel internals TLAA for the period of extended operation is to continue the committed PWR Reactor Vessel Internals Program.

Disposition: 10 CFR 54.21(c)(1)(iii) Integrity of the reactor vessel internals will be managed by the PWR Reactor Vessel Internals Program for the period of extended operation.

4.3 METAL FATIGUE

4.3.1 FATIGUE CYCLES

4.3.1.1 Design Transients

ASME Class 1 components are designed to withstand the effects of cyclic loads due to temperature and pressure changes in the reactor system. These cyclic loads are introduced by normal unit load transients, reactor trips, startup and shutdown operations, and earthquakes.

The 14 original design transients for the RCS are found in USAR Table 5.1-8. Over the life of the plant, additional transients have been identified, including analyzed transients for new components and non-RCS components. The design cycles that are significant contributors to fatigue usage are included in the Fatigue Monitoring Program and are provided in Table 4.3-1.

NRC Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification," required the re-evaluation of the cyclic fatigue of the Pressurizer Surge Line. Topical Report BAW-2127 and its Supplements [References 4.8-10 through 4.8-13] describe the results of the revised evaluation. As part of this evaluation (Supplement 3 to BAW-2127) the Davis-Besse heatup and cooldown transients were redefined. Other transients were modified to include thermal stratification and striping. The transients and numbers of design cycles are listed in Table 4.3-1.

4.3.1.2 Projected Cycles

The number of cycles accrued to February 2008 were compiled. These accrued cycles were linearly extrapolated to 60 years of operation to determine whether the incurred cycles would remain below the number of design cycles. The results are presented in Table 4.3-1.

Transients 9C, 9D, and 32 are the only transients affecting Class 1 components where the 60-year projected cycles exceed the design cycles, and are discussed in some detail below. Transient 31A affects the non-Class 1 permanent canal seal plate, and is discussed in Section 4.6.3.

Transient 9 (A through D):

Transient 9 originally counted rapid depressurizations of the RCS because of the temperature transients a rapid depressurization would impose on the high pressure injection (HPI)/makeup nozzles. It was recognized that HPI flow testing also caused temperature swings on the HPI nozzles, and cycles of flow testing were added to this event. Today this transient counts HPI flow tests individually for each of the four HPI/makeup nozzles.

Forty (40) cycles of HPI flow testing were analyzed to determine the effect of HPI flow testing on the cumulative usage factor (CUF) of the HPI nozzles. See Section 4.3.2.3.1 below for discussion of the HPI/makeup nozzle CUFs. The analysis of the HPI nozzles determined that the elbowlets in HPI nozzles 1-1 and 1-2 were limited to 13 cycles each, Transients 9A and 9B, respectively. Davis-Besse is currently monitoring these nozzles against a limit of 13 design cycles. Current cycles are at 9 and 8 for nozzles 1-1 and 1-2, respectively. Current test practices do not cycle these nozzles and projections are that the cycles will remain at the current levels for 40 years and for 60 years of operation.

HPI nozzles 2-1 and 2-2 are limited to 40 cycles; Transients 9C and 9D, respectively. Current test practices cycle these nozzles. The 60-year cycle projection for these nozzles exceeds the design cycle number of 40. Because these nozzles may be reanalyzed for other reasons such as the planned modification to replace the nozzle safe ends and thermal sleeves, Davis-Besse will manage fatigue of these nozzles for the period of extended operation rather than reanalyze for the possible additional cycles at this time. Davis-Besse has committed (see Appendix A) to replace the nozzle safe ends and thermal sleeves prior to the period of extended operation rather than reanalyze for the possible additional cycles.

Transient 32

Each remote welded plug installed in the once-through steam generators (OTSGs) is limited to 33 cycles of heatup and cooldown. The 60-year cycle projection for some of these plugs exceeds the design cycle number. Davis-Besse monitors these cycles with the Fatigue Monitoring Program and will ensure action (either a reanalysis of record or a plant modification) is taken before the design number of cycles is reached. Because these plugs may be reanalyzed for other reasons, Davis-Besse will manage fatigue of these plugs for the period of extended operation rather than reanalyze for the possible additional cycles at this time.

The Fatigue Monitoring Program monitors the cycles incurred and assures that action is taken prior to any analyzed numbers of events being exceeded. The Fatigue Monitoring Program has been reviewed for consistency with the USAR and the supporting fatigue analyses.

Table 4.3-1 60-Year Projected Cycles

Program Transient #	***Transient***	***Accrued Cycles To 2/19/2008***	***60-year Projection Cycles***	***Design Cycles***	***Notes***
1 A	Reactor Coolant System (RCS) Heatup (70 to 558.7º F) [USAR Transient # 1]	65	128	240	None
1 B	RCS Cooldown (558.7 to 140º F) [USAR Transient # 1]	64	128	240	As Davis-Besse was operating at the time of the latest cycle count, there is one more heatup than cooldown. To reflect complete cycles, the cooldown projection was raised to match the heatup projection.
2 A	RCS Heatup (532 to 582º F) [USAR Transient # 2]	104	205	1440	None
2 B	RCS Cooldown (582 to 532º F) [USAR Transient # 2]	48	94	1440	None
3	Power Change 8-100% [USAR Transient # 3]	NA	NA	1800	Transients 3 and 4 are not monitored. Davis-Besse is not a load following plant and therefore; transients 3 and 4 could not credibly approach the number of design cycles during the period of extended operation.
4	Power Change 100-8% [USAR Transient # 3]	NA	NA	1800	
5	10% Step Load Increase [USAR Transient # 4]	34	67	8000	None
6	10% Step Load Decrease [USAR Transient # 5]	71	140	8000	None
7 A	Step Load Reduction 100-8% from Turbine Trip [USAR Transient # 6]	4	8	160	None
7 B	Step Load Reduction 100-8% from Electrical Load Rejection [USAR Transient # 6]	2	4	150	None
8 A	Reactor Trip from Low Reactor Coolant Flow [USAR Transient # 7]	2	4	40	None
8 B	Reactor Trip from High Temperature, Pressure, or Power [USAR Transient # 7]	24	47	160	None
8 C	Reactor Trip from High Pressure due to loss of Feedwater [USAR Transient # 7]	13	26	88	None
8 D	Reactor Trip from other [USAR Transient # 7]	56	110	112	None

Table 4.3-1 60-Year Projected Cycles

Program Transient #		Transient	Accrued Cycles To 2/19/2008	60-year Projection Cycles	Design Cycles	Notes
9	A	Rapid RCS Depressurization 1-1 [USAR Transient # 8]	9	9	13	The projection rate of future cycles for Transients 9A - 9D is based on the five-year period from 1/25/2003 to 2/19/2008, to include only the current test methodology. Accrued cycles as of 1/25/2003 for Transients 9A, 9B, 9C and 9D were respectively 9, 8, 17, and 14. This current test methodology does not cycle nozzles 1-1 and 1-2. Therefore the 60-year projection for Transients 9A and 9B is equal to the cycles that occurred before 1/25/2003.
9	B	Rapid RCS Depressurization 1-2 [USAR Transient # 8]	8	8	13	
9	C	Rapid RCS Depressurization 2-1 [USAR Transient # 8]	21	44	40	Transients 9C and 9D, high pressure injection nozzle cycles, are projected to exceed the number of design cycles prior to the end of the period of extended operation. Davis-Besse manages fatigue of these nozzles using the Fatigue Monitoring Program.
9	D	Rapid RCS Depressurization 2-2 [USAR Transient # 8]	19	48	40	
10		Loss of Reactor Coolant Pump without Reactor Trip [USAR Transient # 9]	5	10	20	None
11		Control Rod Withdrawal [USAR Transient # 10]	0	40	40	Transient 11 has not occurred; therefore the mathematical projection is zero. The number of 60-year projected cycles has been set to the number of design cycles to allow for future occurrence.
12	A	Hydro-test – RCS [USAR Transient # 12]	2	4	15	None
12	B	Hydro-test – Secondary	2	4	25	None
13		Steady State Power Variations	NA	NA	Infinite	Steady state power variations are not counted because they are not fatigue significant and the design cycle number is infinite.
14		Control Rod Drop	9	18	40	None
15		Loss of Offsite Power	3	6	40	None
16		Steam Line Failure	0	NA	1	Steam line failure is not considered in fatigue evaluations. Therefore, projected cycles are not provided.
17	A	Steam Generator Boiling Dry from Loss of Feedwater	3	6	20	None
17	B	Steam Generator Boiling Dry from Stuck Turbine Bypass Valve	1	NA	10	Transient 17B is an emergency conditions and is not considered in fatigue evaluations; therefore, it is not necessary to project cycles.
18		Feedwater Temperature Variation (Loss of Feedwater Heater)	0	40	40	Transient 18 has not occurred; therefore the mathematical projection is zero. The number of 60-year projected cycles has been set to the number of design cycles to allow for future occurrence.

Table 4.3-1 60-Year Projected Cycles

Program Transient #	Transient	Accrued Cycles To 2/19/2008	60-year Projection Cycles	Design Cycles	Notes
19	Feed and Bleed	NA	NA	4000	Feed and bleed is not counted as it is not a fatigue significant event.
20 A	Miscellaneous - Makeup Flow #1	NA	NA	30000	Miscellaneous makeup flow and pressurizer spray flow are not counted as they are not fatigue significant events.
20 B	Miscellaneous - Makeup Flow #2	NA	NA	$4X10^6$	
20 C	Miscellaneous - Pressurizer Spray	NA	NA	20000	
21	Loss of Coolant Accident (LOCA) [USAR Transient # 11]	0	NA	1	Transients 21 is a faulted condition and is not considered in fatigue evaluations. Therefore, projected cycles are not provided.
22 A	Test Transients – High Pressure Injection System [USAR Transient # 12]	NA	NA	40	Transient 22A is not applicable to Davis-Besse. High pressure injection pumps recirculate back to the Borated Water Storage Tank during the High Pressure Injection System Test and therefore, no inventory is added to the Reactor Coolant System.
22 B	Test Transients - Core Flood 1-1 [USAR Transient # 12]	13	26	240	None
22 C	Test Transients - Core Flood 1-2 [USAR Transient # 12]	13	26	240	None
23 A	OTSG - Fill Secondary	NA	NA	240	OTSG fill, flush, and chemical cleaning are not counted as they are not fatigue significant events.
23 B	OTSG - Fill Primary	NA	NA	240	
23 C	OTSG - Flush	NA	NA	40	
23 D	OTSG –Chemical Cleaning	NA	NA	20	
24	Hot Functional Testing	1	1	1	There will be no further Hot Functional Tests; therefore Transient 24 projection is zero additional cycles.
25 A	Pressurizer Heaters	NA	NA	5000	Pressurizer heater cycles are not counted as they are not fatigue events.
25 B	Pressurizer Heaters	NA	NA	20000	
26 A	Pressurizer Code Safeties	0	30	30	Transient 26A has not occurred; therefore the mathematical projection is zero. The number of 60-year projected cycles has been set to the number of design cycles to allow for future occurrence.
26 B	Pressurizer Electromatic Relief >=400º F	49	96	270	None
26 C	Pressurizer Electromatic Relief < 400º F	21	25	25	No cycles have been accrued for Transient 26C in the last 20 years due to plant modifications to keep the loop seal continuously drained and prevent this transient from occurring. Therefore, the number of 60-year projected cycles is set to the number of design cycles.

Table 4.3-1 60-Year Projected Cycles

Program Transient #	Transient	Accrued Cycles To 2/19/2008	60-year Projection Cycles	Design Cycles	Notes
27	Generator Abnormal Frequency	0	NA	1	Generator abnormal frequency is not considered in fatigue evaluations. Therefore, projected cycles are not provided.
28	Maximum Probable Earthquake [USAR Transient # 13]	0	NA	650	Transients 28 is a faulted condition and is not considered in fatigue evaluations. Therefore, projected cycles are not provided.
29	Pressurizer Spray Nozzle and Spray Line Delta Temperature >300º F	5	10	25	None.
30 A	Auxiliary Feedwater Bolted Nozzle 1-1	196.5	387	875	A Reactor Coolant System heatup and cooldown is one transient cycle and bolting/unbolting of the nozzles is one transient cycle for Transients 30A and 30B.
30 B	Auxiliary Feedwater Bolted Nozzle 1-2	224.5	442	875	
31 A	Permanent Canal Seal Plate (Heatup/Cooldown)	7.5	51	50	The permanent canal seal plate was installed on 1/25/2003. Transient 31A is counted from that date. A Reactor Coolant System heatup and cooldown is one transient cycle. Transient 31A is projected to exceed the number of design cycles prior to the end of the period of extended operation. Davis-Besse manages fatigue of this plate using the Fatigue Monitoring Program.
31 B	Permanent Canal Seal Plate (Operating Basis Earthquake)	0	NA	50	Transients 31B is a faulted condition and is not considered in fatigue evaluations. Therefore, projected cycles are not provided.
32	OTSG Welded Plug (limiting plug is Remote Welded Plug 2A 79-68) (Heatup/Cooldown)	17.5	64	33	The limiting plug (remote welded plug 2A) was installed on 5/23/2003. A Reactor Coolant System heatup and cooldown is one transient cycle. Transient 32 is projected to exceed the number of design cycles prior to the end of the period of extended operation. Davis-Besse manages fatigue of these plugs using the Fatigue Monitoring Program.

4.3.2 Class 1 Fatigue

4.3.2.1 Class 1 Background

The specific codes and standards to which systems, structures, and components were designed are listed in USAR Table 3.2-2. The primary code governing design and construction of the Class 1 systems and components is the ASME Boiler and Pressure Vessel Code. The ASME Code requires evaluation of transient thermal and mechanical load cycles and determination of fatigue usage for Class 1 components.

4.3.2.2 Class 1 Vessels, Pumps, and Major Components

The Class 1 components are those components within the scope of the “Class 1” aging management review (see Section 3.1). The Class 1 components evaluated for license renewal include the reactor vessel, the control rod drives, the reactor coolant pumps, the pressurizer, and the steam generators.

Cumulative usage factors for the Class 1 components are calculated based on normal and upset design transient definitions contained in the component design specifications. The design transients used to generate cumulative usage factors for Class 1 components are discussed in Section 4.3.1 above. In accordance with Davis-Besse Technical Specification 5.5.5, the Allowable Operating Transient Cycles Program (Fatigue Monitoring Program) provides controls to track the USAR Section 5 cyclic and transient occurrences to ensure that components are maintained within the design limits.

Fatigue of Class 1 components is managed by the Fatigue Monitoring Program. This program tracks the occurrence of plant transients that affect fatigue. The number of design cycles originally considered in the design fatigue analyses is not a design limit. The design limit for fatigue is the ASME Code allowable CUF of 1.0. The fatigue usage for a component is normally the result of several different thermal transients, coupled with mechanical loads. Exceeding the design number of cycles for one or more transients does not necessarily imply that fatigue usage will exceed the allowable limit.

4.3.2.2.1 Reactor Vessel

The reactor is designed as a Class A vessel in accordance with the ASME Code, Section III, 1968 Edition through Summer 1968 Addenda.

The reactor vessel consists of a cylindrical shell, a spherically dished bottom head, and a ring flange. The spherically dished reactor closure head (upper head) is welded to a ring flange which is bolted to the vessel ring flange with large-diameter studs. Structural components on the reactor vessel nozzles support the vessel. All internal surfaces of the vessel are clad with stainless steel weld deposit.

The vessel has two outlet nozzles through which reactor coolant flows to the steam generators, and four inlet nozzles through which reactor coolant re-enters the reactor vessel. Smaller nozzles between the reactor coolant nozzles serve as inlets for decay heat cooling and emergency cooling water injection (core flooding and low-pressure injection engineered safety functions).

The bottom head is penetrated by the incore instrumentation nozzles. The closure head is penetrated by flanged nozzles that provide for attaching the control rod drive mechanisms.

A stress analysis of the entire vessel was conducted under both steady-state and transient operations. The result is a complete evaluation of both primary and secondary stresses and the fatigue life of the entire vessel. The reactor vessel was analyzed for fatigue by the original equipment manufacturer.

Design CUFs for the limiting reactor vessel assembly locations were calculated to be less than 1.0 based on the design transients. The number of occurrences of design transients is tracked by the Fatigue Monitoring Program to ensure that action is taken before the analyzed numbers of transients are reached. As such, the effects of aging due to fatigue are managed for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(iii) The effects of fatigue on the reactor vessel will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.3.2.2.2 Reactor Vessel Internals

Reactor vessel internal components include the plenum assembly and the core support assembly. The core support assembly comprises the core support shield, core barrel, lower grid, flow distributor, incore instrument guide tubes, thermal shield, and surveillance specimen holder tubes.

The reactor vessel internals are designed to support the core and to maintain alignment between the fuel assemblies and the control rod drives. The internals also direct the flow of reactor coolant, provide gamma and neutron shielding, provide guides for incore instrumentation between the reactor vessel lower head and the fuel assemblies, support the surveillance specimen assemblies in the annulus between the thermal shield and the reactor vessel wall, and support the internal vent valves.

4.3.2.2.2.1 Low Cycle Fatigue

The core support components are designed to meet the stress requirements of the ASME Section III during normal operation and transients. USAR Appendix 4A contains a detailed stress analysis of the internals under accident conditions. USAR Table 4.2-5 shows that stresses are within established limits, and that deflections would not prevent control rod assembly insertion.

Although the reactor vessel internals are designed to meet the stress requirements of ASME Section III, they are not code components. Consequently, a fatigue analysis of the reactor vessel internals was not performed as part of the original design. The stresses for faulted conditions were analyzed, but fatigue for normal and upset conditions was not analyzed.

Davis-Besse has replaced the majority of the Alloy A-286 bolts for the reactor vessel internals with Alloy X-750 HTH bolts. The replacement bolts were designed to ASME Section III, and fatigue analyses were performed for the replacement bolts. Davis-Besse has not replaced the upper thermal shield bolts, flow distributor bolts, or guide block bolts. All cumulative usage factors calculated for the reactor vessel internals bolts are based on the nuclear steam supply system design transients identified in Table 4.3-1, and are less than 1.0. Therefore, the effects of fatigue will be adequately managed for the period of extended operation by the Fatigue Monitoring Program.

Disposition: 10 CFR 54.21(c)(1)(iii) The low-cycle fatigue analysis TLAA for the reactor vessel internals will be managed by the Fatigue Monitoring Program for the period of extended operation.

4.3.2.2.2.2 Reactor Vessel Internals Flow Induced Vibration

The classic endurance limit approach to design of components subject to flow induced vibration is based on the observation that a fatigue curve becomes approximately asymptotic to a given value of stress (the endurance limit) for large numbers of cycles. A component can be designed for infinite life by maintaining the actual peak stresses below the endurance limit. Unfortunately, actual data, especially for austenitic stainless steel, has not been collected to the endurance limit.

For the Davis-Besse reactor vessel internals, the ASME Code fatigue curve was extended to 1E+12 cycles (the upper bound on the number of cycles for a 40-year design life). The resulting stress value of 20,400 psi was reduced to 18,000 psi as the endurance limit. For 60-years of operation, it follows that 1.5E+12 would bound the expected loading cycles. The extrapolated fatigue curve at 1.5E+12 cycles is approximately 20,200 psi, still above the 18,000 psi that was used as the endurance limit. Therefore the 18,000 psi endurance limit used for the flow induced vibration analyses of the reactor vessel internals remains valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) The endurance limit for flow induced vibration of the reactor vessel internals remains valid to the end of the period of extended operation.

4.3.2.2.2.3 Incore Instrumentation Nozzles, Surveillance Capsule Holder Tubes

The incore instrument nozzles were analyzed for fatigue due to flow induced vibration. The resulting CUF is 0.59. An additional 20 years of operation would result in a CUF of no more than 0.885 (1.5 x 0.59), which remains below the limit of 1.0. This CUF has been satisfactorily projected for the period of extended operation.

The re-designed surveillance capsule holder tubes were analyzed for fatigue due to flow induced vibration. The resulting CUF is 0.00042. An additional 20 years of operation would result in a CUF of no more than 0.00063 (1.5 x 0.00042), which remains below the limit of 1.0. This CUF has been satisfactorily projected for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(ii) The CUFs for flow induced vibration of select reactor vessel internals have been projected to the end of the period of extended operation.

4.3.2.2.3 Control Rod Drive Housings Fatigue

The control rod drive mechanism is an electro-mechanical device that includes a pressure vessel (housing).

The control rod drive housings are designed to ASME Section III, 1968 Edition through Summer 1970 Addenda. The control rod drive housings were analyzed for fatigue by the original equipment manufacturer. The cumulative usage factors calculated for the various control rod drive locations are based on the nuclear steam supply system design transients identified in Table 4.3-1, and are all less than 1.0. The number of occurrences of design transients is tracked by the Fatigue Monitoring Program to ensure that action is taken before the design cycles are reached. As such, the effects of aging due to fatigue are managed for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(iii) The effects of fatigue on the control rod drive housings will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.3.2.2.4 Reactor Coolant Pump Casings Fatigue

The reactor coolant pumps are single stage, single suction, vertical centrifugal pumps. The pump casings consist of a bottom suction inlet, a multi-vane diffuser, a collecting scroll, and a horizontal discharge nozzle. The pump casing is welded into the piping system, and the pump internals can be removed for inspection or maintenance without removing the casing from the piping.

The reactor coolant pump casings are designed to ASME Section III, 1968 Edition through Winter 1968 Addenda. The reactor coolant pumps were analyzed for fatigue by the original equipment manufacturer. Design cumulative usage factors for the limiting reactor coolant pump locations were calculated based on design transients, and are all less than 1.0. The number of occurrences of design transients is tracked by the Fatigue Monitoring Program to ensure that action is taken before the design cycles are reached. As such, the effects of aging due to fatigue are managed for the period of extended operation.

Disposition:	10 CFR 54.21(c)(1)(iii)	The effects of fatigue on the reactor coolant pumps will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.3.2.2.5 Pressurizer Fatigue

The pressurizer is a vertical-cylindrical vessel that is connected to the reactor outlet piping by the surge line. The vessel is protected from thermal effects by a distribution baffle on the surge pipe inside the vessel. Two ASME Code relief valves are connected to the pressurizer to relieve system overpressure. A pilot-operated relief valve limits the lifting frequency of the code relief valves. Replaceable electric heater bundles in the lower section and a water spray nozzle in the upper section maintain the steam and water at the saturation temperature corresponding to the desired Reactor Coolant System pressure.

The pressurizer is designed to ASME Section III, 1968 Edition through Summer 1968 Addenda. The pressurizer was analyzed for fatigue by the original equipment manufacturer. Design cumulative usage factors for the limiting pressurizer locations, including the surge nozzle, were calculated based on design transients, and are all less than 1.0. The number of occurrences of design transients is tracked by the Fatigue Monitoring Program to ensure that action is taken before the design cycles are reached. As such, the effects of aging due to fatigue are managed for the period of extended operation.

Disposition:	10 CFR 54.21(c)(1)(iii)	The effects of fatigue on the pressurizer will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.3.2.2.6 Once Through Steam Generators (OTSGs)

The once through steam generator design is a vertical, straight-tube-and-shell heat exchanger that produces superheated steam at approximately a constant pressure. Reactor coolant flows downward through the tubes, and steam is generated on the shell side. The parts exposed to reactor coolant system pressure are the hemispherical heads (including inlet and outlet nozzles), the tubesheets, and the straight Inconel tubes between the tubesheets. The reactor coolant side has access ports (manways and inspection openings), and a drain nozzle for the bottom head. The reactor coolant side of the unit can be vented by a vent connection on the reactor coolant inlet pipe to each unit. The unit is supported by a skirt attached to the bottom head which rests on a sliding support and provides the required freedom of movement to accommodate thermal expansion of the Reactor Coolant System.

The shell, the outside of the tubes, and the tubesheets form the boundaries of the steam-producing section of the vessel. Within the shell, the tube bundle is surrounded by a baffle, which is divided into two sections. The upper part of the annulus between the shell and baffle is the superheater outlet, and the lower part is the feedwater inlet-heating zone.

The various aspects of steam generator fatigue analysis are addressed in the subsections below.

4.3.2.2.6.1OTSGs Fatigue

The primary (tube) and secondary (shell) sides of the once through steam generators are designed to ASME Section III, 1968 Edition through Summer 1968 Addenda. The steam generators were analyzed for fatigue by the original equipment manufacturer. The cumulative usage factors for the limiting primary and secondary side steam generators locations were calculated based on design transients, and are all less than 1.0. In addition, the steam generator remote weld plugs have a limited design life of 33 heatup-cooldown cycles to maintain a fatigue usage of less than 1.0. The number of occurrences of design transients is tracked by the Fatigue Monitoring Program to ensure that action is taken before the design cycles are reached. As such, the effects of aging due to fatigue are managed for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(iii) The effects of fatigue on the steam generators will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.3.2.2.6.2OTSGs Tube Sleeves Fatigue

USAR Section 5.5.2.3 indicates that steam generator tubes that are found to be leaking may be plugged or repaired by mechanical (rolled) sleeving. Section III of the ASME Code does not provide design rules for mechanically roll-expanded attachments, and theoretical stress analyses are inadequate. In such cases, Appendix II of ASME Section III permits the use of experimental stress analysis to substantiate the critical or governing stress. The structural adequacy of the sleeve attachment to withstand cyclic loadings was demonstrated by a fatigue test per ASME Section III, Appendix II-1500. The sleeve loading transients for the fatigue test were based on the design transients. In particular, the pressure cycling portion of the fatigue test is based on the number of startup cycles for a once through steam generator (360 cycles).

Note that the steam generator tube sleeves were tested to 360 startup cycles to bound all Babcock & Wilcox 177 fuel assembly plants. Davis-Besse has only 240 startup cycles allowed in USAR Table 5.1-8, and only 128 projected startup cycles in 60 years of operation per Table 4.3-1. Consequently, Davis-Besse will not approach the tested number of cycles for the once through steam generator tube sleeves during the period of extended operation, and the TLAA associated with fatigue testing of the tube sleeves will remain valid.

Disposition:	10 CFR 54.21(c)(1)(i)	The fatigue testing of the once through steam generator tube sleeves will remain valid for the period of extended operation.

4.3.2.2.6.3 OTSGs Auxiliary Feedwater Modification

The original auxiliary feedwater headers internal to the steam generators were found damaged during the 1982 refueling outage. The repair installed an external header on each steam generator, including some rerouting of piping and supports. Included in this repair was the evaluation of the eight new holes in the steam generators, the auxiliary feedwater thermal sleeves, the riser flange attachment to the shell (shell, thermal sleeve bearing area and studs), and flow induced vibration of the steam generator tubes.

The design of this 1982 modification has been included in the steam generator stress analysis referenced in Section 4.3.2.2.6.1 above. Therefore the fatigue analyses of the steam generator shell performed as part of this modification are included in the steam generator fatigue previously discussed in Section 4.3.2.2.6.1.

The analysis of the auxiliary feedwater thermal sleeve stresses provided a basis for demonstrating that the auxiliary feedwater thermal sleeve is capable of withstanding 300 cycles of auxiliary feedwater injection transients. This analysis was performed in accordance with the requirements of the ASME Code for Class I components. The riser flange attachment to the steam generator shell was also analyzed per ASME Code requirements, and was acceptable for a design life of 875 cycles of auxiliary feedwater initiation. Auxiliary feedwater initiations, Transients 30A and 30B in Table 4.3-1, are currently only at 196.5 and 224.5 cycles respectively. Transients 30A and 30B are projected to a maximum of 387 and 442 cycles, respectively, through the period of extended operation. These 60-year projections are below the 875 design cycles for the riser flange attachment but exceed the 300 design cycles for the auxiliary feedwater thermal sleeve. The number of occurrences of design transients is tracked by the Fatigue Monitoring Program to ensure that action is taken before the design cycles are reached. As such, the effects of aging due to fatigue are managed for the period of extended operation.

Flow induced vibration of the steam generator tubes with the new feedwater header design was also reviewed. It was concluded that the stress and deflection with the external headers was significantly less than the stress and deflection with the original internal headers; consequently flow induced vibration was not reanalyzed for this modification. Section 4.3.2.2.6.4 below, discusses the flow induced vibration analyses of the steam generator tubes.

Disposition: 10 CFR 54.21(c)(1)(iii) The effects of fatigue on the auxiliary feedwater header modification will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.3.2.2.6.4OTSGs Tubes and Tube Stabilizers Flow Induced Vibration

Flow induced vibration of the once through steam generator tubes has been analyzed several times over the life of the Davis-Besse plant. The latest flow induced vibration analysis shows that the highest cumulative usage factor for any existing tube configuration is 0.443 for an un-repaired tube next to the open lane. Adding 20 years of operation to this tube increases the cumulative usage factor by a factor of 1.5 to a 60-year value of 0.665, which remains acceptable (< 1.0).

The cumulative usage factor for the 3/8 inch tube stabilizers is calculated using both high cycle (flow inducted vibration) and low cycle (transients) fatigue. As the cumulative usage factors are only 0.12 for the tube-to-stabilizer weld and 0.07 for the nail, the flow induced vibration portion of these cumulative usage factors can be increased by 1.5 for 60 years, and the cumulative usage factors will remain below 1.0.

Disposition: 10 CFR 54.21(c)(1)(ii) The TLAA associated with the flow induced vibration of the steam generator tubes and tube stabilizers has been projected through the period of extended operation.

4.3.2.3 Class 1 Piping and Valves

The Davis-Besse reactor coolant system piping, as well as reactor coolant pressure boundary piping in other systems, was designed to American National Standards Institute (ANSI) B31.7 Draft, February 1968 with Errata, June 1968 and also meets the design requirements of ANSI B31.7, 1969 Edition. The B31.7 Piping Code requires evaluation of transient thermal and mechanical load cycles and determination of fatigue usage for Class 1 piping. The reactor head vent and other piping designated as quality group A, B, or C is designed to ASME Section III, 1971 Edition, Class 1, 2 or 3 respectively. Only quality group D piping is designed to ANSI B31.1. Davis-Besse has no Class 1 piping designed to B31.1.

4.3.2.3.1 Class 1 Piping Fatigue

Class 1 piping at Davis-Besse includes the following piping.

<u>Reactor Coolant Piping:</u>

The reactor coolant piping connects the major components of the Reactor Coolant System, including the reactor vessel, the steam generators and the reactor coolant pumps. The reactor coolant piping has welded connections for pressure taps, temperature elements, vents, drains, decay heat removal, and emergency core cooling high-pressure injection water.

The CUFs calculated for the reactor coolant piping are based on the design transients identified in Table 4.3-1 and are all less than 1.0.

Pressurizer Surge Line:

NRC Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification," required the re-evaluation of the cyclic fatigue of the pressurizer surge line [References 4.8-10, 4.8-11, 4.8-12, and 4.8-13]. As part of this evaluation the design basis plant heatup and cooldown transients were completely redefined. Other transients were modified to include thermal stratification and striping. In addition to these changes, a number of transients were added and other modifications were made to the existing transients based on a review of the plant operating history, including the operating procedures. The surge line piping and nozzles were analyzed for license renewal, considering the effects of the reactor coolant environment. See Section 4.3.4 for the latest pressurizer surge line analyses.

Reactor Coolant Drains and Letdown Lines:

The Class 1 portion of the reactor coolant drains, designed to ASME III Class A (Class 1), extends only to the second isolation valve away from the reactor vessel. The letdown line extends from the suction of reactor coolant pump 1-1-1 (RCS Loop 1-1 Cold Leg) to the letdown cooler isolation valves. The original analysis for these vents and drains was updated based on NRC Bulletin 79-14. The CUFs calculated for the reactor coolant drains and letdown line are based on the design transients in Table 4.3-1 and are all less than 1.0.

High Pressure Injection Lines:

The Class 1 portion of the High Pressure Injection System, designated as ASME III Class A (Class 1) is entirely within the containment vessel and consists of four legs, each of which extend from the first of two isolation valves to the cold leg piping on the inlet to each of the four reactor coolant pumps. The current analysis, updated per NRC Bulletin 79-14, is based on the design transients in Table 4.3-1, and all CUFs are less than 1.0.

A thermal sleeve is provided in the high-pressure injection connection to the reactor coolant inlet piping. The analysis of the high-pressure injection nozzles determined that high-pressure injection flow tests had negligible effect on the high-pressure injection nozzles, but a significant effect on the normal makeup nozzle. The CUF for the normal makeup nozzle was calculated to be 0.558 after 40 flow tests; 0.513 usage due to the 40 flow tests and 0.045 usage due to all other transients. Projections of cycles for 60 years implies that the design cycles of 40 will be reached in year 51, with 48 cycles occurring by year 60. Projecting the CUF to a 60-year number with 50 tests, gives a

CUF of 0.686 (0.045 + 50/40 * 0.513), which implies the nozzles will still be acceptable. However, Davis-Besse monitors these cycles and will ensure action is taken before the design cycles are reached. Davis-Besse has committed (see Appendix A) to replace the high pressure injection thermal sleeves and safe ends prior to reaching the period of extended operation. Davis-Besse manages fatigue of these nozzles.

Decay Heat Removal Lines:

The Class 1 portion of the Decay Heat Removal System, designated as ASME III Class A (Class 1) is entirely within the containment vessel and consists of two legs, each of which extends from stop-check isolation valves to the reactor vessel core flood lines. The current analysis, updated per NRC Bulletin 79-14, is based on the design transients in Table 4.3-1 and all CUFs are less than 1.0.

Core Flooding Lines:

The Class 1 portion of the Core Flood System, designated as ASME III Class A (Class 1) is entirely within the containment vessel and consists of two legs, each of which extends from a core flood tank to a reactor vessel core flood nozzle. The current analysis, updated per NRC Bulletin 79-14, is based on the design transients in Table 4.3-1 and all CUFs are less than 1.0.

Pressurizer Safety/Relief Valve Lines:

The Class 1 pressurizer safety/relief valve lines are entirely within the containment, and run from the safety/relief nozzles on the top head of the pressurizer to the safety/relief valves. The CUFs calculated for the pressurizer safety/relief valve lines are based on the design transients in Table 4.3-1 and are all less than 1.0.

Class 1 Piping Summary:

All cumulative usage factors calculated for Class 1 piping are less than 1.0 based on the design transients identified in Table 4.3-1. The Fatigue Monitoring Program will monitor these transients for the period of extended operation and ensure that action is taken before the design cycles are reached. See Section 4.3.1 above for further discussion of the design cycles.

Disposition: 10 CFR 54.21(c)(1)(iii) The effects of aging on the Class 1 piping will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.3.2.3.2 Class 1 Valves Fatigue

A review was performed to determine if the current licensing basis for Davis-Besse contains fatigue analyses for Class 1 valves. Piping and instrumentation diagrams were reviewed to identify the Class 1 valves of four inches or greater diameter. While there is no code distinction for fatigue analyses between large bore and small bore valves, the review of the large bore valves was intended to provide a representation of the status of such analyses for all Class 1 valves. There were 12 valves of four inches or greater diameter that were identified as a result of this effort. A review of the Davis-Besse quality assurance records located the stress reports of record for each of the 12 valves, however, no associated fatigue reports were identified. Therefore, it is concluded that no fatigue analyses for Class 1 valves were performed, and there is no TLAA for Class 1 valves at Davis-Besse. This conclusion is consistent with industry practice at the time Davis-Besse was designed. Valve bodies and pump casings were considered robust compared to the piping systems in which they were located and fatigue of the attached piping was understood to bound the fatigue of the valve bodies.

Disposition:	Not a TLAA	There are no fatigue analyses for the Class 1 valves at Davis-Besse and thus there is no TLAA associated with fatigue of Class 1 valves.

4.3.2.3.3 High Energy Line Break Postulations

USAR Section 3.6.2.1 indicates that the criteria given in Standard Review Plan Sections 3.6.1 and 3.6.2, including Branch Technical Position MEB 3-1, were used in determining the pipe break locations for pipe whip restraint design. This allows the elimination of potential break locations based on cumulative usage factors being less than 0.1, if other stress criteria are also met. The cumulative usage factors calculated for Davis-Besse piping were based on the design transients that are counted by the Fatigue Monitoring Program. If any of the design cycles are approached, the Fatigue Monitoring Program will require action prior to the design cycles being reached. That action will include a review of the high energy line break location selections. As such, the effects of fatigue on the high energy line break location selection will be managed for the period of extended operation.

The identification of high energy line break locations for the hot and cold leg piping was replaced by leak-before-break criteria in 1990. See Section 4.7.1 below for a discussion of leak-before-break.

Disposition:	10 CFR 54.21(c)(1)(iii)	The effects of fatigue on the high energy line break location selection will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.3.3 NON-CLASS 1 FATIGUE ANALYSES

The specific codes and standards to which systems and components important to safety were designed are listed in USAR Table 3.2-2. Non-class 1 components that are Quality Group B or C are largely designed and constructed to the ASME Boiler and

Pressure Vessel Code, but certain components are built to other codes including B31.1, American Water Works Association, and the Draft Pump and Valve Code.

The aging management review for Davis-Besse non-Class 1 mechanical components is contained in Section 3.2. Non-Class 1 components with a maximum service temperature in excess of 220ºF for carbon steel, or 270ºF for stainless steel, are identified in Section 3.2 as requiring further evaluation for fatigue. That evaluation is summarized in Sections 4.3.3.1 and 4.3.3.2 below. Section 4.3.3.1 determines that all TLAAs associated with piping and in-line components (tubing, piping, thermowells, valve bodies, etc.) remain valid for the period of extended operation. Section 4.3.3.2 determines that there are no TLAAs associated with non-piping components (tanks, heat exchangers, pump & turbine casings, etc.).

4.3.3.1 Non-Class 1 Piping and In-Line Components

The design of ASME Section III Class 2 and Class 3 piping systems incorporates a stress range reduction factor for determining acceptability of piping design with respect to thermal stresses. Davis-Besse components designated as quality group D are designed to ANSI B31.1, which incorporates stress range reduction factors based upon the number of thermal cycles. A stress range reduction factor of 1.0 in the stress analyses applies for up to 7,000 thermal cycles. The allowable stress range is reduced by the stress range reduction factor if the number of thermal cycles exceeds 7,000. If fewer than 7,000 cycles are expected through the period of extended operation, then the fatigue analysis (stress range reduction factor) of record remains valid through the period of extended operation.

Thermal cycles have been projected for 60 years of plant operation in Section 4.3.1.2 above. These projections, applied to the non-Class 1 piping and in-line components indicate that 7,000 thermal cycles will not be exceeded during 60 years of operation.

- Piping connected to the Reactor Coolant System, the Main Steam System, or the Main Feedwater System will experience essentially the same transients as the Reactor Coolant System. As shown in Table 4.3-1, there are less than 2400 total thermal cycles projected in 60 years of operation. As such, systems connected to the Reactor Coolant, Main Steam, or Main Feedwater systems will not exceed 7,000 equivalent full temperature cycles during the period of extended operation, and the system piping fatigue analyses (stress range reduction factors) remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).
- Piping from the fire water storage tank heat exchanger to the fire water storage tank operates at a temperature that exceeds the fatigue threshold temperature. While cycles have not been counted on this system, it is estimated that the system is cycled four times a week for 24 weeks (October-March) out of the year, or 96 cycles a year. This is a conservative estimate because in very cold months

the system is kept running rather than being cycled. As 96 cycles per year for 60 years is 5,760 cycles, the fire water storage tank will not exceed 7,000 design cycles through the period of extended operation, and the system piping fatigue analyses (stress range reduction factors) remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

- Piping and piping components associated with the emergency diesels, the fire pump diesel engine, and the station blackout diesel require evaluation of thermal fatigue.

  Technical Specification surveillance requirements 3.8.1.2 and 3.8.1.3 require each emergency diesel generator to be started once per 31 days, or 720 starts in 60 years. Surveillance requirement 3.8.1.8 requires each emergency diesel to be run twice per year, or 120 starts in 60 years. Surveillance requirements 3.8.1.13, 3.8.1.14, and 3.8.1.15 require extended runs every two years, or 30 starts in 60 years. As these surveillance requirements may be run consecutively, or may take credit for inadvertent starts, conservatively combining these starts indicates there will be less than 870 (720 + 120 + 30) surveillance-related starts in 60 years. Unanticipated operation of the emergency diesels is less frequent than testing. Doubling the surveillance-related starts to account for unanticipated operation produces 1,740 cycles in 60 years and remains below the 7,000 cycles implicitly assumed in the analysis.

  The station blackout diesel generator is tested monthly per Technical Requirements Manual Section 8.8.2. This will account for 720 thermal cycles in 60 years. Unplanned operation of the station blackout diesel is very infrequent (less than once per year), so the total cycles in 60 years remains below the 7,000 cycles implicitly assumed in the analysis.

  Fire Hazards Analysis Report surveillance requirement 8.1.2.E.1 requires a start of the diesel fire pump engine every 31 days, or 720 times in 60 years. Surveillance requirements 8.1.2.E.4 and 8.1.2.E.5 require extended diesel runs once per cycle, conservatively estimated at 60 times in 60 years. Combining these surveillance requirements concludes there will be less than 780 surveillance-related starts in 60 years. Unanticipated operation of the fire pump diesel engine is less frequent than testing. Doubling the surveillance-related starts to account for unanticipated operation produces 1,560 cycles in 60 years and remains below the 7,000 cycles implicitly assumed in the analysis.

  As such, the emergency diesels, diesel fire pump engine, and station blackout diesel, will not exceed 7,000 equivalent full temperature cycles during the period of extended operation, and the system piping fatigue analyses (stress range reduction factors) remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

- Piping and piping components in the Gaseous Radwaste System may exceed the temperature threshold for fatigue. The piping and piping components are designed to either ASME Section III, Class 3 or ANSI B31.1. There are no explicit fatigue analyses for this piping. The only source of hot gas above the fatigue threshold is the vent of the reactor coolant drain tank. Gas vented from this tank will only exceed the fatigue threshold immediately after a safety valve or power operated relief valve lift. As shown in Table 4.3-1, Events 26A, 26B, and 26C, only 72 lifts of these valves are expected in 60 years. As such, the Gaseous Radwaste System will not exceed 7,000 equivalent full temperature cycles during the period of extended operation, and the system piping fatigue analyses (stress range reduction factors) remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).
- Piping and piping components associated with the containment air systems may be exposed to maximum operating temperatures that exceed the threshold values for fatigue, and therefore require further evaluation of thermal fatigue. The subject piping is designed to ASME Section III Class 2 or ANSI B31.1. There are no explicit fatigue analyses for this piping. The containment air temperature is restricted to less than 120°F per Technical Specification 3.6.5. The maximum operating temperature for the containment air systems is 264°F; which corresponds to the containment design temperature. These systems will only see that temperature following the containment design transient (LOCA), and will only see that temperature once in the life of the plant. As such, the containment air systems will not exceed 7,000 equivalent full temperature cycles during the period of extended operation, and the system piping fatigue analyses (stress range reduction factors) remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).
- Piping and piping components in the sampling systems may exceed the temperature threshold for fatigue, and therefore require further evaluation of thermal fatigue. These sample pipes, valves, and tubing are used for collecting samples of feedwater or main steam and for routing reactor coolant to the Post Accident Sampling System.

  Sample piping to the Post Accident Sampling System would be used only in the case of a design basis accident; and thus no cycles are anticipated. The lines are occasionally used as a test, less than once per year, or 60 cycles in 60 years. The lines may also be used to degasify the Reactor Coolant System (pressurizer) but this is defined as an “Infrequent or Special Operation”. An estimate of “infrequent operation” is less than once per fuel cycle, or 30 times in 60 years. Consequently this piping and piping components are expected to see less than 90 cycles in 60 years of operation. As this is well below the 7,000 cycles in any implicit fatigue analyses, the system piping stress analyses remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Placing the secondary sample panel in service is an infrequent operation performed after each refueling outage. As such the sample panel will only heatup and cooldown when the secondary plant heats up and cools down, which per Table 4.3-1 is projected to 128 cycles in 60 years. Even doubling the cycles to allow for unplanned isolations and restarts, this system will experience only 256 cycles in 60 years. As such, any implicit fatigue analyses in the system piping stress analyses remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

- Piping and piping components of the Auxiliary Steam System may be exposed to maximum operating temperatures that exceed the threshold for further evaluation of thermal fatigue. The Auxiliary Steam System is supplied from the Main Steam System during normal operation and by the auxiliary boiler when the plant is off line (including during startups). Because the auxiliary boiler sometimes maintains temperature and pressure in the Auxiliary Steam System when the plant is off line, the Auxiliary Steam System will see fewer transients than are experienced by the overall plant. As shown in Table 4.3-1, the Main Steam System (and Reactor Coolant System) is projected to see only 1,915 total thermal cycles in 60 years of operation. As such, the Auxiliary Steam System will not exceed 7,000 equivalent full temperature cycles during the period of extended operation, and the system piping fatigue analyses (stress range reduction factor)s remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).
- Piping and piping components of the Station Heating System may be exposed to maximum operating temperatures that exceed the threshold for further evaluation of thermal fatigue. The Station Heating System is a hot water system with a primary loop heated by the Auxiliary Steam System and secondary loops heated by the primary loop. This system is normally in service only during the heating season (winter). The Station Heating System could cycle several times per year as environmental conditions change. Cycling 20 times per year produces 1,200 cycles in 60 years, therefore the Station Heating System will remain below the 7,000 cycles. As such, the Station Heating System will not exceed 7,000 equivalent full temperature cycles during the period of extended operation, and the system piping fatigue analyses (stress range reduction factors) remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: 10 CFR 54.21(c)(1)(i) The TLAAs associated with fatigue of non-Class 1 piping and in-line components will remain valid for the period of extended operation.

4.3.3.2 Non-Class 1 Major Components

Fatigue need not be addressed for non-Class 1 vessels, heat exchangers, storage tanks, and pumps, unless these components were designed to ASME Section VIII Division 2 or ASME Section III Subsection NC-3200. For those non-Class 1 non-piping components possibly subject to fatigue, a review of component design codes was conducted to determine if fatigue analyses of the components were required. If no fatigue analysis was required, then no TLAA for fatigue exists.

While most Class 1 components are designed in accordance with ASME Section III, non-Class 1 pressure vessels, heat exchangers, tanks, and pumps are often designed in accordance with other industry codes and standards, reactor designer specifications, and architect engineer specifications. ASME Section III Subsection NC-3200 and ASME Section VIII Division 2 include fatigue design requirements, and include provisions for "exemption from fatigue," which is actually a simplified fatigue evaluation based on materials, configuration, temperature, and cycles. If cyclic loading and fatigue usage for a component could be significant, then ASME Section VIII Division 2 or NC-3200 would have been specified.

Due to conservatism in ASME Section VIII Division 1 and ASME Section III NC-3100 and ND-3000, detailed fatigue analysis is not required. Also, fatigue analyses are not required for NC and ND pumps and storage tanks (< 15 psig), or for other design codes (e.g., ASME Section VIII Division 1, AWWA, MSS, NEMA). Components designed and fabricated to these codes require no fatigue analyses for the period of extended operation.

The non-Class 1 non-piping components identified in Sections 3.2, 3.3 and 3.4 as requiring further evaluation for fatigue are discussed below.

- The decay heat removal coolers, decay heat removal pumps, and borated water storage tank heater are the only non-piping components in the Decay Heat Removal / Low Pressure Injection System that may exceed the fatigue threshold temperature. The decay heat removal coolers are designed to ASME Section III-C (tube side) and ASME Section VIII (shell side). The decay heat removal pumps are designed to the draft ASME Code for pumps and valves 1968, Class 2. The borated water storage tank heater is designed to ASME Section VIII Division 1 (tube side) and ASME Section VIII (shell side)

  No fatigue analyses exist for these components, and therefore, there are no TLAAs related to fatigue. These components require no further fatigue evaluation for period of extended operation.

- The auxiliary feedwater pump turbine casings are the only non-piping components within the evaluation boundaries of the Main Steam System that exceed the fatigue threshold temperature. There are no design codes associated with these turbines, only the standards of the American Society for Testing and Materials and National Electrical Manufacturers Association.

No fatigue analyses exist for the auxiliary feedwater pump turbine casings, and therefore, there are no TLAAs related to fatigue. These components require no further fatigue evaluation for the period of extended operation.

- The fire water storage tank heat exchanger is the only non-piping component within the evaluation boundaries of the Fire Protection System that exceeds the fatigue threshold temperature. This heat exchanger was fabricated in accordance with ASME Section VIII Division 1.

  No fatigue analysis exists for the fire water storage tank heat exchanger, and therefore, there is no TLAA related to fatigue. This component requires no further fatigue evaluation for the period of extended operation.

- The waste gas surge tank is the only non-piping component within the evaluation boundaries of the Gaseous Radwaste System that exceeds the fatigue threshold temperature. The waste gas surge tank is built to ASME Section III, Class C.

  No fatigue analysis exists for the waste gas surge tank, and therefore, there is no TLAA related to fatigue. This component is acceptable for period of extended operation without further evaluation.

- The pressurizer quench tank is the only non-piping component within the boundaries of the Reactor Coolant Drains and Vents System that may exceed the threshold temperature requiring further evaluation of thermal fatigue. The design code for the pressurizer quench tank is ASME Section III Class 3.

  No fatigue analysis exists for the pressurizer quench tank, and therefore, there is no TLAA related to fatigue. This component requires no further fatigue evaluation for the period of extended operation.

- The Intake Structure Unit Heater heat exchangers are supplied by low pressure steam and may exceed the threshold temperature of thermal fatigue. No fatigue analysis exists for these nonsafety-related components, and therefore, there is no TLAA related to fatigue. These components require no further fatigue evaluation for the period of extended operation.

- The evaporator package condensate drain pumps, the degasifier package drain pumps, and the condensate pumps all may reach temperatures of approximately 300°F. No fatigue analysis exists for these nonsafety-related pumps, and therefore, there is no TLAA related to fatigue. These components require no further fatigue evaluation for the period of extended operation.

- The 10 psig condensate tank may reach 298°F. The 10 psig condensate tank is built to ASME Section VIII. No fatigue analysis exists for this nonsafety-related tank, and therefore, there is no TLAA related to fatigue. This component requires no further fatigue evaluation for the period of extended operation.

Disposition: Not a TLAA — There are no fatigue analyses, and hence no TLAAs, associated with the non-Class 1 non-piping components.

4.3.4 EFFECTS OF REACTOR COOLANT ENVIRONMENT ON FATIGUE

4.3.4.1 Background

Industry test data indicate that certain environmental effects (such as temperature and dissolved oxygen content) in the primary systems of light water reactors could result in greater susceptibility to fatigue than would be predicted by fatigue analyses based on the ASME Section III design fatigue curves. The ASME design fatigue curves were based on laboratory tests in air and at low temperatures. Although the failure curves derived from laboratory tests were adjusted to account for effects such as data scatter, size effect, and surface finish, these adjustments may not be sufficient to account for actual plant operating environments.

No immediate NRC staff or licensee action is necessary to deal with the environmentally assisted fatigue issue. However, because metal fatigue effects increase with service life, environmentally assisted fatigue is evaluated for license renewal. Guidance for performing this evaluation is provided in NUREG/CR-6260 "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," and EPRI Report MRP-47, "Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application."

NUREG/CR-6260 identifies locations of interest for consideration of environmental effects in several types of nuclear plants. Section 5.3 of NUREG/CR-6260 reviews the following locations for Babcock & Wilcox pressurized water reactors.

- Reactor vessel shell and lower head; including the instrumentation nozzles
- Reactor vessel inlet and outlet nozzles
- Pressurizer surge line (including pressurizer surge nozzle and hot leg surge nozzle)
- High pressure injection/makeup nozzle
- Reactor vessel core flood nozzle
- Decay heat removal Class 1 piping

Evaluations performed for the period of extended operation do not indicate that 40-year cumulative usage factors will exceed the fatigue limit (1.0) because the environmentally assisted fatigue adjustment is not applied during the initial 40 years of operation, consistent with the closure of Generic Safety Issue (GSI) 190, “Fatigue Evaluation of Metal Components for 60-year Plant Life.”

4.3.4.2 Davis-Besse Evaluation

The effect of the reactor coolant environment on fatigue usage has been evaluated for the six locations identified in NUREG/CR-6260. An environmentally assisted fatigue correction factor, F_{en}, was determined using material specific guidance contained in NUREG/CR-6583 “Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels,” in NUREG/CR-5704 “Effects of LW Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels,” and in NUREG/CR-6909, “Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials.” Environmentally adjusted cumulative usage factors (U_{en}), which include the effect of reactor water environment, were obtained by multiplying the F_{en} times the in-air CUFs.

The following bounding F_{en} values were calculated: 1.74 for carbon steel, 2.45 for low-alloy steel, 15.35 for stainless steel with $T \geq 200$ ºC, and 2.55 for stainless steel with $T < 200$ºC. An F_{en} value of 4.16 was calculated for the nickel-based alloy incore instrument nozzles. These F_{en} values were applied to either design CUFs or adjusted CUFs at all NUREG/CR-6260 locations with the exception of the surge line piping and high pressure injection/makeup (HPI/MU) nozzle safe end. The surge line piping and HPI/MU nozzle safe end were evaluated using an integrated F_{en} approach consistent with MRP-47, Revision 1, Section 4.2.

Environmentally-adjusted U_{en} factors are summarized in Table 4.3-2. Each location listed in Table 4.3-2 is discussed individually below.

Location 1 is the reactor vessel shell and lower head, including the nickel-based alloy (NBA) incore instrument nozzles.

Evaluations for the vessel shell and lower head base metal and welds are based on application of bounding F_{en} environmental penalty factors to design CUFs. The maximum design CUF for the clad alloy steel reactor vessel head is 0.024. Adjusting this CUF by a bounding F_{en} of 2.45 for low alloy steel (LAS) results in an U_{en} of 0.059.

Evaluations for the nickel-based alloy incore instrument nozzles are based on application of an F_{en} environmental penalty factor, calculated in accordance with NUREG/CR-6909, to CUFs that were adjusted using the new in-air fatigue curves reported in NUREG/CR-6909. The maximum design CUF for the nickel-based alloy incore instrument nozzle is 0.77. The original design CUF of 0.77 was conservative due to the use of ASME III, Figure N-415a (applies to LAS), to determine allowable cycles versus Figure N-415b (applies to stainless steel and nickel-based alloy). This original design CUF was reduced to 0.206 by applying the alternating stresses from the original design calculation to the new in-air design curve for stainless steel in NUREG/CR-6909. The new design curve for austenitic stainless steel may also be used for nickel-based alloy materials. Adjusting the revised CUF of 0.206 by an F_{en} of 4.16 for nickel-based alloy results in an U_{en} of 0.857.

Location 2 is the reactor vessel inlet and outlet nozzles.

Evaluations for the reactor vessel inlet and outlet nozzles are based on application of bounding F_{en} environmental penalty factors to design CUFs that were adjusted by identifying incremental fatigue contribution attributed to the full NSSS design transient cycles and reducing those incremental contributions based on the 60-year cycle projections presented in Table 4.3-1.

The maximum design CUF for the clad low alloy steel RV inlet nozzles is 0.829. This design CUF was reduced to 0.146 by considering incremental usage and utilizing the 60-year cycle projections from Table 4.3-1. Adjusting the revised CUF of 0.146 by a bounding F_{en} of 2.45 for LAS results in a U_{en} of 0.358. The maximum design CUF for the clad low alloy steel RV outlet nozzles is 0.768. This design CUF was reduced to 0.335 by considering incremental usage and utilizing the 60-year cycle projections. Adjusting the revised CUF of 0.335 by a bounding F_{en} of 2.45 for LAS results in a U_{en} of 0.821.

Location 3 is the pressurizer surge line, which includes the hot leg surge nozzle, surge line piping, and pressurizer surge nozzle.

Hot Leg Surge Nozzle - Includes the stainless steel clad carbon steel surge nozzle, Alloy 82/182 weld buildup (buttering) on the outboard end of the nozzle, Alloy 82/182 weld that connects the weld buildup to the stainless steel pipe, and the Alloy 52/152 weld overlay on the outer diameter of the nozzle that extends from near the end of the taper region of the hot leg surge nozzle to just beyond the Alloy 82/182 weld.

The bounding environmentally adjusted cumulative usage factor for the hot leg surge nozzle is as follows:

- Evaluations for the stainless steel clad carbon steel nozzle are based on application of bounding F_{en} environmental penalty factors to design CUFs. The maximum design CUF occurs at the inside radius of the carbon steel nozzle at 0.445. Adjusting this CUF by a bounding F_{en} of 1.74 for carbon steel results in a U_{en} of 0.774.

Surge Line Piping - Includes stainless steel pipe, stainless steel fittings, and stainless steel welded joints between the outboard end of the hot leg surge nozzle weld overlay up to the stainless weld that connects the pressurizer surge line to the pressurizer nozzle stainless steel safe end.

The ASME Section III structural/stress analyses performed in the 1990 – 1992 timeframe (BAW-2127 [References 4.8-10 through 4.8-13]) for the stainless steel surge line piping was used to obtain U_{en} values for the surge line. The 60-year transient projections were used for the evaluation with the exception of the 60-year projection of heatup/cooldowns (HU/CDs), where a best estimate number of 114 total was used. The surge line piping was evaluated using an integrated F_{en} approach consistent with MRP-47, Revision 1, Section 4.2.

For the stainless steel surge line piping, the equations for the fatigue penalty factors F_{en} were taken from NUREG/CR-5704. The F_{en} values are a function of dissolved oxygen (DO) level, metal service temperature and strain rate, as described in MRP-47, Revision 1, Section 4.2. The effects of metal service temperature were considered, transformed strain rates were assumed to be at saturation, and dissolved oxygen was considered as being less than 0.05 ppm.

Transformed Strain Rate

Transformed strain rates were assumed to be at the saturation value of ln(0.001). This corresponds to a strain rate of 0.0004%/sec or less.

Transformed Metal Service Temperature

For each Peak or Valley, the metal temperature is known from the Surge Line Functional Specification. For each load set pair, the F_{en} values were calculated based on the varying metal temperature values from the valley to the peak will be integrated. The multiplication of the resulting F_{en} factor - after integration - by the usage factor in air for that particular load set pair (from the Valley to the Peak) results in the usage factor with consideration of the environmental effects for that particular load set pair. This means that for each load set pair: $U_{en} = F_{en} * U(\text{in-air})$.

For each integration point from the Valley to the Peak, the transformed temperature T* is calculated as specified for stainless steel in Subsection 4.2.4 of MRP-47, Revision 1: $T^* = 0.0$ for $T < 392^{o}F$, and $T^* = 1.0$ for $T \geq 392^{o}F$.

Transformed Dissolved Oxygen

For the stainless steel surge line, it will be assumed that dissolved oxygen is less than 0.05 ppm. $O^* = 0.260$.

Surge Line Fatigue Calculation

Using the methodology described above, the ASME Section III structural/stress analyses performed in the 1990 – 1992 timeframe (BAW-2127) for the stainless steel surge line piping was re-evaluated to extract the variations of metal service temperature to calculate environmental correction factors F_{en}. With regard to the methodology discussed above, the following are relevant to the calculation of environmentally-adjusted CUFs for the surge line.

- In the main fatigue usage calculations the F_{en} values are calculated as a function of the temperature changes between the Valley and the Peak [Integration of the F_{en} values ranged between 2.55 when metal temperature is less than 392°F to a maximum of 15.35 when metal temperature equals or exceeds 392°F]. In addition, all the F_{en} calculations are based on the most severe strain rate of 0.0004 % / sec, which is the “saturation strain rate.”
- In the fatigue usage calculations for the low stratification transients, the most severe F_{en} of 15.35 is used.
- For all the full-flush cycles, the most severe F_{en} of 15.35 is used.
- For thermal striping by itself (thermal striping fluctuations), the most severe strain amplitude is less than 0.097% and F_{en} is equal to 1.0 for thermal striping.

Surge Line Fatigue Results

The bounding environmentally adjusted cumulative usage factors for the surge line are as follows:

- The maximum design CUF for the stainless steel pipe adjacent to the outboard end of the hot leg surge nozzle is 0.179. Using the integrated F_{en} approach described above, the U_{en} for the stainless steel pipe adjacent to the outboard end of the hot leg surge nozzle weld overlay is 0.387 with a global F_{en} of 5.83. An adjusted CUF of 0.07 is obtained by dividing the U_{en} of 0.387 by the global F_{en} of 5.83.
- The maximum design CUF for the elbows is 0.643. Using the integrated F_{en} approach described above, the maximum U_{en} for the elbows is 0.996 with a global F_{en} of 4.17. An adjusted CUF of 0.239 is obtained by dividing the U_{en} of 0.996 by the global F_{en} of 4.17.
- The maximum design CUF for the straight pipe is 0.764. Using the integrated F_{en} approach described above, the maximum U_{en} for the straight pipe is 0.846 with a global F_{en} of 2.52. An adjusted CUF of 0.336 is obtained by dividing the U_{en} of 0.846 by the global F_{en} of 2.52.
- The maximum design CUF for the stainless steel weld that connects the surge line to the pressurizer surge nozzle safe end is 0.51. Using the integrated F_{en} approach described above, the U_{en} for the stainless steel weld that connects the surge line to the pressurizer surge nozzle safe end is 0.644 with a global F_{en} of 8.84. An adjusted CUF of 0.073 is obtained by dividing the U_{en} of 0.644 by the global F_{en} of 8.84.

Pressurizer Surge Nozzle - Includes the stainless steel clad carbon steel surge nozzle, Alloy 82/182 weld buttering on the outboard end of the nozzle, Alloy 82/182 weld that connects the buttering to the stainless steel safe end, the stainless steel safe end, and the Alloy 52/152 weld overlay on the outer diameter of the nozzle that extends from the end of the taper region of the pressurizer surge nozzle to just beyond the Alloy 82/182 weld.

The bounding environmentally adjusted cumulative usage factors for the pressurizer surge nozzle are as follows:

- Evaluations for the stainless steel clad carbon steel nozzle are based on application of bounding F_{en} environmental penalty factors to design CUFs. For the stainless steel clad carbon steel nozzle the maximum design CUF occurs at the inside radius of the carbon steel nozzle is 0.182. Adjusting this CUF by a bounding F_{en} of 1.74 for carbon steel results in a U_{en} of 0.317.
- Evaluations for the stainless steel safe end are based on application of bounding F_{en} environmental penalty factors to design CUFs adjusted by identifying incremental fatigue contribution attributed to the full NSSS design transient cycles and reducing those incremental contributions based on the 60-year cycle projections. The maximum design CUF for the stainless steel safe end at the inside surface is 0.108. This design CUF was reduced to 0.058 by considering incremental usage and utilizing the 60-year cycle projections. Adjusting this CUF by a bounding F_{en} of 15.35 for stainless steel results in a U_{en} of 0.892.

Location 4 is the high pressure injection/makeup nozzle and stainless steel safe end.

The stainless steel clad carbon steel nozzle is connected to a stainless steel safe end by an Alloy 82/182 weld. Adjustments of design CUFs were made for the HPI/MU nozzle and associated safe end by removing conservatisms in the original design calculation yet maintaining the full set of 40-year NSSS design cycles. In addition, the stainless steel safe end was evaluated using an integrated F_{en} approach consistent with MRP-47, Revision 1, Section 4.2

For the stainless steel clad carbon steel nozzle the maximum design CUF is 0.589. This design CUF was reduced to 0.348 by removing conservatisms in the design analysis yet retaining the full set of NSSS design transients. Adjusting this CUF by a bounding F_{en} of 1.74 for carbon steel results in a U_{en} of 0.606.

The maximum design CUF for the stainless steel safe end is 0.664. This design CUF was reduced to 0.550 by removing conservatisms in the design analysis yet retaining the full set of NSSS design transients. Adjusting this CUF using an integrated F_{en} based on the methodology in MRP-47, Section 4.2.2, yields a U_{en} of 4.417, which is >1.0 and is unacceptable for the period of extended operation. Both the HPI/MU nozzle stainless steel safe end and associated Alloy 82/182 weld have environmentally adjusted CUFs greater than 1.0. and are therefore, unacceptable for the period of extended operation.

Location 5 is the reactor vessel core flood nozzle.

Evaluations of the core flood nozzle are based on application of bounding F_{en} environmental penalty factors to design CUF. As specified in the NUREG/CR-6260, the limiting location for B&W plants is the stainless steel clad low alloy steel nozzle. The maximum design CUF for the stainless steel clad low alloy steel core flood nozzle is 0.0504. Adjusting this CUF by a bounding F_{en} of 2.45 for LAS results in a U_{en} of 0.123.

Location 6 is the decay heat removal system Class 1 piping.

The limiting location is the decay heat return line to core flood system tee. The evaluation is based on application of a bounding F_{en} environmental penalty factor to the design CUF. The maximum design CUF for the stainless steel tee is 0.233. Adjusting this CUF by a bounding F_{en} of 2.55 for stainless steel at fluid temperatures less than 200 ºC (392 ºF) results in a U_{en} of 0.595. The decay heat system cut in temperature is 280 ºF, which is well below the threshold of 200 ºC (392 ºF).

Table 4.3-2 Davis-Besse CUFs for NUREG/CR-6260 Locations

	NUREG/CR-6260 generic locations	Davis-Besse plant-specific locations	Material type	Design CUFs	Adjusted CUFs	F_{en}	U_{en}
1	Reactor vessel shell and lower head	Vessel shell and lower head	LAS	0.024	NA[8]	2.45	0.059
		Incore instrument nozzle	NBA	0.770	0.206[5]	4.16	0.857
2	Reactor vessel inlet and outlet nozzles	Reactor vessel inlet nozzle	LAS	0.829	0.146[1]	2.45	0.358
		Reactor vessel outlet nozzle	LAS	0.768	0.335[1]	2.45	0.821
3	Pressurizer surge line	Hot leg surge nozzle inside radius	CS	0.445	NA[8]	1.74	0.774
		Piping adjacent to outboard end of hot leg surge nozzle	SS	0.179	0.07[2]	5.83	0.387
		Piping elbows	SS	0.643	0.239[2]	4.17	0.996
		Piping straights	SS	0.764	0.336[2]	2.52	0.846
		Piping to pressurizer surge nozzle safe end weld,	SS	0.51	0.073[2]	8.84	0.644
		Pressurizer surge nozzle inside radius	CS	0.182	NA[8]	1.74	0.317
		Pressurizer surge nozzle, safe end	SS	0.108	0.058[1]	15.35	0.892
4	HPI/Makeup nozzle	HPI/Makeup nozzle	CS	0.589	0.348[3]	1.74	0.606
		HPI/Makeup nozzle safe end	SS	0.664	0.550[4]	8.03[6]	4.417[7]
5	Reactor vessel core flood nozzle	Nozzle	LAS	0.0504	NA[8]	2.45	0.123
6	Decay heat Class 1 piping	Decay heat to core flood tee	SS	0.233	NA[8]	2.55	0.595

1. Adjusted CUF obtained by identifying incremental fatigue contribution attributed to the full NSSS design transient cycles for design CUF and reducing those incremental contributions based on the 60-year cycle projections.
2. Adjusted CUF obtained by dividing U_{en} by global F_{en}. Global F_{en} calculated using method from Section 4.2 of MRP-47, Revision 1 as described above for the pressurizer surge line.
3. Design CUF reduced from 0.589 to 0.348 by removing conservatisms in the original calculation. Full set of design cycles were used for the calculation.
4. Design CUF reduced from 0.664 to 0.550 by removing conservatisms in the original calculation. Full set of design cycles were used for the calculation.
5. Adjusted CUF obtained by applying the alternating stresses from the original design calculation to the new in-air design curve in NUREG/CR-6909 for stainless steel.
6. This is a global F_{en} obtained by dividing U_{en} by the CUF (4.417/ 0.550).
7. 4.417 is >1.0 and is unacceptable for the period of extended operation. (See Section 4.3.4.2, Location 4).
8. Adjusted CUF was not required. Design CUF multiplied by F_{en} resulted in an U_{en} of < 1.0.

4.3.4.3 Management of Environmentally Assisted Fatigue

As indicated in Table 4.3-2, the environmentally adjusted CUF for most locations is less than 1.0. However, HPI/MU nozzle stainless steel safe end and associated Alloy 82/182 weld have environmentally adjusted CUFs greater than 1.0. FENOC will replace the HPI/MU nozzle safe end and associated Alloy 82/182 weld prior to entering the period of extended operation. 60 year cycle projections were used in the evaluation of U_{en} for the RV inlet and outlet nozzles, HPI/MU nozzles safe end, and pressurizer surge nozzle and attached safe end. Sixty-year cycle projections and a best estimate prediction of total HU/CDs of 114 at 60 years were used in the evaluation of U_{en} for the pressurizer surge line. The remaining locations are qualified for environmentally-assisted fatigue for the full set of NSSS design cycles.

The Davis-Besse Fatigue Monitoring Program will manage the effects of environmentally assisted fatigue for each NUREG/CR-6260 location by counting the design transients on which these environmentally adjusted analyses are based, and assuring that appropriate action is taken prior to any transient approaching its analyzed number of cycles.

Disposition: 10 CFR 54.21(c)(1)(iii) The effects of environmentally assisted fatigue will be managed for the period of extended operation by the Fatigue Monitoring Program.

A commitment is provided in Appendix A to replace all four high pressure injection / makeup nozzle safe ends prior to the period of extended operation. In addition, FENOC commits to evaluate the environmental effects of the replacement HPI nozzle safe ends and associated welds in accordance with NUREG/CR-6260 and the guidance of EPRI Technical Report MRP-47, “Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application. Any nickel-based alloy locations will be evaluated in accordance with NUREG/CR-6909.

4.4 ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

The Davis-Besse Environmental Qualification (EQ) of Electrical Components Program manages component thermal, radiation, and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, environmentally qualified components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the limits established in the evaluation. The EQ program ensures that the environmentally qualified components are maintained in accordance with their qualification bases. Equipment qualification evaluations for environmentally qualified components that specify a qualification of at least 40 years are considered TLAAs for license renewal.

Under 10 CFR 54.21(c)(1)(iii) the Environmental Qualification program, which implements the requirements of 10 CFR 50.49 (as further defined and clarified by the Division of Operating Reactors Guidelines, NUREG-0588, Regulatory Guide 1.89 Revision 1, and Regulatory Guide 1.97 Revision 3), is viewed as an aging management program for license renewal. Reanalysis of an aging evaluation to extend the qualifications of components is performed on a routine basis as part of the Environmental Qualification program. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). A discussion of the environmentally qualified component re-analysis attributes is included in the description of the Environmental Qualification (EQ) of Electrical Components Program.

Continued implementation of the Environmental Qualification (EQ) of Electrical Components Program for the period of extended operation ensures that the requirements of 10 CFR 50.49 will continue to be met.

Disposition: 10 CFR 54.21(c)(1)(iii) Environmental qualification of electrical equipment will be managed by the Environmental Qualification (EQ) of Electrical Components Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

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4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

The Davis-Besse containment structure does not include pre-stressed tendons. As described in USAR Section 1.2.10.2, the Davis-Besse containment vessel is a cylindrical steel pressure vessel with hemispherical dome and ellipsoidal bottom. The containment vessel is completely enclosed by a reinforced concrete shield building having a cylindrical shape with a shallow dome roof. An annular space is provided between the wall of the containment vessel and the wall of the shield building, and between the top of the containment vessel and the dome of the shield building. With the exception of the concrete under the containment vessel there are no structural ties between the containment vessel and the shield building. Above the foundation slab there is virtually unlimited freedom for differential movement between the containment vessel and the shield building.

Disposition: Not applicable

TLAAs for tendon prestress are not applicable for Davis-Besse, which has a free-standing metal containment.

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4.6 CONTAINMENT FATIGUE ANALYSES

The containment system for the station utilizes a free-standing containment vessel surrounded by a reinforced concrete shield building. The containment vessel, including all its penetrations, is a low leakage steel structure designed to withstand a postulated loss-of-coolant accident and to confine a postulated release of radioactive material. The Davis-Besse containment does not have a containment liner plate.

The containment, including the vessel, the penetrations, the relief valves, and internal structures, was reviewed for license renewal. The only TLAAs identified were for the containment vessel and the permanent canal seal plant, which are discussed below.

4.6.1 CONTAINMENT VESSEL

The containment vessel is a cylindrical steel pressure vessel with hemispherical dome and ellipsoidal bottom which houses the reactor vessel, reactor coolant piping, pressurizer, pressurizer quench tank and coolers, reactor coolant pumps, steam generators, core flooding tanks, letdown coolers, and normal ventilating system. The containment vessel is a Class B vessel as defined in the ASME Section III, Paragraph N-132, 1968 Edition through Summer 1969 Addenda.

The containment vessel is designed to resist dead loads, LOCA loads, operating loads, external pressure load, temperature and pressure, impingement force and missiles, wind loads, seismic loads, gravity loads, and live loads. The containment vessel meets the requirements of ASME Section III, Paragraph N-415.1; thereby justifying the exclusion of cyclic or fatigue analyses in the design of the containment vessel. Analysis of 400 pressure cycles (from -25 to 120 psi) and 400 temperature cycles (from 30°F to 120°F) were performed against the requirements of ASME Section III, Paragraph N-415.1. To date, the containment vessel has not seen any pressure cycles from -25 to 120 psi. The values of 400 pressure and temperature cycles used to exclude fatigue analyses will not be exceeded for 60 years of operation. Thus, the TLAAs associated with exclusion of fatigue analyses for the containment vessel will remain valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) The TLAAs excluding the containment vessel from fatigue analysis per ASME Section III, Paragraph N415-1 will remain valid through the period of extended operation.

4.6.2 CONTAINMENT PENETRATIONS

Penetrations (of the containment vessel) conform to the requirements of Section III of the ASME Boiler and Pressure Vessel Code.

Piping penetrations (of the containment vessel) are either large diameter, high energy, hot piping (main steam and feedwater lines) or small diameter lower energy piping (general piping). Each main steam and main feedwater containment penetration consists of 1) process pipe, 2) guard pipe, 3) flued head, and 4) penetration bellows assembly.

Consistent with the exclusion of cyclic fatigue analyses in containment vessel design (see Section 4.6.1), a search of the Davis-Besse CLB did not identify any pressurization cycles or fatigue analyses for containment penetration assemblies.

Disposition:	Not a TLAA	There are no fatigue analyses, and hence no TLAA, associated with the containment vessel penetration assemblies.

4.6.3 Permanent Canal Seal Plate

The permanent canal seal plate (also known as permanent reactor cavity seal plate) spans the gap between the reactor vessel and the fuel transfer canal floor, and retains water in the canal when the canal is flooded. The permanent canal seal plate is made up of a support structure that rests on the shield plate and reactor vessel seal ledge and a seal membrane that covers the support structure and is welded to the shield plate and reactor vessel seal ledge. Eight access ports and covers are equally spaced around the permanent canal seal plate to allow for sufficient air flow during normal operations. Multiple shield plate holddown clamps are installed to ensure the shield plate will not fail due to heatup and cooldown loads or core flood line break loads.

The fatigue analysis of the permanent canal seal plate seal membrane, which was installed 2004, shows that the maximum fatigue usage factor, at the inner leg to the reactor vessel seal ledge weld, is based on 50 full heatup/cooldown cycles. As shown in Table 4.3-1, Transient 31A, the permanent canal seal plate is projected to experience 51 heatup/cooldown cycles between installation in 2004 and the end of the period of extended operation. However, the number of occurrences of permanent canal seal plate heatup and cooldown is tracked by the Fatigue Monitoring Program to ensure that action is taken before the analyzed numbers of transients are reached. As such, the effects of aging due to fatigue of the permanent canal seal plate seal membrane are managed for the period of extended operation.

Disposition:	10 CFR 54.21(c)(1)(iii)	The effects of fatigue on the permanent canal seal plate seal membrane will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

4.7.1 LEAK-BEFORE-BREAK

The Reactor Coolant System has been evaluated using the criteria of Standard Review Plan Section 3.6.3, Leak-Before-Break, evaluation procedures (see USAR Sections 3.6.2.2.1 and 3.8.2.3.4.d). In conjunction with General Design Criterion 4 of 10 CFR 50 Appendix A, this allows the exclusion of the dynamic effects of a postulated pipe rupture and excludes cold leg and hot leg breaks from the reactor vessel cavity pressurization analysis post-LOCA.

The leak-before-break (LBB) concept relies on the plant's ability to detect leakage from a through-wall flaw and then take appropriate action before that flaw grows to the point of pipe failure. Topical report BAW-1847 Revision 1 [Reference 4.8-1] presents the LBB topical evaluation of Reactor Coolant System primary piping (36 inch hot leg piping and 28 inch cold leg piping) under normal plus faulted loading conditions over the current term of operation (i.e., 40 years). Report BAW-1847 Revision 1 showed that postulated flaws producing detectable leakage exhibit stable growth, and thus, allow a controlled plant shutdown before any potential exists for catastrophic piping failure. The inputs to these analyses include Reactor Coolant System piping structural loads, leakage flaw size determination, and Reactor Coolant System piping material properties.

The LBB analysis reported in BAW-1847 Revision 1 was performed in accordance with the guidance provided in Section 5.2, Item (d), of NUREG-1061, Volume 3, "Report of the U.S. Nuclear Regulatory Commission Piping Review Committee, Evaluation of Potential for Pipe Breaks."

FENOC received relief to install Alloy 52 weld overlays on the reactor coolant pump suction and discharge nozzles Alloy 82/182 dissimilar metal welds for mitigation of primary water stress corrosion cracking (PWSCC). These welds are located in piping approved for LBB. Therefore, an updated LBB evaluation to reflect the new weld configuration with the weld overlays in place was submitted and has been approved by the NRC [Reference 4.8-17]. These weld overlays were installed during the Cycle 16 refueling outage.

The LBB analysis includes fatigue flaw growth analysis, thermal aging analyses for cast austenitic stainless steel, and PWSCC analyses that could be influenced by time. The time-limited aspects of fatigue flaw growth, thermal aging and PWSCC are addressed separately in the subsections below.

4.7.1.1 Fatigue Flaw Growth

The LBB analysis postulated surface flaws at the piping system locations with the highest stress coincident with the lower bound of the material properties for base metal and welds. The fatigue crack growth analysis for postulated flaws was performed to demonstrate that a surface flaw is likely to propagate in the through-wall direction and develop an identifiable leak before it will propagate circumferentially around the pipe to such an extent that it could cause a double-ended pipe rupture under faulted conditions. The fatigue flaw growth analysis used plant design transients. The updated analysis used 1.5 times the design cycles for the reactor coolant pump suction and discharge weld overlays.

The transient cycles are being monitored by the Fatigue Monitoring Program. If a transient cycle count approaches the allowable design limit, corrective actions are taken. Therefore, the effects of fatigue flaw growth on piping approved for LBB will be managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: 10 CFR 54.21(c)(1)(iii) The effects of fatigue flaw growth on piping approved for LBB will be managed by the Fatigue Monitoring Program for the period of extended operation.

4.7.1.2 Thermal Aging

The only stainless steels in the leak-before-break analysis are the safe ends welded to the reactor coolant pump casings and the pump casings themselves; with the pump casings the only cast stainless steel. The reactor coolant pump casings at Davis-Besse, including the suction and discharge nozzles, are annealed SA 351 CF-8M, and were statically cast.

The updated LBB analysis was based on saturated embrittlement of the cast austenitic stainless steel (CASS) casings such that there is no embrittlement TLAA.

An aging management review of the Reactor Coolant System, including the reactor coolant pumps, has been performed for license renewal (see Section 3.1). Reduction of fracture toughness due to thermal embrittlement of CASS components is an aging effect requiring management for the reactor coolant pump casings and is managed by the Inservice Inspection Program. The acceptability of a 10-year inspection interval for these weld overlays was demonstrated in the updated LBB analysis. This analysis does not justify operation of the weld overlays for the life of the plant, but for the 10 years between inspections. Therefore, the effects of thermal aging on CASS components in the approved LBB piping will be managed by the Inservice Inspection Program for the period of extended operation.

Disposition: Not a TLAA. The effects of thermal aging on CASS components in the approved LBB piping will be managed by the Inservice Inspection Program for the period of extended operation.

4.7.1.3 Primary Water Stress Corrosion Cracking

FENOC received relief to install weld overlays on certain Alloy 600 components and Alloy 82/182 dissimilar metal welds for mitigation of PWSCC. As presented in Section 4.7.1, this relief included Alloy 82/182 dissimilar metal welds that are located in piping approved for LBB. FENOC updated the original leak-before-break calculations for Davis-Besse with an evaluation demonstrating that the weld overlays resolve the concerns for original welds susceptibility to primary water stress corrosion cracking. Critical crack sizes and leakage rates with the weld overlay in place were evaluated to demonstrate that margins exist for detection of leakage, i.e., the conclusions of the existing leak-before-break analysis remain valid.

For license renewal, an aging management review of the Reactor Coolant System, including the nickel-alloy weld locations, has been performed (see Section 3.1). Cracking due to PWSCC is an aging effect requiring management for the period of extended operation and is managed by the Inservice Inspection Program and Nickel-Alloy Management Program.

Disposition:	Not a TLAA.	The effects of PWSCC on the Reactor Coolant System piping will be managed by the Inservice Inspection Program and Nickel-Alloy Management Program for the period of extended operation.

4.7.2 METAL CORROSION ALLOWANCE FOR PRESSURIZER INSTRUMENT NOZZLES

USAR Section 5.2.3.2 indicates that pressurizer nozzle repairs and replacements have resulted in a portion of the carbon steel pressurizer nozzle bore being exposed to reactor coolant. This resulted in an increase of the general corrosion rate of the pressurizer shell base metal in the nozzle bores from zero to 1.42 thousandths of an inch (mils) per year. Over the 9 years from the installation of this modification to the end of the original licensed period, this will result in a loss of 13 mils of the pressurizer carbon steel shell in the nozzle annular regions. The allowable radial corrosion limit, calculated per ASME Section III, is 293 mils for the level instrument nozzles, 493 mils for the sample nozzle and 495 mils for the vent and thermowell nozzles. This corrosion analysis is a TLAA.

The projected loss of material can be extrapolated to 60-years by multiplying the 1.42 mils per year corrosion rate times the 29 years from the date of installation to the end of the period of extended operation. The projected loss of 41.2 mils (29 x 1.42) remains below the allowable radial corrosion limits.

Disposition: 10 CFR 54.21(c)(1)(ii) The metal corrosion allowance TLAA for the pressurizer nozzle annular regions has been projected through the period of extended operation.

4.7.3 Reactor Vessel Thermal Shock Due to Borated Water Storage Tank Water Injection

USAR Section 5.2 addresses integrity of the reactor coolant pressure boundary and the analysis to demonstrate that the reactor vessel can safely accommodate the rapid temperature change associated with the postulated operation of the Emergency Core Cooling System (ECCS) at the end of the vessel's design life. The analysis documents the reactor vessel integrity during a small steam line break, which creates a pressurized thermal shock condition. This transient generates the greatest level of stress in the reactor vessel. Technical Specifications allow the borated water storage tank (BWST) water temperature to be as low as 35°F. The analysis was revised for license renewal to use reactor vessel embrittlement values that bound the period of extended operation.

The revised fracture mechanics analysis evaluated the integrity of the reactor vessel against PTS for 52 EFPY considering the 35°F minimum temperature for the BWST. Several locations in the reactor vessel were analyzed for PTS, and all locations have demonstrated service life greater than 52 EFPY. Flaws do not initiate for any of the postulated flaw depths. The minimum critical margin to applied pressure margin is 2.21 at the nozzle belt forging.

In addition, as addressed in Section 4.2.3, the vessel's compliance with 10 CFR 50.61 has been assessed. All RT_{PTS} values are below the screening criteria at 60 years.

Disposition: 10 CFR 54.21(c)(1)(ii) The reactor vessel integrity analysis has been projected to the end of the period of extended operation.

4.7.4 High Pressure Injection/Makeup Nozzle Thermal Sleeves

During the Cycle 5 refueling outage, Davis-Besse discovered a failed thermal sleeve for high pressure injection (HPI)/makeup nozzle A-1. Corrective actions included assessment and preservation of the structural integrity of the nozzle, which had experienced thermal cycling due to the thermal sleeve failure. The makeup flow path was re-routed from nozzle A-1 to nozzle A-2 during the Cycle 6 refueling outage (1990) as one of the corrective actions. Fracture mechanics analysis of thermal sleeve life under various makeup flow cycling conditions predicted a thermal sleeve lifetime exceeding 20 eighteen-month operating cycles under current makeup flow control conditions.

Since that analysis, Davis-Besse had an extended (approximately two year) Cycle 13 refueling outage, converted to a 24-month fuel cycle, and performed a measurement uncertainty recapture power uprate. The corresponding predicted end-of-life for the HPI/makeup nozzle thermal sleeve is approximately 2022, based on the predicted number of makeup thermal cycles. The current operating license for Davis-Besse will expire in April of 2017. Davis-Besse will replace all four makeup nozzle thermal sleeves prior to the period of extended operation. The commitment to replace these thermal sleeves is found in Appendix A to this application.

Disposition: 10 CFR 54.21(c)(1)(iii) Cracking of the HPI/makeup thermal sleeve will be managed through the period of extended operation by the Fatigue Monitoring Program. In addition, a FENOC commitment to replace the thermal sleeves prior to the period of extended operation is contained in Appendix A of the License Renewal Application.

4.7.5 INSERVICE INSPECTION – FRACTURE MECHANICS ANALYSES

10 CFR 50.55a(g) requires an Inservice Inspection program to verify the integrity of the reactor coolant pressure boundary. ASME Section XI, Table IWB-2500-1 requires the use of nondestructive examination techniques to detect and characterize flaws. Flaws detected during examination are compared to acceptance standards established in ASME Section XI. Unacceptable flaws require detailed analyses, repair, or replacement.

Acceptance via fracture mechanics analysis requires a prediction of flaw growth considering a chosen evaluation period, i.e., no shorter than the time until the next inspection following discovery of the flaw or as long as the remaining service life of the plant. Flaw indications that are determined not to grow beyond acceptance limits during the evaluation period are justified for continued operation. Fracture mechanics analyses performed for the life of the plant are TLAAs that typically involve the same design transient cycle assumptions considered in the current licensing basis.

A search of Davis-Besse inservice inspection reports and docketed correspondence was performed. Two flaw growth analyses were identified as TLAAs and are evaluated below.

4.7.5.1 Reactor Coolant System Loop 1 Cold Leg Drain Line Weld Overlay Repair

FENOC performed a full structural overlay repair for an axial indication found on the Reactor Coolant System Loop 1 cold leg drain line during the Cycle 14 refueling outage. The structural weld overlay of the cold leg drain nozzle was designed consistent with the requirements of ASME Section XI; Code Case N-504-2; non-mandatory Appendix

Q; and was supplemented by additional design considerations specific to the unique nature of the geometry and materials of the cold leg drain nozzle-to-elbow weld.

The overlay is designed as a full structural overlay that assumes the as-found flaw propagates to a 100% through-wall 360-degree crack rather than performing a crack growth analysis of the as-found flaw. Thus there is no time dependency in the weld overlay design.

The fatigue analysis for the repaired configuration conservatively estimated cycles for 60 years at 1.5 times the original design cycles. Because this analysis is based on a specific number of cycles, it is a TLAA. The Fatigue Monitoring Program manages the effects of fatigue on the reactor coolant system drain line weld overlay repair by counting the thermal cycles incurred through the period of extended operation.

Disposition:	10 CFR 54.21(c)(1)(iii)	The effects of fatigue on the reactor coolant system cold leg drain line nozzle weld overlay repair will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.7.5.2 OTSG 1-2 Flaw Evaluations

During the Cycle 5 refueling outage (May 1988) a number of flaw indications were detected in steam generator 1-2, both in the shell near the steam outlet nozzle and in the shell welds near the lower tubesheet-to-shell juncture. Two of the indications in the shell near the steam outlet nozzle were evaluated according to ASME Section XI, with the remaining shell indications bounded by those evaluated. Five of the indications in the shell welds near the lower tubesheet-to-shell juncture were evaluated, with the remaining shell weld indications bounded by those evaluated.

Simplified evaluation of fatigue crack growth, based on 240 heatup and cooldown cycles, concluded that there would be only slight crack growth, and the indications were found to be acceptable by ASME Section XI, IWB-3612 standards. Because these analyses are based on a specific number of cycles, they are TLAAs. The Fatigue Monitoring Program manages the effects of fatigue on steam generator flaw evaluations by counting the thermal cycles incurred through the period of extended operation.

Disposition:	10 CFR 54.21(c)(1)(iii)	The effects of fatigue on the steam generator flaw growth will be managed for the period of extended operation by the Fatigue Monitoring Program.

4.8 REFERENCES

4.8-1 AREVA NP Document BAW-1847, “Leak-Before-Break Evaluation of Margins Against Full Break for RCS Piping of B&W Designed NSS,” Revision 1

4.8-2 AREVA NP Document BAW-2178P-A, “Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group, for Level C & D Service Loads,” Revision 0

4.8-3 AREVA NP Document BAW-2192P-A, “Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group, for Level A & B Conditions,” Revision 0

4.8-4 AREVA NP Document BAW-2222, “Reactor Vessel Working Group Response to Closure Letters to NRC Generic Letter 92-01, Revision 1,” June 1994

4.8-5 AREVA NP Document BAW-2325, “Response to Request for Additional Information (RAI) Regarding Reactor Pressure Vessel Integrity, B&W Owners Group – Reactor Vessel Working Group,” Revision 1

4.8-6 AREVA NP Document BAW-2241P-A, “Fluence and Uncertainty Methodologies,” April 1999 (NRC Safety Evaluation Report included)

4.8-7 AREVA NP Document BAW-10013-A, "Study of Intergranular Separations in Low-Alloy Steel Heat-Affected Zones under Austenitic Stainless Steel Weld Cladding,” Last Revised February 15, 1972

4.8-8 AREVA NP Document BAW-10046A, “Method of Compliance with Fracture Toughness and Operational Requirements of 10CFR50, Appendix G,” Revision 4

4.8-9 Electric Power Research Institute (EPRI) Report TR-105090, “Guidelines to Implement the License Renewal Technical Requirements of 10CFR54 for Integrated Plant Assessments and Time-Limited Aging Analyses,” November 1995

4.8-10 BAW-2127, “Final Submittal for Nuclear Regulatory Commission Bulletin 88-11 'Pressurizer Surge Line Thermal Stratification’,” December 1990

4.8-11 BAW-2127, Supplement 1, “Plant-Specific Analysis in Response to Nuclear Regulatory Commission Bulletin 88-11 'Pressurizer Surge Line Thermal Stratification,’ Davis-Besse Nuclear Power Station Unit 1,” September 1991 - replaced by Supplement 3

4.8-12 BAW-2127, Supplement 2, “Pressurizer Surge Line Thermal Stratification for the B&W 177-FA Nuclear Plants, Summary Report, Fatigue Stress Analysis of the Surge Line Elbows,” May 1992

4.8-13 BAW-2127, Supplement 3, “Plant-Specific Analysis in Response to Nuclear Regulatory Commission Bulletin 88-11 'Pressurizer Surge Line Thermal Stratification,’ Davis-Besse Nuclear Power Station Unit 1,” December 1993

4.8-14 AREVA NP Document BAW-2308-01-A, "Initial RT_{NDT} Of Linde 80 Weld Materials," August 2005 (NRC SER Included)

4.8-15 AREVA NP Document BAW-2251A, "Demonstration of the Management of Aging Effects for the Reactor Vessel," August 1999 (NRC SER included)

4.8-16 FENOC Letter L-09-225, Barry S. Allen to USNRC Document Control Desk, "Supplemental Information Related to a License Amendment Request to Incorporate the Use of Alternate Methodologies for the Development of Reactor Pressure Vessel Pressure-Temperature Limit Curves, and Request for Exemption from Certain Requirements Contained in 10 CFR 50.61 and 10 CFR 50, Appendix G (TAC No. ME1127) – License Amendment Request, ME1128 – Exemption Request)," December 18, 2009 (ADAMS, ML093570103)

4.8-17 NRC Letter, Michael Mahoney (NRC), to Barry S. Allen (FENOC), Davis-Besse Nuclear Power Station, Unit 1 - Issuance of Amendment Regarding Application To Update the Leak-Before-Break Evaluation for the Reactor Coolant Pump Suction and Discharge Nozzle Dissimilar Metal Welds (TAC No. ME2310), March 26, 2010

APPENDIX A

UPDATED SAFETY ANALYSIS REPORT SUPPLEMENT

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A.0 INTRODUCTION

This appendix provides the information to be submitted in an Updated Safety Analysis Report (USAR) Supplement as required by 10 CFR 54.21(d) for the Davis-Besse License Renewal Application (LRA). The LRA contains the technical information required by 10 CFR 54.21(a) and (c). Section 3 contains the results of the aging management reviews. The programs and activities credited to manage the effects of aging are described in Appendix B. Section 4 documents the evaluations of time-limited aging analyses for the period of extended operation. Section 3, Section 4, and Appendix B have been used to prepare the program and activity descriptions that are contained in this appendix.

This appendix is divided into three sections:

- Section A.1 contains summary descriptions of the programs and activities credited to manage the effects of aging during the period of extended operation;
- Section A.2 contains summaries of the evaluations of time-limited aging analyses for the period of extended operation;
- Section A.3 contains a listing of the commitments associated with license renewal.

The information presented in these three sections will be incorporated into the Davis-Besse USAR following issuance of the renewed operating license in accordance with 10 CFR 50.71(e).

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A.1 SUMMARY DESCRIPTIONS OF AGING MANAGEMENT PROGRAMS AND ACTIVITIES

The license renewal integrated plant assessment and evaluation of time-limited aging analyses identified existing and new aging management programs necessary to provide reasonable assurance that components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. This section describes the aging management programs and activities identified during the integrated plant assessment and evaluation of time-limited aging analyses. The aging management programs and activities will be implemented as identified in the list of license renewal commitments (see Table A-1). The aging management programs identified as necessary in association with the evaluation of time-limited aging analyses are described in Sections A.1.14 and A.1.16.

Three elements of an effective aging management program that are common to each of the aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the Quality Assurance Program Manual for Davis-Besse, which implements the requirements of 10 CFR 50, Appendix B. The corrective actions, confirmation process, and administrative controls in the Quality Assurance Program Manual, to be applied to the credited aging management programs and activities for the structures and components determined to require aging management, are consistent with the related discussions in the Appendix on Quality Assurance for Aging Management Programs in NUREG-1801, Volume 2.

A.1.1 10 CFR PART 50, APPENDIX J PROGRAM

The 10 CFR Part 50, Appendix J Program monitors Containment leak rate. Containment leak rate tests are required to assure that: (a) leakage through primary Containment, and systems and components penetrating primary Containment, shall not exceed allowable values specified in the Technical Specifications, and (b) periodic surveillance of primary Containment penetrations and isolation valves is performed so that proper maintenance and repairs are made. Appendix J, Option B, is utilized. The Containment leak rate tests are performed in accordance with the guidelines contained in NRC Regulatory Guide 1.163, Performance-Based Containment Leak-Test Program [Reference A.1-1], as modified by approved exceptions; and NEI 94-01, Industry Guidance for Implementing Performance-Based Options of 10 CFR Part 50 Appendix J [Reference A.1-2].

A.1.2 ABOVEGROUND STEEL TANKS INSPECTION PROGRAM

The Aboveground Steel Tanks Inspection Program manages the effects of corrosion on the external surfaces and inaccessible locations of the steel fire water storage tank and diesel oil storage tank. The Aboveground Steel Tanks Inspection Program is a condition monitoring program that consists of periodic visual inspections of tank external surfaces and volumetric examinations of tank bottoms.

A.1.3 AIR QUALITY MONITORING PROGRAM

The Air Quality Monitoring Program is a preventive program that is implemented via periodic sampling of the air for hydrocarbons, dew point, and particulates. The Air Quality Monitoring Program ensures that the system remains dry and free of contaminants, such that there are no aging effects which require management.

A.1.4 BOLTING INTEGRITY PROGRAM

The Bolting Integrity Program is a combination of existing activities that rely on manufacturer and vendor information, as well as on industry recommendations, such as contained in EPRI Reports TR-104213 [Reference A.1-3] and TR-111472 [Reference A.1-4], for a comprehensive bolting and bolting maintenance program addressing proper selection, assembly, and maintenance of bolting for pressure-retaining closures and structural connections. The program also includes preventive measures to preclude or minimize loss of preload and cracking.

The Bolting Integrity Program includes, through the Inservice Inspection Program, Inservice Inspection (ISI) Program – IWE, Inservice Inspection (ISI) Program – IWF, Structures Monitoring Program, and External Surfaces Monitoring Program, the periodic inspection of bolting for indications of degradation such as leakage, loss of material due to corrosion, loss of preload, and cracking.

A.1.5 BORAL® MONITORING PROGRAM

The Boral® Monitoring Program detects degradation of Boral® neutron absorbers in the spent fuel storage racks by in situ testing. From the monitoring data, the stability and integrity of Boral® in the storage cells are assessed.

A.1.6 BORIC ACID CORROSION PROGRAM

The Boric Acid Corrosion Program manages the effects of boric acid leakage on the external surfaces of in-scope structures and components potentially exposed to boric acid leakage. The Boric Acid Corrosion Program is a condition monitoring program consisting of visual inspections.

A.1.7 BURIED PIPING AND TANKS INSPECTION PROGRAM

The Buried Piping and Tanks Inspection Program manages the effects of corrosion on the external surfaces of piping, tanks and associated bolting exposed to a buried (soil) environment. The Buried Piping and Tanks Inspection Program is a combination of a mitigation program (consisting of protective coatings) and a condition monitoring program (consisting of visual inspections).

A.1.8 CLOSED COOLING WATER CHEMISTRY PROGRAM

The Closed Cooling Water Chemistry Program mitigates damage due to loss of material, cracking, and reduction in heat transfer of components that are within the scope of license renewal and contain closed cooling water. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material, cracking, or reduction in heat transfer through proper monitoring and control of corrosion inhibitor concentrations consistent with the current EPRI water chemistry guideline.

The Closed Cooling Water Chemistry Program includes corrosion rate measurement at selected locations in the closed cooling water systems and is supplemented by the One-Time Inspection, which provides verification of the effectiveness of the program in managing the effects of aging.

A.1.9 COLLECTION, DRAINAGE, AND TREATMENT COMPONENTS INSPECTION PROGRAM

The Collection, Drainage, and Treatment Components Inspection Program consists of visual inspections of the surfaces of in-scope steel and other metal components exposed to raw (untreated) water, that are not covered by other aging management programs, for evidence of loss of material, as well as cracking of susceptible materials, or reduction in heat transfer for susceptible components. This program is implemented via opportunistic inspections during periodic maintenance, repair, and surveillance activities when the surfaces are made available for inspection, or via focused inspection. These inspections ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation.

A.1.10 CRANES AND HOISTS INSPECTION PROGRAM

The Cranes and Hoists Inspection Program manages loss of material for structural components of cranes (including bridge, trolley, rails, and girders), monorails, and hoists within the scope of license renewal through periodic visual inspection of structural members for signs of corrosion and wear. The cranes, monorails and hoists within the scope of license renewal are those defined by NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," and light load handling systems related to refueling.

The Cranes and Hoists Inspection Program is based on guidance contained in ANSI B30.2 [Reference A.1-5] for overhead and gantry cranes, ANSI B30.11 [Reference A.1-6] for monorail systems and underhung cranes, and ANSI B30.16 [Reference A.1-7] for overhead hoists.

A.1.11 ELECTRICAL CABLE CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS INSPECTION

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection detects and characterizes the aging of metallic electrical connections within the scope of license renewal. The one-time inspection uses thermography (augmented by the optional use of contact resistance testing) to detect loose or degraded connections that lead to increased resistance for a representative sample of metallic electrical connections in various plant locations.

A.1.12 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS PROGRAM

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program manages the aging of cables and connections that are not required to be environmentally qualified but are within the scope of license renewal and subject to adverse localized environments.

Cables and connections subject to an adverse localized environment are managed by visual inspection. Accessible electrical cables and connections installed in adverse localized environments are visually inspected for signs of accelerated age-related degradation such as embrittlement, discoloration, cracking, or surface contamination.

A.1.13 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program manages the potential loss of insulation resistance for high voltage, low current, sensitive instrument circuits that are subject to adverse localized environments (heat, radiation, and moisture in the presence of oxygen). The program is applicable to in-scope neutron monitoring and radiation monitoring circuits and utilizes testing of the cable assemblies for the subject circuits to determine if the cable insulation resistance is degrading.

A.1.14 Environmental Qualification (EQ) of Electrical Components Program

The Environmental Qualification (EQ) of Electrical Components Program implements the requirements of 10 CFR 50.49 (as further defined and clarified by the Division of Operating Reactors (DOR) Guidelines [Reference A.2-10], NUREG-0588 [Reference A.2-11], Regulatory Guide 1.89 [Reference A.2-12], and Regulatory Guide 1.97 [Reference A.2-13]). The program demonstrates that subject electrical components located in harsh plant environments are qualified to perform their safety functions in those harsh environments, consistent with 10 CFR 50.49 requirements. The program manages component thermal, radiation, and cyclical aging, as applicable, through the use of aging evaluations. The program requires action to be taken before individual components in the scope of the program exceed their qualified life. Actions taken to maintain qualification include replacement of piece parts, replacement of complete components, or reanalysis.

As required by 10 CFR 50.49, EQ components not qualified to the end of the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. Some aging evaluations for EQ components specify a qualification of at least 40 years and are considered time-limited aging analyses for license renewal. The program ensures that these EQ components are maintained within the bounds of their qualification bases.

Reanalysis of an aging evaluation to extend a component qualification is performed on a routine basis as part of the program. Important attributes for the reanalysis of an aging evaluation include analytical models, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met).

A.1.15 EXTERNAL SURFACES MONITORING PROGRAM

The External Surfaces Monitoring Program is a condition monitoring program that consists of periodic visual inspections and surveillance activities of in-scope mechanical component external surfaces to manage loss of material, including loss of material for internal surfaces where the environment is the same as the external environment.

In addition, the External Surfaces Monitoring Program includes opportunistic inspection of external component surfaces that are inaccessible or not readily visible during either normal plant operations or refueling outages.

Also, the External Surfaces Monitoring Program, supplemented by the One-Time Inspection, includes inspection and surveillance of elastomers and polymers that are exposed to air-indoor uncontrolled and air-outdoor environments, but are not replaced on a set frequency or interval (i.e., are long-lived), for evidence of cracking and change in material properties (hardening and loss of strength).

The External Surfaces Monitoring Program also includes inspection of control room emergency ventilation system air-cooled condensing unit cooling coil tubes and fins and station blackout diesel generator radiator tubes and fins (exposed to an air-outdoor environment) for conditions that could result in a reduction in heat transfer, evidenced by visible dirt or other foreign material buildup on tube and fin external surfaces.

A.1.16 FATIGUE MONITORING PROGRAM

The Fatigue Monitoring Program manages fatigue of select primary and secondary components; including the reactor vessel, reactor internals, pressurizer and steam generators; by tracking thermal cycles as required by Technical Specification 5.5.5, “Component Cyclic or Transient Limit.”

The Fatigue Monitoring Program uses the systematic counting of plant transient cycles to ensure that the numbers of design cycles are not exceeded, thereby ensuring that component fatigue usage limits are not exceeded.

The Fatigue Monitoring Program acceptance criteria are to maintain the number of counted transient cycles below the analyzed number of cycles for each transient. The program periodically updates the cycle counts. When the accumulated cycles approach the design cycles, corrective action is taken to ensure the design cycles is not exceeded. Corrective action may include update of the fatigue usage calculation. Any re-analysis uses an NRC-approved version of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) or NRC-approved alternative (e.g., NRC-approved ASME Code case) to determine a valid cumulative usage factor.

For license renewal, the effects of the reactor coolant environment on component fatigue life are addressed by assessing the impact of the environment on a sample of critical components, as identified in NUREG/CR-6260 [Reference A.1-8]. Environmental effects are evaluated in accordance with NUREG/CR-6260 and the guidance of EPRI Technical Report MRP-47 [Reference A.1-9]. Components identified in NUREG/CR-6260 are evaluated using material specific guidance presented in NUREG/CR-6583 [Reference A.1-10] and NUREG/CR-5704 [Reference A.1-11].

A.1.17 FIRE PROTECTION PROGRAM

The Fire Protection Program is a combination condition and performance monitoring program, comprised of tests and inspections that follow the applicable National Fire Protection Association (NFPA) recommendations. The Fire Protection Program manages, through visual inspections and functional tests, as appropriate, the aging effects on fire barrier penetration seals, fire wraps, fire-rated doors and fire barrier walls, ceilings, and floors that perform a current licensing basis fire barrier intended function. The Fire Protection Program also supplements the Fuel Oil Chemistry Program for managing the aging effects on the diesel fire pump fuel oil supply line.

A.1.18 FIRE WATER PROGRAM

The Fire Water Program (sub-program of the overall Fire Protection Program) is credited with aging management of the fire water supply and water-based fire suppression components in the scope of license renewal. Periodic inspection and testing of the fire water supply and water-based fire suppression systems provide reasonable assurance that the supply and suppression components will remain capable of performing their intended functions. Periodic inspection and testing activities include hydrant and hose station inspections, fire main flushes, flow tests, tank inspections, and sprinkler system inspections. The Fire Water Program is a condition monitoring program that comprises tests and inspections based on NFPA recommendations.

The Fire Water Program also includes: 1) NFPA 25 [Reference A.1-18] identified sprinkler head sampling or replacement prior to 50 years of service (in-place), 2) periodic ultrasonic testing (or internal visual inspection, if certain conditions are met) of representative above-ground piping that contains, or has contained, stagnant water, and 3) opportunistic or focused internal visual inspection of buried fire protection piping.

A.1.19 FLOW-ACCELERATED CORROSION (FAC) PROGRAM

The Flow-Accelerated Corrosion (FAC) Program manages loss of material for steel components that are within the scope of license renewal and are exposed to single-phase water above 190ºF or two phase steam at any temperature in systems that are susceptible to flow-accelerated corrosion, also called erosion-corrosion. The Flow-Accelerated Corrosion (FAC) Program combines the elements of predictive analysis, baseline inspections, and periodic inspections (to monitor wall-thinning) to monitor and predict wall thickness in susceptible locations. The program is a condition monitoring program that implements the recommendations of NRC Generic Letter 89-08, Erosion/Corrosion – Induced Pipe Wall Thinning [Reference A.1-17] and follows the guidance and recommendations of EPRI NSAC-202L [Reference A.1-12], to ensure that the integrity of piping systems susceptible to flow-accelerated corrosion is maintained.

A.1.20 FUEL OIL CHEMISTRY PROGRAM

The Fuel Oil Chemistry Program monitors and maintains fuel oil quality in order to mitigate damage due to loss of material, as well as due to cracking of susceptible materials, for the storage tanks and associated piping and components containing fuel oil that are within the scope of license renewal. The program includes verifying the quality of new fuel oil, periodic sampling of stored diesel fuel oil, and periodic cleaning and inspection for emergency diesel generator, diesel fire pump, and station blackout diesel generator fuel oil tanks and associated components. The Fuel Oil Chemistry Program manages the presence of contaminants, such as water or microbiological organisms, that could lead to the onset and propagation of loss of material or cracking (of susceptible material) through proper monitoring and control of fuel oil contamination consistent with plant Technical Specifications and ASTM International (ASTM) standards for fuel oil. The Fuel Oil Chemistry Program is a mitigation program.

The effectiveness of the Fuel Oil Chemistry Program is verified by the One-Time Inspection, which includes ultrasonic thickness measurement of a sample of fuel oil tank bottoms.

A.1.21 INACCESSIBLE MEDIUM-VOLTAGE CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS PROGRAM

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program manages the aging of inaccessible medium-voltage electrical cables that are not required to be environmentally qualified but are susceptible to aging effects caused by moisture and voltage stress, such that there is reasonable assurance that the cables will perform their intended function in accordance with the current licensing basis during the period of extended operation.

Inaccessible medium-voltage cables within the scope of the program and exposed to significant moisture and significant voltage are tested to provide an indication of the condition of the conductor insulation.

The program also requires periodic inspection of electrical manholes associated with in-scope medium-voltage cables for water accumulation, and requires the removal of water from the electrical manholes as necessary.

A.1.22 INSERVICE INSPECTION (ISI) PROGRAM – IWE

The Inservice Inspection (ISI) Program – IWE establishes responsibilities and requirements for conducting ASME Code, Section XI, Subsection IWE (IWE) inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWE includes examination and testing of accessible surface areas of the steel containment; containment hatches and airlocks; seals, gaskets and moisture barriers; and containment pressure-retaining bolting in accordance with the requirements of IWE.

The inservice examinations conducted throughout the service life of Davis-Besse will comply with the requirements of the ASME Code Section XI edition and addenda incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC.

A.1.23 INSERVICE INSPECTION (ISI) PROGRAM – IWF

The Inservice Inspection (ISI) Program – IWF establishes responsibilities and requirements for conducting ASME Code, Section XI, Subsection IWF (IWF) inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWF includes visual examination of supports based on sampling of the total support population. The sample size varies depending on the ASME Class. The largest sample size is specified for the most critical supports (ASME Class 1). The sample size decreases for the less critical supports (ASME Classes 2 and 3). The primary inspection method is visual examination. Degradation that potentially compromises support function or load capacity is identified for evaluation. Supports determined to be unacceptable for continued service requiring corrective actions are re-examined during the next inspection period in accordance with the requirements of IWF.

The inservice examinations conducted throughout the service life of Davis-Besse will comply with the requirements of the ASME Code Section XI edition and addenda incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC.

A.1.24 INSERVICE INSPECTION PROGRAM

The Inservice Inspection Program manages cracking of reactor coolant pressure boundary components and once-through steam generator secondary-side components. The Inservice Inspection Program also manages reduction in fracture toughness of cast austenitic stainless steel pump casings and valve bodies. In addition, the Inservice Inspection Program, in conjunction with the PWR Water Chemistry Program, manages loss of material for once-through steam generator secondary-side components.

The Inservice Inspection Program is a condition monitoring program that meets the inservice inspection requirements specified by the ASME Code, Section XI, Division 1, including Subsections IWB, IWC, and IWD, as modified by 10 CFR 50.55a. The Inservice Inspection Program includes augmented examinations that correspond to commitments made to the regulatory authorities beyond the ASME Code requirements.

The inservice examinations (and pressure tests) conducted throughout the service life of Davis-Besse will comply with the requirements of the ASME Code Section XI, Subsections IWB, IWC, and IWD, edition and addenda incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC.

A.1.25 LEAK CHASE MONITORING PROGRAM

The Leak Chase Monitoring Program is a condition monitoring program, consisting of observation and activities to detect leakage from the spent fuel pool, the fuel transfer pit, and the cask pit liners due to age-related degradation.

The Leak Chase Monitoring Program includes periodic monitoring of the spent fuel pool, the fuel transfer pit, and the cask pit liners leak chase system. Periodic monitoring of leakage from the leak chase system permits early determination and localization of leakage.

A.1.26 LUBRICATING OIL ANALYSIS PROGRAM

The Lubricating Oil Analysis Program mitigates age-related degradation due to loss of material and reduction in heat transfer due to fouling for plant components that are within the scope of license renewal and that are exposed to a lubricating oil environment. The program requires management of the relevant conditions that could lead to the onset and propagation of loss of material due to crevice, galvanic, general, or pitting corrosion, or reduction in heat transfer due to fouling, through monitoring of the lubricating oil consistent with various manufacturers' recommendations and industry standards. The Lubricating Oil Analysis Program is a mitigation program.

The Lubricating Oil Analysis Program is supplemented by the One-Time Inspection, which provides verification of the effectiveness of the program in mitigating the effects of aging.

A.1.27 MASONRY WALL INSPECTION

The Masonry Wall Inspection, implemented as part of the Structures Monitoring Program, consists of inspection activities to detect cracking of masonry walls and degradation of steel edge supports and bracing on masonry walls within the scope of license renewal. Masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program. The Masonry Wall Inspection performs visual inspection of external surfaces of masonry walls.

A.1.28 NICKEL-ALLOY MANAGEMENT PROGRAM

The Nickel-Alloy Management Program manages primary water stress corrosion cracking (PWSCC) and stress corrosion cracking / intergranular attack (SCC/IGA) of nickel-alloy pressure boundary components other than reactor vessel closure head nozzles and steam generator tubes. The Nickel-Alloy Management Program is a combination mitigative and condition monitoring program.

The Nickel-Alloy Management Program uses a number of inspection techniques to detect cracking, including volumetric and bare metal visual examinations. The Nickel-Alloy Management Program implements the inspections of components through the Inservice Inspection Program. Component evaluations, examination methods, scheduling, and site documentation comply with 10 CFR 50, the ASME Code, NRC bulletins and generic letters, and staff-approved industry guidelines related to nickel-alloy issues. The Nickel-Alloy Management Program includes mitigation and repair activities to ensure long-term operability of nickel-alloy components.

A.1.29 NICKEL-ALLOY REACTOR VESSEL CLOSURE HEAD NOZZLES PROGRAM

The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program manages cracking of the control rod drive nozzles and welds in the reactor vessel closure head, and the Boric Acid Corrosion Program manages wastage of associated reactor vessel closure head surfaces. The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program ensures that inservice inspections of all nickel-alloy reactor vessel closure head penetration nozzles, and associated reactor vessel closure head surfaces, will continue to be performed in accordance with ASME Code Case N-729-1 as modified by 10 CFR 50.55a Section (g)(6)(ii)(D).

A.1.30 ONE-TIME INSPECTION

One-Time Inspection performs inspections to verify the effectiveness of the Closed Cooling Water Chemistry Program, the Fuel Oil Chemistry Program, the Lubricating Oil Analysis Program, and the PWR Water Chemistry Program, or confirms the absence of aging effects. One-time inspections address situations where: 1) an aging effect is not expected to occur, but it cannot be ruled out with reasonable assurance, 2) an aging effect is expected to progress very slowly in the specified environment, but the local environment may be more adverse, or 3) the characteristics of the aging effect include a long incubation period.

The elements of One-Time Inspection include:

- Determination of a representative sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience;
- Identification of the inspection locations in the system or component based on the aging effect, or based on the areas susceptible to concentration of contaminants that promote certain aging effects;
- Determination of the examination technique, including acceptance criteria that is effective in managing the aging effect for which the component is examined; and
- Evaluation of the need for follow-up examinations to monitor the progression of any age-related degradation.

When evidence of an aging effect is revealed by a one-time inspection, the routine evaluation of the inspection results triggers additional actions to assure the intended function of affected components will be maintained through the period of extended operation.

A.1.31 OPEN-CYCLE COOLING WATER PROGRAM

The Open-Cycle Cooling Water Program manages loss of material due to crevice, galvanic, general, pitting and microbiologically-influenced corrosion; and erosion for in-scope components in the Service Water System and components connected to or cooled by the Service Water System (including the cooling tower makeup water relative to the Circulating Water System), along with cracking of susceptible materials. The program manages fouling due to particulates (e.g., corrosion products) and biological material (micro- and macro-organisms) resulting in reduction in heat transfer for heat exchangers (including condensers, coolers, cooling coils, and evaporators) within the scope of the program.

The Open-Cycle Cooling Water Program consists of inspections, surveillances, and testing to detect and evaluate cracking, fouling, and loss of material, combined with chemical treatments and cleaning activities to minimize cracking, fouling, and loss of material. The program is a combination condition and performance monitoring, and mitigation program that implements the recommendations of NRC Generic Letter 89-13, “Service Water System Problems Affecting Safety-Related Equipment” [Reference A.1-17] for safety-related equipment in the scope of the program and manages loss of material for in-scope nonsafety-related components that contain service water or cooling tower makeup water.

A.1.32 PWR Reactor Vessel Internals Program

The PWR Reactor Vessel Internals Program manages change in dimension due to void swelling; cracking due to flaw initiation and growth, SCC/IGA, and irradiation-assisted stress corrosion cracking (IASCC); loss of preload due to stress relaxation; reduction in fracture toughness due to radiation and thermal embrittlement; and loss of material due to wear. The PWR Reactor Vessel Internals Program is a condition monitoring program.

The PWR Reactor Vessel Internals Program is based upon the examination requirements for Babcock & Wilcox (B&W) designed pressurized water reactors (PWRs) provided in EPRI Report 1016596, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-Rev. 0)" [Reference A.1-14], along with the implementation guidance described in NEI 03-08, “Guideline for the Management of Materials Issues” [Reference A.1-15]. MRP-227 has been submitted to the NRC for review and approval. Following NRC approval, MRP-227 will be revised to incorporate any necessary changes to the guidelines and re-issued as MRP-227-A. The PWR Reactor Vessel Internals Program will be revised, as necessary, to incorporate the final recommendations and requirements as published in MRP-227-A.

The EPRI inspection and evaluation guidelines establish the augmented ASME Code Section XI inservice inspection requirements that will be used to monitor for the aging effects that are applicable to certain susceptible or limiting reactor vessel internals components for B&W designed PWRs.

A.1.33 PWR Water Chemistry Program

The PWR Water Chemistry Program mitigates damage due to loss of material, cracking, and reduction in heat transfer of components that are within the scope of license renewal and contain, or are exposed to, treated water or steam in the primary, secondary, or auxiliary systems. The program includes periodic monitoring and control of the known detrimental contaminants that could lead to, or are indicative of, conditions for the onset and propagation of loss of material, cracking, or reduction in heat transfer through proper monitoring and control of chemical concentrations consistent with EPRI primary and secondary water chemistry guidelines.

In addition, the PWR Water Chemistry Program is credited in conjunction with the Nickel-Alloy Management Program, Inservice Inspection Program, Nickel-Alloy Reactor Vessel Closure Head Nozzles Program, PWR Reactor Vessel Internals Program, Steam Generator Tube Integrity Program, and Small Bore Class 1 Piping Inspection to manage the effects of aging for reactor vessel, reactor vessel internals, reactor coolant pressure boundary, and steam generator components.

The PWR Water Chemistry Program is also supplemented by a One-Time Inspection to provide verification of the effectiveness of the program in managing the effects of aging.

A.1.34 REACTOR HEAD CLOSURE STUDS PROGRAM

The Reactor Head Closure Studs Program manages cracking and loss of material for the reactor head closure stud assemblies (studs, nuts, and washers). The Reactor Head Closure Studs Program is a combination mitigative and condition monitoring program.

The Reactor Head Closure Studs Program includes the preventive measures of NRC Regulatory Guide 1.65, “Materials and Inspection for Reactor Vessel Closure Studs,” [Reference A.1-21] to mitigate cracking, including the use of a stable lubricant that is compatible with the fastener material and the environment. The program provides a specific precaution against the use of compounds containing sulfur (sulfide), including molybdenum disulfide (MoS_2), as a lubricant for the reactor head closure stud assemblies. An approved lubricant is applied to the threaded areas of studs and nuts and to the concave and convex faces of the spherical washers during each assembly.

The Reactor Head Closure Studs Program examines reactor vessel stud assemblies in accordance with the examination and inspection requirements specified in the ASME Code, Section XI, Subsection IWB (1995 Edition through the 1996 Addenda) and approved ASME Code Cases. Visual examinations (VT-2) for leak detection are performed during system pressure tests.

The Reactor Head Closure Studs Program inspections are implemented by the Inservice Inspection Program. The Inservice Inspection Program will continue to comply with the requirements of the ASME Code Section XI edition and addenda incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC.

A.1.35 REACTOR VESSEL SURVEILLANCE PROGRAM

The Reactor Vessel Surveillance Program is a condition monitoring program that manages reduction of fracture toughness for the low alloy steel reactor vessel shell and welds in the beltline region. Davis-Besse participates in the Pressurized Water Reactor Owners Group (PWROG) Master Integrated Reactor Vessel Surveillance Program (MIRVSP) which includes all seven operating B&W 177-fuel assembly plants and six participating Westinghouse-designed plants having B&W fabricated reactor vessels. The MIRVSP is an NRC-approved program that implements the requirements of Appendix H to 10 CFR Part 50.

Data resulting from the Reactor Vessel Surveillance Program is used to:

- determine pressure-temperature limits, minimum temperature requirements, and end of life upper shelf energy (USE) in accordance with the requirements of 10 CFR 50 Appendix G, “Fracture Toughness Requirements,” and
- determine end of life reference temperature for pressurized thermal shock (RT_{PTS}) values in accordance with 10 CFR 50.61, “Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock.”

Six surveillance capsules containing Davis-Besse specific materials were inserted into the reactor before initial plant startup. These capsules were designated as TE1-A through TE1-F. The requirements of 10 CFR 50 Appendix H were met by the first four capsules having been withdrawn and tested. The remaining two capsules, TE1-C and TE1-E, have been removed and the materials have not been tested. Capsule TE1-C contains the Davis-Besse limiting material and has been exposed to a fluence slightly above the 60-year projected fluence for the Davis-Besse plant. The Reactor Vessel Surveillance Program is enhanced to require testing of capsule TE1-C. Capsule TE1-E has been discarded.

Since Davis-Besse does not have plant-specific surveillance capsules remaining inside the reactor vessel, ex-vessel cavity dosimetry is used to monitor neutron fluence.

A.1.36 SELECTIVE LEACHING INSPECTION

The Selective Leaching Inspection detects and characterizes the conditions on internal and external surfaces of subject components exposed to raw water, treated water, soil, and moist air (including condensation) environments. The inspection provides direct evidence through visual inspection, hardness measurement, or other appropriate examinations (such as chipping, scraping, or other mechanical means), of whether, and to what extent, loss of material due to selective leaching has occurred.

A.1.37 SMALL BORE CLASS 1 PIPING INSPECTION

The Small Bore Class 1 Piping Inspection will detect and characterize cracking of small bore ASME Code Class 1 piping less than 4 inches nominal pipe size (NPS 4), which includes pipe, fittings, and branch connections. The Small Bore Class 1 Piping Inspection is a condition monitoring program.

The ASME Code does not require volumetric examination of Class 1 small bore piping. The Small Bore Class 1 Piping Inspection is a one-time inspection that consists of volumetric examination of a representative sample of small bore piping locations that are susceptible to cracking. The inspection sample will include both socket welds and butt welds. The sample size and inspection locations are based on susceptibility, inspectability, dose considerations, operating experience, and limiting locations of the total population of ASME Code Class 1 small bore piping locations. The guidelines of EPRI Report 1011955, "Materials Reliability Program: Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines (MRP-146)" [Reference A.1-13], and the supplemental guidelines issued in EPRI Report 1018330, "Materials Reliability Program: Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines - Supplemental Guidance (MRP-146S)" [Reference A.1-20] are considered in selecting the sample size and locations. Volumetric examinations (including qualified destructive or nondestructive techniques) are performed by qualified personnel following procedures that are consistent with Section XI of the ASME Code and 10 CFR 50, Appendix B.

If a qualified non-destructive volumetric examination technique does not become available for socket welds, an opportunistic destructive examination will be conducted. Opportunistic destructive examination is performed when a weld is removed from service for other considerations, such as plant modifications. If a socket weld does not become available on an opportunistic bases, one will be selected for destructive testing. This socket weld will be selected from a piping location that is susceptible to cracking.

A.1.38 STEAM GENERATOR TUBE INTEGRITY PROGRAM

The Steam Generator Tube Integrity Program is credited for aging management of cracking, denting, loss of material, and reduction in heat transfer of the steam generator tubes, as well as cracking of the tube plugs, tube sleeves, and tube support plates.

The Steam Generator Tube Integrity Program is a combination condition monitoring and mitigation program. The Steam Generator Tube Integrity Program is based on the Steam Generator Management program, which meets the intent of the guidance in NEI 97-06, "Steam Generator Program Guidelines" [Reference A.1-16] and the requirements of the Technical Specifications. The Steam Generator Tube Integrity Program also includes secondary-side examinations to assist in verification of tube integrity and the condition of the tube support plates. The program establishes a framework for prevention, inspection, evaluation, repair or removal from service, and leakage monitoring measures.

Primary-side and secondary-side water chemistry control and foreign material exclusion requirements inhibit degradation. Eddy current testing and visual inspections are used for the detection of flaws. Condition monitoring compares the inspection results against performance criteria, and an operational assessment ensures that the performance criteria will be met throughout the next operating cycle.

A.1.39 STRUCTURES MONITORING PROGRAM

The Structures Monitoring Program manages age-related degradation of plant structures and structural components within the scope of the program to ensure that each structure or structural component retains the ability to perform its intended function. Aging effects are detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended function. The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection and the Masonry Wall Inspection. The Structures Monitoring Program implements provisions of the Maintenance Rule, 10 CFR 50.65, that relate to structures, masonry walls, and water control structures. Concrete, masonry walls, and other structural components that perform a fire barrier intended function are also managed by the Fire Protection Program.

A.1.40 WATER CONTROL STRUCTURES INSPECTION

The Water Control Structures Inspection, implemented as part of the Structures Monitoring Program, consists of inspection activities to detect age-related degradation. The Water Control Structures Inspection ensures the structural integrity and operational adequacy of the Intake Structure, Forebay, Service Water Discharge Structure, and in-scope structural components within the structures.

A.1.41 REFERENCES

A.1-1 NRC Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," September 1995

A.1-2 NEI 94-01, "Industry Guidance for Implementing Performance-Based Options of 10 CFR Part 50 Appendix J," Revision 0

A.1-3 EPRI Report TR-104213, "Bolted Joint Maintenance and Applications Guide," December 1995

A.1-4 EPRI Report TR-111472, "Assembling Bolted Connections Using Spiral Wound Gaskets," August 1999

A.1-5 ANSI B30.2, "Overhead and Gantry Cranes," 1976

A.1-6 ANSI B30.11, "Monorail Systems and Underhung Cranes," 1980

A.1-7 ANSI B30.16, "Overhead Hoists (Underhung)," 1981

A.1-8 NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," February 1995

A.1-9 EPRI Report MRP-47, "Materials Reliability Program: Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application," Revision 1, September 2005

A.1-10 NUREG/CR-6583, "Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels," March 1998

A.1-11 NUREG/CR-5704, "Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels," April 1999

A.1-12 EPRI Report 1011838, "Recommendations for An Effective Flow Accelerated Corrosion Program (NSAC-202L-R3)," May 2006

A.1-13 EPRI Report 1011955, "Materials Reliability Program: Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines (MRP-146)," June 2005

A.1-14 EPRI Report 1016596, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-Rev. 0)," December 2008

A.1-15 NEI 03-08, "Guideline for the Management of Materials Issues," May 2003

A.1-16 NEI 97-06, "Steam Generator Program Guidelines," Revision 2

A.1-17 NRC Generic Letter 89-08, "Erosion/Corrosion, – Induced Pipe Wall Thinning," May 1989

A.1-18 NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," 2002

A.1-19 NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment," July 1989

A.1-20 EPRI Report 1018330, "Materials Reliability Program: Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines – Supplemental Guidance (MRP-146S)," December 2008

A.1-21 NRC Regulatory Guide 1.65, "Material and Inspection for Reactor Vessel Closure Studs," October 1973

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A.2 EVALUATION SUMMARIES OF TIME-LIMITED AGING ANALYSES

In accordance with 10 CFR 54.21(c), an application for a renewed operating license requires an evaluation of time-limited aging analyses (TLAAs) for the period of extended operation. The following TLAAs have been identified and evaluated to meet this requirement.

A.2.1 INTRODUCTION

Time-limited aging analyses are defined in 10 CFR 54.3(a) as those calculations and analyses that:

(1) Involve systems, structures, and components within the scope of license renewal, as delineated in § 54.4(a);

(2) Consider the effects of aging;

(3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;

(4) Were determined to be relevant by the licensee in making a safety determination;

(5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in § 54.4(b); and

(6) Are contained or incorporated by reference in the CLB.

The TLAAs (i.e., each calculation or analysis) that meet all six aspects above, are evaluated in accordance with 10 CFR 54.21(c)(1) to demonstrate that:

(i) The analyses remain valid for the period of extended operation, or

(ii) The analyses have been projected to the end of the period of extended operation, or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

This section provides a summary of the TLAAs identified in the Davis-Besse License Renewal Application, and includes the following topics:

- Reactor Vessel Neutron Embrittlement (Section A.2.2)
- Metal Fatigue (Section A.2.3)
- Environmental Qualification of Electrical Equipment (Section A.2.4)
- Containment Fatigue (Section A.2.5)
- Inservice Inspection – Fracture Mechanics Analyses (Section A.2.6)
- Other Plant-Specific Time-Limited Aging Analyses (Section A.2.7)

A.2.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

Neutron embrittlement is the term used to describe changes in mechanical properties of reactor vessel materials that result from exposure to fast neutron flux, energy greater than 1.0 mega-electron volts (E>1.0 MeV), within the vicinity of the reactor core called the beltline region. The most pronounced material change is a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases. The rate of neutron exposure is neutron flux ($n/cm^2/sec$) and the cumulative neutron exposure over time is neutron fluence (n/cm^2).

Fracture toughness is also dependent on temperature. The reference temperature for nil-ductility transition (RT_{NDT}) is the temperature above which the material behaves in a ductile manner and below which the material behaves in a brittle manner. As fluence increases, RT_{NDT} increases. This means higher temperatures are required for the material to continue to act in a ductile manner. Determining the projected reduction in fracture toughness as a function of fluence affects several analyses used to support the operation of Davis-Besse:

- Neutron Fluence (Section A.2.2.1)
- Upper Shelf Energy (Section A.2.2.2)
- Pressurized Thermal Shock (Section A.2.2.3)
- Pressure-Temperature Limits (Section A.2.2.4)
- Low-Temperature Overpressure Protection Limits (Section A.2.2.5)
- Intergranular Separation – Underclad Cracking (Section A.2.2.6)
- Reduction in Fracture Toughness of Reactor Vessel Internals (Section A.2.2.7)

Requirements associated with fracture toughness and pressure-temperature limits for the reactor coolant pressure boundary are contained in Appendices G and H of 10 CFR 50.

A.2.2.1 Neutron Fluence

Neutron fluence is not a TLAA, it is a time-limited assumption used in the evaluation of neutron embrittlement TLAAs.

<u>Fluence Projection</u>

The fluence analysis methodology from BAW-2241P-A [Reference A.2-14] was used to calculate the fast neutron fluence (E > 1.0 MeV) of the reactor vessel welds and forgings of interest. The fast neutron fluence at each location was calculated in accordance with the requirements of NRC Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Vessel Neutron Fluence," [Reference A.2-17].

Fluence results were calculated for Cycles 13-14 irradiation using a computer model that extends from below the core to the vessel mating surface. The sum of the End-of-Cycle (EOC) 12 and Cycles 13-14 fluence results in the EOC 14 cumulative fluence. This data was benchmarked against cavity dosimetry data for Cycles 13-14. To extrapolate the fluence values to end of life, Cycle 15 design information was utilized to develop flux projections at each location. These Cycle 15 flux values were used to extrapolate the EOC 14 fluence to 52 effective full power years (EFPY) assuming 100% power at 2,817 MWt and a partial low leakage core design whereby High Thermal Performance fuel assemblies (a total of 12) were introduced on the periphery.

Beltline Evaluation

10 CFR 50.61 defines the reactor vessel beltline as the region of the reactor vessel (shell materials including welds, heat affected zones, and plates or forgings) that directly surrounds the effective height of the active core and adjacent regions of the reactor vessel that are predicted to experience sufficient neutron radiation damage to be considered in the selection of the most controlling material with regard to radiation damage.

The Davis-Besse beltline for the first 40 years of operation includes the nozzle belt forging (ADB 203), the nozzle belt forging to upper shell forging circumferential weld (WF-232/233), the upper shell forging (AKJ 233), the upper shell forging to lower shell forging circumferential weld (WF-182-1), and the lower shell forging (BCC 241).

For the period of extended operation, the beltline will include all items with 52 EFPY surface fluence greater than 1.0E+17 n/cm^2 (E >1 MeV). The limiting weld with regard to USE, adjusted reference temperature (ART), and reference temperature for pressurized thermal shock (RT_{PTS}) is the upper shell to lower shell weld WF-182-1, as is the case for the first 40 years of operation. The limiting forging with regard to ART and RT_{PTS} is the lower shell forging BCC 241, as is the case at 40 years. Both of these materials are included in the Reactor Vessel Surveillance Program and no additional materials are required for irradiation and testing.

A.2.2.2 Upper-Shelf Energy

10 CFR 50 Appendix G requires the USE for the reactor vessel beltline materials to be no less than 50 ft-lb at all times during plant operation, including the effects of neutron radiation. If USE cannot be shown to remain above this limit, then an equivalent margin analysis (EMA) must be performed to show that the margins of safety against fracture are equivalent to those required by Appendix G of ASME Section XI. Initial (unirradiated) USE values for the Davis-Besse reactor vessel are recorded in USAR Table 5.2-15. As no initial USE is available for the beltline welds (Linde80 welds), operation for 32 EFPY was justified based on an equivalent margins analysis (fracture mechanics analysis).

For license renewal, the initial USE values are projected to 52 EFPY using Regulatory Guide 1.99, Revision 2, Position 1.2. Position 2.2, use of surveillance data, was also used for weld WF-182-1 and lower shell forging BCC 241. All locations are above 50 ft-lb with the exception of weld WF-182-1.

The limiting reactor vessel beltline weld WF-182-1 is the only 60-year (52 EFPY) beltline location with a projected Charpy impact energy level below 50 ft-lbs. The fracture mechanics evaluation of weld WF-182-1 was extended from 40 years (32 EFPY) to 60 years (52 EFPY) based on the projected 52 EFPY neutron fluence values. The analysis demonstrates that the limiting reactor vessel beltline weld satisfies the ASME Code requirements of Appendix K for ductile flaw extensions and tensile stability using projected upper-shelf Charpy impact energy levels for the weld material at 52 EFPY.

Reactor vessel USE and the equivalent margin analyses have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.2.3 Pressurized Thermal Shock

10 CFR 50.61(a)(2) defines pressurized thermal shock (PTS) as an event or transient in pressurized water reactors (PWRs) causing severe overcooling (thermal shock) concurrent with or followed by significant pressure in the reactor vessel. 10 CFR 50.61(b)(2) defines screening criteria for embrittlement of reactor vessel materials in PWRs, and required actions if the screening criteria are exceeded. The screening criteria are based on the RT_{PTS}. The screening criterion for circumferential welds is 300°F maximum and the screening criterion for forgings is 270°F maximum. If the projected RT_{PTS} values remain below the applicable screening temperature, then no corrective actions are required.

For license renewal, a 52 EFPY RT_{PTS} evaluation was performed for the reactor vessel beltline materials. In accordance with 10 CFR 50.61, the RT_{PTS} values were calculated by adding the initial RT_{NDT} to the predicted radiation-induced ΔRT_{NDT} including a margin term to cover the uncertainties, as prescribed by Regulatory Guide 1.99 Revision 2. The predicted radiation induced ΔRT_{NDT} was calculated using the 52 EFPY neutron fluence at the clad-low alloy steel interface. Initial RT_{NDT} and margins for welds WF-182-1 and WF-232 (Nozzle Belt Forging to Upper Shell Forging Circumferential Weld) were obtained from BAW-2308, Revision 1-A.

All RT_{PTS} values are below the screening criteria at 60 years. The upper to lower shell circumferential weld (WF-182-1) is the limiting material with respect to RT_{PTS}.

Reactor vessel RT_{PTS} has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.2.4 Pressure-Temperature Limits

10 CFR 50 Appendix G requires the establishment of pressure-temperature (P-T) limits for material fracture toughness requirements of the reactor coolant pressure boundary materials. 10 CFR 50, Appendix G requires the use of the ASME Section III, Appendix G to determine the stresses and fracture toughness at locations within the reactor coolant pressure boundary.

The current P-T limits, generated consistent with the requirements of 10 CFR 50 Appendix G and Regulatory Guide 1.99 Revision 2, are valid until 21 EFPY. A revised pressure and temperature limits report (PTLR) will be submitted to the NRC, in accordance with Technical Specification 5.6.4, before Davis-Besse operates beyond 21 EFPY, in accordance with the requirements of 10 CFR 50, Appendix G. The P-T limit curves, as contained in the PTLR, will be updated as necessary through the period of extended operation as part of the Reactor Vessel Surveillance Program.

Reactor vessel P-T limits will be managed, as part of the Reactor Vessel Surveillance Program, for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.2.5 Low-Temperature Overpressure Protection Limits

Appendix G of ASME Section XI establishes procedures and limits for Reactor Coolant System pressure and temperature primarily for low temperature conditions to provide protection against non-ductile failure of the reactor vessel.

Low-temperature overpressure protection (LTOP) is provided in two ways at Davis-Besse.

1. Administrative controls are used to assure protection within the existing pressure-temperature limits when the pressurizer power-operated relief valve and the safety valves are no longer providing overpressure protection.
2. A relief valve in the Decay Heat Removal System suction piping is placed into service when the Reactor Coolant System temperature is below 280ºF.

The current technical specifications for LTOP are valid through 21 EFPY. These technical specifications used an improved methodology to calculate LTOP limits in accordance with generically approved topical report BAW-10046A [Reference A.2-16]. Maintaining the LTOP limits in accordance with Appendix G of ASME Section XI, as required by Appendix G of 10 CFR 50, assures that the effects of aging on the intended functions will be adequately managed for the period of extended operation.

LTOP limits will be managed, as part of the Reactor Vessel Surveillance Program, for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.2.6 Intergranular Separation – Underclad Cracking

Underclad cracking refers to intergranular separations in the heat affected zones of low alloy base metal under austenitic stainless steel cladding in SA-508, Class 2 reactor vessel forgings manufactured to a coarse grain practice, and clad by high-heat-input submerged arc processes. BAW-10013-A [Reference A.2-15] contains a fracture mechanics analysis that demonstrates the critical crack size required to initiate fast fracture is several orders of magnitude greater than the assumed maximum flaw size plus predicted flaw growth due to design fatigue cycles. The flaw growth analysis was performed for a 40 year cyclic loading, and an end-of-life assessment of radiation embrittlement (i.e., fluence at 32 EFPY) was used to determine fracture toughness properties. The report concluded that the intergranular separations found in B&W vessels would not lead to vessel failure. This report was accepted by the Atomic Energy Commission.

Evaluation of intergranular separations for the Davis-Besse SA-508 Class 2 forgings was performed for 60 years using the current fracture toughness information, applied stress intensity factor solutions, and fatigue crack growth correlations for SA-508 Class 2 material. The analysis was applied to two relevant regions of the reactor vessel: the beltline and the nozzle belt. Both axial and circumferential oriented flaws were considered in the evaluation; however, the detailed flaw evaluation was only performed for the bounding axially oriented flaws. The fatigue crack growth analysis considered the normal and upset condition transients with the associated 60-year projected cycles for the period of extended operation. The analysis determined that the postulated underclad cracks in the reactor vessel are acceptable through the period of extended operation.

[Proposed text for this section, pending closure of Confirmatory Action Letter CAL No. 3-10-001 commitments related to the replacement of the Davis-Besse closure head in 2011.] The closure head/head flange was replaced in the Fall of year 2011. This replacement head was fabricated using SA-508 Class 3 material, which is not susceptible to the subject intergranular separations. Therefore, this replacement closure head/head flange is not considered in the underclad cracking evaluation.

Reactor vessel underclad cracking TLAAs have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.2.7 Reduction in Fracture Toughness of Reactor Vessel Internals

Reduction in fracture toughness of (stainless steel) reactor vessel internals is an aging effect caused by exposure to neutron irradiation. Prolonged exposure to high-energy neutrons results in changes to the mechanical properties, such as an increase in tensile and yield strength, and decreases in ductility and fracture toughness. The extent of reduction in fracture toughness is a function of the material, irradiation temperature, and neutron fluence.

USAR Appendix 4A describes the detailed stress analysis of the reactor vessel internals under accident conditions for the current term of operation. The results of this analysis show that although there is some deflection of the internals, the reactor vessel internals will not fail because the stresses are within established limits.

Evaluation of the impact of the measurement uncertainty recapture (MUR) power uprate on the structural integrity of the reactor vessel internals components concluded that the temperature changes due to the power uprate are bounded by those used in the existing analyses. As part of MUR uprate, FirstEnergy Nuclear Operating Company (FENOC) provided the following commitment:

> "As appropriate, FENOC commits to incorporate recommendations from EPRI's MRP inspection guidelines into the reactor vessel internals program at Davis-Besse Nuclear Power Station, Unit, No. 1."

Integrity of reactor vessel internals will be managed, as part of the PWR Reactor Vessel Internals Program, for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3 METAL FATIGUE

The following sections summarize the analyses associated with metal fatigue of fluid systems:

- Class 1 Code Fatigue Requirements (Section A.2.3.1)
- Class 1 Fatigue Evaluations (Section A.2.3.2)
- Non-Class 1 Fatigue Evaluations (Section A.2.3.3)
- Generic Industry Issues on Fatigue (Section A.2.3.4)

A.2.3.1 Class 1 Code Fatigue Requirements

The ASME Class 1 components for Davis-Besse include the reactor vessel, reactor coolant pressure boundary components, and the once through steam generators. The specific codes and standards to which systems, structures, and components were designed are listed in USAR Table 3.2-2.

Cumulative usage factors for the Class 1 components are calculated based on normal and upset design transient definitions contained in the component design specifications. The design transients used to generate cumulative usage factors for Class 1 components are reported in USAR Table 5.1-8. In accordance with Davis-Besse Technical Specification 5.5.5, provides controls to track the USAR Section 5 cyclic and transient occurrences to ensure that components are maintained within design limits.

Fatigue of Class 1 components is managed by the Fatigue Monitoring Program. This program tracks the occurrence of plant transients that affect fatigue. The number of design cycles originally considered in the design fatigue analyses is not a design limit. The design limit for fatigue is the ASME Code allowable cumulative usage factor of 1.0. The fatigue usage for a component is normally the result of several different thermal transients, coupled with mechanical loads. Exceeding the design cycles for one or more transients does not necessarily imply that fatigue usage will exceed the allowable limit.

A.2.3.1.1 ASME Section III

The primary code governing design and construction of the Class 1 systems and components is the ASME Boiler and Pressure Vessel Code, Section III. The ASME Code requires evaluation of transient thermal and mechanical load cycles and determination of fatigue usage for Class 1 components.

A.2.3.1.2 B31.7 Piping Code

The Davis-Besse reactor coolant system piping, as well as reactor coolant pressure boundary piping in other systems, was designed to American National Standards Institute (ANSI) B31.7 Draft, February 1968 with Errata, June 1968 and also meets the design requirements of ANSI B31.7, 1969 Edition. The ANSI B31.7 Piping Code requires evaluation of transient thermal and mechanical load cycles and determination of fatigue usage for Class 1 piping. The reactor head vent and other piping designated as quality group A, B, or C is designed to ASME Section III, 1971 Edition, Class 1, 2 or 3 respectively. Davis-Besse has no Class 1 piping designed to ANSI B31.1.

A.2.3.1.3 Design Cycles

ASME Class 1 components are designed to withstand the effects of cyclic loads due to temperature and pressure changes in the reactor system. These cyclic loads are introduced by normal unit load transients, reactor trips, startup and shutdown operations, and earthquakes. The 14 original design transients for the Reactor Coolant System (RCS) are found in USAR Table 5.1-8. Over the life of the plant, additional transients have been identified, including analyzed transients for new components and non-RCS components. The design cycles that are significant contributors to fatigue usage are included in the Fatigue Monitoring Program.

A.2.3.1.4 Reactor Coolant Piping

The reactor coolant piping connects the major components of the Reactor Coolant System, including the reactor vessel, the steam generators and the reactor coolant pumps. The reactor coolant piping has welded connections for pressure taps, temperature elements, vents, drains, decay heat removal, and emergency core cooling high-pressure injection water.

A thermal sleeve is provided in the high-pressure injection connection to the reactor coolant inlet piping. The analysis of the high-pressure injection nozzles determined that high-pressure injection flow tests had negligible effect on the high-pressure injection nozzles, but a significant effect on the normal makeup nozzle. The cumulative usage factor (CUF) for the normal makeup nozzle was calculated to be 0.558 after 40 flow tests; 0.513 usage due to the 40 flow tests and 0.045 usage due to all other transients. Projections of cycles for 60 years implies that the 40 design cycles will be reached in year 51, with 48 cycles occurring by year 60. Projecting the CUF to a 60-year number with 50 tests, gives a CUF of 0.686 (0.045 + 50/40 * 0.513), which implies the nozzles will still be acceptable. However, Davis-Besse monitors these cycles and will ensure action is taken before the analyzed number of cycles is reached. Because these nozzles may be reanalyzed for other reasons such as the planned modification to replace the nozzle safe ends and thermal sleeves, Davis-Besse will manage fatigue of these nozzles for the period of extended operation rather than reanalyze for the possible additional cycles at this time. Davis-Besse has committed (Table A-1, item 23) to replace the nozzle safe ends and thermal sleeves prior to reaching the period of extended operation.

The effects of fatigue on the reactor coolant piping will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3.1.5 Steam Generator Remote Welded Plugs

Each remote welded plug installed in the once-through steam generators is limited to 33 cycles of heatup and cooldown. The 60-year cycle projection for some of these plugs exceeds the analyzed number of cycles. The number of occurrences of design transients is tracked by the Fatigue Monitoring Program to ensure action is taken before the design cycles are reached. As such, the effects of aging due to fatigue are managed for the period of extended operation.

The effects of fatigue on the steam generator remote welded plugs will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3.2 Class I Fatigue Evaluations

The Fatigue Monitoring Program monitors the number of plant transient cycles to ensure that action is taken before the number of design cycles is exceeded. As such, the effects of aging due to fatigue are managed for the period of extended operation for the Class 1 piping and components. The effects of fatigue on the high energy line break analyses are also managed by the Fatigue Monitoring Program.

Specific evaluations for Class 1 components are discussed below.

A.2.3.2.1 Reactor Vessel Internals Bolts

Although the reactor vessel internals are designed to meet the stress requirements of ASME Section III, they are not code components. Consequently, a fatigue analysis of the reactor vessel internals was not required and was not performed as part of the original design.

FENOC has replaced the majority of the stainless steel, Alloy A-286, bolts for the reactor vessel internals with Alloy X-750 HTH bolts at Davis-Besse. The replacement bolts were designed to ASME Section III, and are provided with fatigue analyses. FENOC has not replaced the upper thermal shield bolts, flow distributor bolts, or guide block bolts at Davis-Besse. Design cumulative usage factors for the reactor vessel internals bolts are based on design cycles.

The effects of fatigue on the reactor vessel internals bolts will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3.2.2 Reactor Vessel Internals Flow Induced Vibration

The reactor vessel internals were analyzed for flow induced vibration. The classic endurance limit approach to design of components subject to flow-induced vibration was used, except for the incore instrumentation nozzles and the re-designed surveillance capsule holder tubes. The classic endurance limit approach is based on the observation that a fatigue curve becomes approximately asymptotic to a given value of stress (the endurance limit) for large numbers of cycles. A component can be designed for infinite life by maintaining the actual peak stresses below the endurance limit.

For the Davis-Besse reactor vessel internals, the ASME Code fatigue curve was extended to 1E+12 cycles (the upper bound on the number of cycles for a 40-year design life). The resulting stress value of 20,400 psi was reduced to 18,000 psi as the endurance limit. For 60-years of operation, it follows that 1.5E+12 would bound the expected loading cycles. The extrapolated fatigue curve at 1.5E+12 cycles is approximately 20,200 psi, still above the 18,000 psi that was used as the endurance limit. As such, the 18,000 psi endurance limit used for the flow induced vibration analyses of the reactor vessel internals remains valid for the period of extended operation. Therefore, the endurance limit for flow induced vibration of the reactor vessel internals remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

The effects of fatigue due to flow induced vibration were analyzed for the incore instrument nozzles and re-designed surveillance capsule holder tubes for 40 years of operation. The resulting cumulative usage factors have been projected to remain below the limit of 1.0 for 60 years of operation.

The flow induced vibration analyses of the incore instrument nozzles and re-designed surveillance capsule holder tubes have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.3.2.3 Control Rod Drive Housings

The control rod drive housings are designed to ASME Section III and are analyzed for fatigue. The fatigue analyses for the control rod drive housings are based on the design transients, and the resulting cumulative usage factors are all less than 1.0.

The effects of fatigue on the control rod drive housings will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3.2.4 Reactor Coolant Pump Casings Fatigue

The reactor coolant pump casings are designed to ASME Section III and are analyzed for fatigue. The fatigue analyses for the reactor coolant pump casings are based on design transients, and the resulting cumulative usage factors are all less than 1.0.

The effects of fatigue on the reactor coolant pump casings will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3.2.5 Pressurizer Fatigue

The pressurizer is designed to ASME Section III and is analyzed for fatigue. Design cumulative usage factors for the limiting pressurizer locations, including the surge nozzle, were analyzed based on design transients and are all less than 1.0.

The effects of fatigue on the pressurizer will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3.2.6 Steam Generator Tube Sleeves Fatigue

USAR Section 5.5.2.3 indicates that steam generator tubes that are found to be leaking may be plugged or repaired by mechanical (rolled) sleeving.

Section III of the ASME Code does not provide design rules for mechanically roll expanded attachments, and theoretical stress analyses are inadequate. In such cases, Appendix II of ASME Section III permits the use of experimental stress analysis to substantiate the critical or governing stress. The structural adequacy of the sleeve attachment to withstand cyclic loadings was demonstrated by a fatigue test with the sleeve loading transients based on the design transients. The pressure cycling portion of the fatigue test for the steam generator tube sleeves is based on 360 startup cycles to bound all Babcock & Wilcox 177 fuel assembly plants. Davis-Besse has only

240 startup cycles allowed in USAR Table 5.1-8, and only 128 startup cycles projected for 60 years of operation.

The fatigue testing of the once-through steam generator tube sleeves remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.3.2.7 Auxiliary Feedwater Header Modification

The original auxiliary feedwater (AFW) headers internal to the steam generators were found damaged during the 1982 refueling outage. The repair was to install an external header on each steam generator, including some rerouting of piping and supports. Since this 1982 modification, the new design has been included in the steam generator stress report and included in the steam generator fatigue analyses.

The auxiliary feedwater thermal sleeve stresses were also analyzed according to the ASME Code for Class I components. The analysis provided a basis for demonstrating that the AFW thermal sleeve is capable of withstanding 300 cycles of auxiliary feedwater injection transients.

In addition, the riser flange attachment to the steam generator shell was analyzed per ASME Code requirements. However, it was necessary to limit the design life to 875 cycles of auxiliary feedwater initiation.

Flow induced vibration of the steam generator tubes with the new feedwater header design was reviewed. It was concluded that the stress and deflection with the external headers was significantly less than the stress and deflection with the original internal headers; consequently flow induced vibration was not reanalyzed for this modification. Section A.2.3.2.8 discusses the flow induced vibration analyses of the steam generator tubes.

Auxiliary feedwater initiations are projected to a maximum of 442 cycles through the period of extended operation. This projection exceeds the 300 cycles analyzed for the thermal sleeve but is less than the 875 cycles analyzed for the riser flange. The number of occurrences of design transients is tracked by the Fatigue Monitoring Program to ensure that action is taken before the design cycles are reached. As such, the effects of aging due to fatigue are managed for the period of extended operation.

The effects of fatigue on the auxiliary feedwater header modification will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3.2.8 Steam Generator Tubes and Tube Stabilizers Flow Induced Vibration

Flow induced vibration of the steam generator tubes has been analyzed for 40 years of operation. The analysis for an un-repaired tube has been projected to remain below 1.0 for 60 years of operation in accordance with 10 CFR 54.21(c)(1)(ii).

The CUF for the 3/8 inch tube stabilizers is calculated using both high cycle (flow induced vibration) and low cycle (transients) fatigue. The CUFs for the tube stabilizers have been projected to remain below 1.0 for 60 years of operation.

The analyses associated with the effects of flow induced vibration on the steam generator tubes and tube stabilizers have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.3.3 Non-Class 1 Fatigue Evaluations

The specific codes and standards to which systems and components important to safety were designed are listed in USAR Table 3.2-2.

The non-Class 1 mechanical components susceptible to fatigue fit into the two major categories:

1. Piping and in-line components (tubing, piping, thermowells, valve bodies, etc.)

   Non-class 1 components that are quality group B or C are largely designed and constructed to the ASME Code, but certain components are built to other codes including ANSI B31.1. The design of ASME Section III Code Class 2 and 3 piping systems incorporates a stress range reduction factor for determining acceptability of piping design with respect to thermal stresses. Piping systems designed to ANSI B31.1 also incorporate stress range reduction factors based upon the number of thermal cycles. In general, a stress range reduction factor of 1.0 in the stress analyses applies for up to 7,000 thermal cycles. The allowable stress range is reduced by the stress range reduction factor if the number of thermal cycles exceeds 7,000. If fewer than 7,000 cycles are expected through the period of extended operation, then the fatigue analysis (stress range reduction factor) of record will remain valid through the period of extended operation.

2. Non-piping components (Major Components)

   Fatigue need not be addressed for non-Class 1 vessels, heat exchangers, storage tanks, and pumps, unless these components were designed to ASME Section VIII Division 2 or ASME Section III, Subsection NC-3200.

Each of these categories is addressed below.

A.2.3.3.1 Non-Class 1 Piping and In-Line Components

Thermal cycles have been projected through 60 years of plant operation. These projections, applied to the non-Class 1 piping and in-line components, indicate that 7,000 thermal cycles will not be exceeded during 60 years of operation.

The analyses associated with fatigue of non-Class 1 piping and in-line components remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.3.3.2 Non-Class 1 Major Components

For those non-Class 1 non-piping components identified as possibly subject to fatigue, a review of component design codes was conducted to determine if fatigue analyses of the components were required. If no fatigue analysis was required, then no TLAA for fatigue exists.

While most Class 1 components are designed in accordance with ASME Section III, non-Class 1 pressure vessels, heat exchangers, tanks, and pumps are often designed in accordance with other industry codes and standards, reactor designer specifications, and architect engineer specifications. ASME Section III, Subsection NC-3200 and ASME Section VIII, Division 2 include fatigue design requirements, and include provisions for "exemption from fatigue," which is actually a simplified fatigue evaluation based on materials, configuration, temperature, and cycles. If cyclic loading and fatigue usage for a component could be significant, then ASME Section III, Subsection NC-3200 or ASME Section VIII, Division 2 are specified.

Due to conservatism in ASME Section III, Subsections NC-3100 and ND-3000 and ASME Section VIII, Division 1, detailed fatigue analyses are not required. Also, fatigue analyses are not required for ASME Section III, Subsection NC and ND pumps and storage tanks (less than 15 psig), or for other design codes (e.g., ASME Section VIII, Division 1, American Water Works Association, Manufacturer's Standardization Society, National Electrical Manufacturers Association).

There are no fatigue analyses, and therefore no TLAA, associated with the non-Class 1 non-piping components.

A.2.3.4 Generic Industry Issues on Fatigue

This section addresses the Davis-Besse fatigue TLAAs associated with NRC Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification," and with the effects of the primary coolant environment on fatigue life.

A.2.3.4.1 Pressurizer Surge Line Thermal Stratification

NRC Bulletin 88-11 required the re-evaluation of the cyclic fatigue of the pressurizer surge line. As part of the re-evaluation, the Davis-Besse plant heatup and cooldown transients were redefined. Other transients were modified to include thermal stratification and striping. The surge line piping and nozzles were analyzed for license renewal, considering the effects of the reactor coolant environment. See Section A.2.3.4.2 for a discussion of the effects of the reactor coolant environment on fatigue.

A.2.3.4.2 Effects of the Reactor Coolant Environment on Fatigue

Industry test data indicates that certain environmental effects (such as temperature and dissolved oxygen content) in the primary systems of light water reactors could result in greater susceptibility to fatigue than would be predicted by fatigue analyses based on the ASME Section III design fatigue curves. The ASME design fatigue curves were based on laboratory tests in air and at low temperatures. Although the failure curves derived from laboratory tests were adjusted to account for effects such as data scatter, size effect, and surface finish, these adjustments may not be sufficient to account for actual plant operating environments.

No immediate NRC staff or licensee action is necessary to deal with the environmentally assisted fatigue issue. However, because metal fatigue effects increase with service life, environmentally assisted fatigue is evaluated for license renewal.

NUREG/CR-6260 [Reference A.2-5] identifies locations of interest for consideration of environmental effects in several types of nuclear plants. Section 5.3 of NUREG/CR-6260 reviewed the following locations for Babcock & Wilcox pressurized water reactors.

1. Reactor vessel shell and lower head; including the instrumentation nozzles
2. Reactor vessel inlet and outlet nozzles
3. Pressurizer surge line (including pressurizer surge nozzle and hot leg surge nozzle)
4. High pressure injection/makeup nozzle
5. Reactor vessel core flood nozzle
6. Decay heat removal Class 1 piping

Evaluations performed for the period of extended operation indicate that 40-year cumulative usage factors will not exceed 1.0; however an environmentally assisted fatigue adjustment is not applied for the initial 40 years of operation, consistent with the closure of Generic Safety Issue (GSI) 190, “Fatigue Evaluation of Metal Components for 60-year Plant Life.”

The effect of the reactor coolant environment on fatigue usage has been evaluated for the six locations identified in NUREG/CR-6260. The results for those six locations show that most locations have an environmentally assisted fatigue adjusted cumulative usage factor of less than 1.0. However, high pressure injection/makeup (HPI/MU) nozzle stainless steel safe end and associated Alloy 82/182 weld have environmentally adjusted CUFs greater than 1.0. FENOC has committed (see Table A-1, Item 23) to replace the HPI/MU nozzle safe end and associated Alloy 82/182 weld prior to entering the period of extended operation.

The effects of environmentally assisted fatigue for each NUREG/CR-6260 location will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.4 ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

The Environmental Qualification (EQ) of Electrical Components Program manages component thermal, radiation, and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, components in the EQ program that are not qualified for the full current license term (40 years) are required to be refurbished, replaced, or have their qualification extended prior to reaching the limits established in the evaluation. The EQ program ensures that the environmentally qualified components are maintained in accordance with their qualification bases. Equipment qualification evaluations for components in the EQ program that specify a qualification of at least 40 years are TLAAs for license renewal.

Environmental qualification of electrical equipment will be managed by the Environmental Qualification (EQ) of Electrical Components Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.5 CONTAINMENT FATIGUE ANALYSES

Additional potential TLAAs associated with the Containment structure were reviewed and are summarized in the following sections:

- Containment Vessel (Section A.2.5.1)
- Containment Penetrations (Section A.2.5.2)
- Permanent Canal Seal Plate (Section A.2.5.3)

A.2.5.1 Containment Vessel

The containment vessel is a Class B vessel as defined in the ASME Section III, Paragraph N-132, 1968 Edition through Summer Addenda 1969. The containment vessel meets the requirements for Paragraph N-415.1 of ASME Section III, thereby justifying the exclusion of cyclic or fatigue analyses in the design of the containment vessel, as discussed in USAR Section 3.8.2.1.5. The containment vessel has been analyzed for 400 pressure cycles (from -25 psi to 120 psi) and 400 temperature cycles (from 30°F to 120°F). The containment vessel has not seen any pressure cycles in the defined range (through 2009). The values of 400 pressure cycles and 400 temperature cycles used to exclude fatigue analyses will not be exceeded for 60 years of operation.

The TLAA associated with exclusion of the containment vessel from fatigue analyses per ASME Section III, Paragraph N-415.1 remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.5.2 Containment Penetrations

There are no fatigue analyses, and hence no TLAA, associated with the containment vessel penetration assemblies.

A.2.5.3 Permanent Canal Seal Plate

The permanent canal seal plate (also known as permanent reactor cavity seal plate) spans the gap between the reactor vessel and the fuel transfer canal floor, and retains water in the canal when the canal is flooded. The permanent canal seal plate is made up of a support structure that rests on the shield plate and reactor vessel seal ledge and a seal membrane that covers the support structure and is welded to the shield plate and reactor vessel seal ledge.

The fatigue analysis of the permanent canal seal plate seal membrane installed in 2004 shows that the maximum fatigue cumulative usage factor location is the inner leg to the reactor vessel seal ledge weld. A limit of 50 zero-to-full power cycles is recommended to meet the ASME Code requirement of maintaining the cumulative usage factor less than 1.0. The permanent canal seal plate is projected to experience 51 heatup and cooldown cycles from the date of installation (2004) through the end of the period of extended operation. However, the number of occurrences of permanent canal seal plate heatup and cooldown is tracked by the Fatigue Monitoring Program to assure that action is taken before the analyzed number of transients is reached.

The effects of fatigue of the permanent canal seal plate will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.6 INSERVICE INSPECTION – FRACTURE MECHANICS ANALYSES

10 CFR 50.55a(g) requires an Inservice Inspection program to verify the integrity of the reactor coolant pressure boundary. Flaws detected during examination are compared to acceptance standards established in ASME Section XI. Unacceptable flaw require detailed analyses, repair, or replacement.

Acceptance via fracture mechanics analysis requires a prediction of flaw growth considering a chosen evaluation period, i.e., no shorter than the time until the next inspection following discovery of the flaw or as long as the remaining service life of the plant. Flaw indications that are determined not to grow beyond acceptance limits during the evaluation period are justified for continued operation. Fracture mechanics analyses performed for the life of the plant are TLAAs that typically involve the same design transient cycle assumptions considered in the current licensing basis.

A.2.6.1 Reactor Coolant System Loop 1 Cold Leg Drain Line Weld Overlay Repair

A full structural overlay repair was performed for an axial indication found on the Reactor Coolant System Loop 1 cold leg drain line during the Cycle 14 refueling outage. The structural weld overlay of the cold leg drain nozzle was designed consistent with the requirements of ASME Section XI; Code Case N-504-2; Non-mandatory Appendix Q; and was supplemented by additional design considerations specific to the cold leg drain nozzle-to-elbow weld.

The overlay is designed as a full structural overlay that assumes the as-found flaw propagates to a 100% through-wall 360-degree crack rather than performing a crack growth analysis of the as-found flaw. Thus there is no time dependency in the weld overlay design.

The fatigue analysis estimated cycles for 60 years based on the original design cycles. Because this analysis is based on a specific number of cycles, it is considered a TLAA. All cumulative usage factors for the reactor coolant pump drain line weld overlay are less than 1.0.

The effects of fatigue on the reactor coolant pump drain line weld overlay repair will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.6.2 OTSG 1-2 Flaw Evaluations

During the Cycle 5 refueling outage (year 1988) a number of flaw indications were detected in steam generator 1-2, both in the shell near the steam outlet nozzle and in the shell welds near the lower tubesheet-to-shell juncture. Two of the indications in the shell near the steam outlet nozzle were evaluated according to ASME Section XI, with the remaining shell indications bounded by those evaluated. Five of the indications in the shell welds near the lower tubesheet-to-shell juncture were evaluated, with the remaining shell weld indications bounded by those evaluated.

Simplified evaluation of fatigue crack growth, based on 240 heatup and cooldown cycles concluded that there would be only slight crack growth, and the indications were found to be acceptable by ASME Section XI, IWB-3612 standards. Because these analyses are based on a specific number of cycles, they are TLAAs.

The effects of fatigue on the steam generator flaw evaluations will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

The TLAAs that do not fit into any of the previous major categories are evaluated below.

A.2.7.1 Leak-Before-Break

The leak-before-break (LBB) concept relies on the plant's ability to detect leakage from a through-wall flaw and then take appropriate action before that flaw grows to the point of pipe failure. Analyses showed that postulated flaws producing detectable leakage exhibit stable growth, and thus, allow a controlled plant shutdown before any potential exists for catastrophic piping failure.

The LBB analyses were updated to include the Alloy 52 weld overlays that were installed on the reactor coolant pump suction and discharge nozzles for PWSCC mitigation. These analyses considered fatigue flaw growth, and PWSCC. Because these analysis considerations could be influenced by time, LBB analyses are considered to be TLAAs. Fatigue flaw growth, thermal aging, and PWSCC are addressed separately below.

Fatigue Flaw Growth

Surface flaws were postulated at the piping system locations with the highest stress coincident with the lower bound of material properties for the base metal and welds. The leak-before break analysis for the reactor coolant pump suction and discharge weld overlays is based on 1.5 times the design cycles.

The effects of fatigue flaw growth on piping approved for LBB will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

Thermal Aging

The only stainless steel materials addressed in the LBB analysis are the safe ends welded to the reactor coolant pump casings and the casings themselves; with the pump casings being the only cast stainless steel.

The updated LBB analysis was based on saturated embrittlement of the cast austenitic stainless steel (CASS) casings such that there is no embrittlement TLAA.

Aging management review of the RCS determined reduction of fracture toughness due to thermal embrittlement of CASS components to be an aging effect requiring management for the reactor coolant pump casings. The acceptability of a 10-year inspection interval for these weld overlays was demonstrated in the updated LBB. This analysis does not justify operation of the weld overlays for the life of the plant, but for the 10 years between inspections. Therefore, the effects of thermal aging on CASS components in the approved LBB piping will be managed by the Inservice Inspection Program for the period of extended operation.

The effects of thermal aging on CASS components in the approved LBB piping are not a TLAA.

PWSCC

FENOC received relief to install weld overlays on certain Alloy 600 components and Alloy 82/182 dissimilar metal welds for mitigation of PWSCC, including Alloy 82/182 welds in piping approved for LBB. FENOC updated the original leak-before-break calculations for Davis-Besse with an evaluation demonstrating that the weld overlays resolve the concerns for original welds susceptibility to primary water stress corrosion cracking. Critical crack sizes and leakage rates with the weld overlay in place were evaluated to demonstrate that margins exist for detection of leakage, i.e., the conclusions of the existing leak-before-break analysis remain valid.

Aging management review of the RCS, including the nickel alloy weld locations, identified cracking due to PWSCC as an aging effect requiring management for the period of extended operation. Cracking due to PWSCC is managed by the Inservice Inspection Program and the Nickel-Alloy Management Program.

The analyses associated with the effects of PWSCC of Alloy 600/82/182 materials on the LBB analysis are not a TLAA.

A.2.7.2 Metal Corrosion Allowance for Pressurizer Instrument Nozzles

USAR Section 5.2.3.2 indicates that pressurizer nozzle repairs and replacements have resulted in a portion of the carbon steel pressurizer nozzle bore being exposed to reactor coolant. This resulted in an increase of the general corrosion rate of the pressurizer shell base metal in the nozzle bores from zero to 1.42 thousandths of an inch (mils) per year. Over the 9 years from the installation of this modification to the end of the original licensed period, this will result in a loss of 13 mils of the pressurizer carbon steel shell in the nozzle annular regions. The allowable radial corrosion limit, calculated per ASME Section III, is 293 mils for the level instrument nozzles, 493 mils for the sample nozzle and 495 mils for the vent and thermowell nozzles. This corrosion analysis is a TLAA.

Loss of material in the annular region of the repaired pressurizer nozzles has been projected through the end of the period of extended operation and remains below the allowable radial corrosion limit, to meet ASME Section III, Class 1 Code design for the nozzles.

The corrosion allowance TLAA for the pressurizer nozzle annular regions has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(ii).

A.2.7.3 Reactor Vessel Thermal Shock due to Borated Water Storage Tank Water Injection

USAR Section 5.2 addresses integrity of the reactor coolant pressure boundary and the analysis to demonstrate that the reactor vessel can safely accommodate the rapid temperature change associated with the postulated operation of the Emergency Core Cooling System (ECCS) at the end of the vessel's design life. The analysis documents the reactor vessel integrity during a small steam line break, which creates a pressurized thermal shock condition. This transient generates the greatest level of stress in the reactor vessel. Technical Specifications allow the borated water storage tank (BWST) water temperature to be as low as 35°F. The analysis was revised for license renewal to use reactor vessel embrittlement values that bound the period of extended operation.

The revised fracture mechanics analysis evaluated the integrity of the reactor vessel against pressurized thermal shock (PTS) for 52 EFPY considering the 35° F minimum temperature for the BWST. Several locations in the reactor vessel were analyzed for PTS, and all locations have demonstrated service life greater than 52.0 EFPY. Flaws do not initiate for any of the postulated flaw depths. The minimum critical margin to applied pressure margin is 2.21 at the nozzle belt forging.

The reactor vessel integrity analysis has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.7.4 High Pressure Injection / Makeup Nozzle Thermal Sleeves

During the Cycle 5 refueling outage, Davis-Besse discovered a failed thermal sleeve for HPI/MU nozzle A-1. Corrective actions included assessment and preservation of the structural integrity of the nozzle, which had experienced thermal cycling due to the thermal sleeve failure. The makeup flow path was re-routed from nozzle A-1 to nozzle A-2 during the Cycle 6 refueling outage (1990) as one of the corrective actions. Fracture mechanics analysis of thermal sleeve life under various makeup flow cycling conditions predicted a thermal sleeve lifetime exceeding 20 eighteen-month operating cycles under current makeup flow control conditions.

Since that analysis, Davis-Besse had an extended (approximately two year) Cycle 13 refueling outage, converted to a 24-month fuel cycle, and performed a measurement uncertainty recapture power uprate. The corresponding predicted end-of-life for the HPI/MU nozzle thermal sleeve is approximately 2022, based on the predicted number of makeup thermal cycles. The current operating license for Davis-Besse will expire in April of 2017. However, FENOC has committed (see Table A-1, Item 23) to replace the

HPI/MU nozzle safe end and associated Alloy 82/182 weld prior to entering the period of extended operation.

The TLAA associated with cracking of the high pressure injection / makeup nozzle thermal sleeves will be managed by the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.8 APPENDIX A.2 REFERENCES

A.2-1 Allen, Barry S. (Davis-Besse), Letter to NRC, L-09-072, “License Amendment Request to Incorporate the Use of Alternate Methodologies for the Development of Reactor Pressure Vessel Pressure-Temperature Limit Curves, and Request for Exemption from Certain Requirements Contained in 10 CFR 50.61 and 10 CFR 50, Appendix G,” April 15, 2009.

A.2-2 NUREG/CR-6177, "Assessment of Thermal Embrittlement of Cast Stainless Steels," May 1994.

A.2-3 Wengert, Thomas J. (NRC), Letter to Barry S. Allen (Davis-Besse), R-08-153, “Davis-Besse Nuclear Power Station, Unit 1-Request for Additional Information Related to Improved Technical Specifications Conversion (MD6398),” June 18, 2008.

A.2-4 Allen, Barry S. (Davis-Besse), Letter to NRC, L-08-224, “Response to Request for Additional Information Regarding License Amendment Request: Conversion of Current Technical Specifications (CTS) to Improved Technical Specifications (ITS) and Copy of Two Questions from the U.S. Regulatory Commission and Davis-Besse Nuclear Power Station Improved Technical Specifications Conversion Website (TAC No. MD6398),” September 3, 2008

A.2-5 NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components,” February 1995.

A.2-6 Collins, Daniel S. (NRC), Letter to Bezilla, Mark B. (Davis-Besse), Log 6459, “Davis-Besse Nuclear Power Station, Unit 1- Evaluation of Request for Relief RE: Full Structural Weld Overlay (TAC No. MD0683),” October 19, 2006

A.2-7 Wengert, Thomas J. (NRC), Letter to Barry S. Allen (Davis-Besse), R-08-162, “Davis-Besse Nuclear Power Station, Unit No.1 – Issuance of Amendment RE: Measurement Uncertainty Recapture Power Uprate (TAC No. MD8326), June 30, 2008

A.2-8 Bezilla, Mark B. (Davis-Besse), Letter to NRC, L-08-034, “Summary of Design and Analyses of the Weld Overlays for Pressurizer and Hot Leg Nozzle Large Bore Dissimilar Metal Welds for Alloy 600 Mitigation (TAC No. MD4452),” February 8, 2008

A.2-9 NRC Regulatory Guide 1.99, “Radiation Embrittlement of Reactor Vessel Materials,” Revision 2

A.2-10 DOR Guidelines, “Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors,” November 1979

A.2-11 NUREG-0588, “Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment,” Revision 1

A.2-12 NRC Regulatory Guide 1.89, “Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants,” Revision 1

A.2-13 NRC Regulatory Guide 1.97, “Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident,” Revision 3

A.2-14 AREVA NP Document BAW-2241P-A, “Fluence and Uncertainty Methodologies,” April 1999 (NRC Safety Evaluation Report included)

A.2-15 AREVA NP Document BAW-10013-A, "Study of Intergranular Separations in Low-Alloy Steel Heat-Affected Zones under Austenitic Stainless Steel Weld Cladding,” Last Revised February 15, 1972

A.2-16 AREVA NP Document BAW-10046A, “Method of Compliance with Fracture Toughness and Operational Requirements of 10CFR50, Appendix G,” Revision 4

A.2-17 NRC Regulatory Guide 1.190, “Calculational and Dosimetry Methods for Determining Vessel Neutron Fluence,” March 2001

A.3 LICENSE RENEWAL COMMITMENT LIST

Table A-1 identifies those actions committed to by FENOC for Davis-Besse in the Davis-Besse LRA. These regulatory commitments will be tracked within the FENOC regulatory commitment management program. Any other actions discussed in the LRA represent intended or planned actions by FENOC. These other actions are described only as information and are not regulatory commitments. This list will be revised as necessary in subsequent amendments to reflect changes resulting from NRC audit questions and Davis-Besse responses to NRC requests for additional information.

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Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
1	Enhance the Aboveground Steel Tanks Inspection Program to: • Include a volumetric examination of the tank bottoms to detect evidence of loss of material due to crevice, general, or pitting corrosion, or to confirm a lack thereof. Establish the examination technique, the inspection locations, and the acceptance criteria for the examination of the tank bottoms. Require that unacceptable inspection results be entered into the FENOC Corrective Action Program.	April 22, 2017	LRA	A.1.2 B.2.2
2	Implement the Boral® Monitoring Program as described in LRA Section B.2.5.	April 22, 2017	LRA	A.1.5 B.2.5
3	Enhance the Buried Piping and Tanks Inspection Program to: • Add 1) bolting for buried Fire Protection System piping and 2) the emergency diesel fuel oil storage tanks (DB-T153-1, DB-T153-2) to the scope of the program. [continued]	April 22, 2017	LRA	A.1.7 B.2.7

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
3 [continued]	• Require that an inspection of coated and wrapped buried piping or tank be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40). Specify that if an opportunistic inspection has not occurred between year 30 and year 38, then an excavation of a section of coated and wrapped buried piping for the purpose of inspection will be performed before year 40. • Require that an additional inspection of coated and wrapped buried piping or tank be performed within 10 years after entering the period of extended operation (i.e., between year 40 and year 50). Specify that if an opportunistic inspection has not occurred between year 40 and year 48, then an excavation of a section of coated and wrapped buried piping for the purpose of inspection will be performed before year 50. • Require that an inspection of uncoated cast iron buried piping be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40). Specify that if an opportunistic inspection has not occurred between year 30 and year 38, then an excavation of a section of uncoated cast iron buried piping for the purpose of inspection will be performed before year 40. [continued]	April 22, 2017	LRA	A.1.7 B.2.7

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
3 [continued]	• Require that an additional inspection of uncoated cast iron buried piping be performed within 10 years after entering the period of extended operation (i.e., between year 40 and year 50). Specify that if an opportunistic inspection has not occurred between year 40 and year 48, then an excavation of a section of uncoated cast iron buried piping for the purpose of inspection will be performed before year 50. • Require that an inspection of buried Fire Protection System bolting will be performed when the bolting becomes accessible during opportunistic or focused inspections. • Require that the inspections of buried piping be conducted using visual (VT-3 or equivalent) inspection methods. Excavation shall be of approximately 10 linear feet of piping, with all surfaces of the pipe exposed.	April 22, 2017	LRA	A.1.7 B.2.7
4	Implement the Collection, Drainage, and Treatment Components Inspection Program as described in LRA Section B.2.9.	April 22, 2017	LRA	A.1.9 B.2.9
5	Implement the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection as described in LRA Section B.2.11.	April 22, 2017	LRA	A.1.11 B.2.11
6	Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program as described in LRA Section B.2.12.	April 22, 2017	LRA	A.1.12 B.2.12

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
7	Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program as described in LRA Section B.2.13.	April 22, 2017	LRA	A.1.13 B.2.13
8	Enhance the External Surfaces Monitoring Program to: • Add systems which credit the program for license renewal but do not have Maintenance Rule intended functions to the scope of the program. • Perform opportunistic inspections of surfaces that are inaccessible or not readily visible during normal plant operations or refueling outages, such as surfaces that are insulated. • Perform, in conjunction with the One-Time Inspection, inspection and surveillance of elastomers and polymers exposed to air-indoor uncontrolled or air-outdoor environments, but not replaced on a set frequency or interval (i.e., are long-lived), for evidence of cracking and change in material properties (hardening and loss of strength). Specify acceptance criteria of no unacceptable visual indications of cracks or discoloration that would lead to loss of function prior to the next inspection. [continued]	April 22, 2017	LRA	A.1.15 B.2.15

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
8 [continued]	• Perform inspection of the control room emergency ventilation system air-cooled condensing unit cooling coil tubes and fins and the station blackout diesel generator radiator tubes and fins for visible evidence of external surface conditions that could result in a reduction in heat transfer. Specify acceptance criteria of no unacceptable visual indications of fouling (build up of dirt or other foreign material) that would lead to loss of function prior to the next scheduled inspection.	April 22, 2017	LRA	A.1.15 B.2.15
9	Enhance the Fatigue Monitoring Program to: • For locations, including NUREG/CR-6260 locations, projected to exceed a cumulative usage factor (CUF) of 1.0, the program will implement one or more of the following: (1) Refine the fatigue analyses to determine valid CUFs less than 1.0 using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case), (2) Manage the effects of aging due to fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC), (3) Repair or replacement of the affected locations. • Monitor any transient where the 60-year projected cycles were used in an environmentally-assisted fatigue evaluation and establish an administrative limit that is equal to or less than the 60-year projected cycles.	April 22, 2017	LRA	A.1.16 B.2.16

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
10	Enhance the Fire Water Program to: • Perform periodic ultrasonic testing for wall thickness of representative above-ground water suppression piping that is not periodically flow tested but contains, or has contained, stagnant water. The ultrasonic testing will be performed prior to the period of extended operation and at appropriate intervals thereafter, based on engineering evaluation of the initial results. • Perform at least one opportunistic or focused visual inspection of the internal surface of buried fire water piping and of similar above-ground fire water piping, within the five-year period prior to the period of extended operation, to confirm whether conditions on the internal surface of above-ground fire water piping can be extrapolated to be indicative of conditions on the internal surface of buried fire water piping. • Perform representative sprinkler head sampling (laboratory field service testing) or replacement prior to 50 years in-service (installed), and at 10-year intervals thereafter, in accordance with NFPA 25, or until there are no untested sprinkler heads that will see 50 years of service through the end of the period of extended operation. [continued]	April 22, 2017	LRA	A.1.18 B.2.18

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
10 [continued]	• Perform opportunistic fire water supply and water-based suppression system internal inspections each time a fire water supply or water-based suppression system (including fire pumps) is breached for repair or maintenance. These internal visual inspections must be demonstrated to be: 1) representative of water supply and water-based suppression locations, 2) performed on a reasonable basis (frequency), and 3) capable of evaluating wall thickness and flow capability. If the internal inspections cannot be completed of a representative sample, then ultrasonic testing inspections will be used to complete the representative sample.	April 22, 2017	LRA	A.1.18 B.2.18
11	Implement the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program as described in LRA Section B.2.21.	April 22, 2017	LRA	A.1.21 B.2.21

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
12	Enhance the Masonry Wall Inspection to: • Include and list the structures within the scope of license renewal that credit the program for aging management. • Add an action to follow the documentation requirement of 10 CFR 54.37, including submittal of records of structural evaluations to records management. • Specify that for each masonry wall, the extent of observed masonry cracking or degradation of steel edge supports or bracing is evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of masonry cracking or steel degradation is sufficient to invalidate the evaluation basis. An option is to develop a new evaluation basis that accounts for the degraded condition of the wall (i.e., acceptance by further evaluation).	April 22, 2017	LRA	A.1.27 B.2.27

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
13	Implement the One-Time Inspection as described in LRA Section B.2.30. Enhance the One-Time Inspection to: • Include visual inspections to detect and characterize the material condition of aluminum, copper alloy (including copper alloy greater than 15% zinc), stainless steel, and steel (including gray cast iron) components exposed to condensation or diesel exhaust to provide direct evidence as to whether, and to what extent, cracking, loss of material, or reduction in heat transfer has occurred. • Include visual and physical examination, such as manipulation and prodding, of elastomers (flexible connections) to supplement the External Surfaces Monitoring Program and provide direct evidence as to whether, and to what extent, hardening and loss of strength due to thermal exposure, ultraviolet exposure, and ionizing radiation of elastomers has occurred.	April 22, 2017	LRA	A.1.30 B.2.30
14	Implement the PWR Reactor Vessel Internals Program as described in LRA Section B.2.32.	April 22, 2017	LRA	A.1.32 B.2.32
15	The PWR Reactor Vessel Internals Program will be revised, as necessary, to incorporate the final recommendations and requirements as published in MRP-227-A.	Following NRC approval of MRP-227 and re-issuance of the guidelines as MRP-227-A.	LRA	A.1.32 B.2.32

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
16	Enhance the Reactor Head Closure Studs Program as follows: • Select an alternate stable lubricant that is compatible with the fastener material and the environment. A specific precaution against the use of compounds containing sulfur (sulfide), including molybdenum disulfide (MoS_2), as a lubricant for the reactor head closure stud assemblies will be included in the program.	April 22, 2017	LRA	A.1.34
17	Enhance the Reactor Vessel Surveillance Program as follows: • The Capsule Insertion and Withdrawal Schedule for Davis-Besse will be revised to schedule testing of the TE1-C capsule.	April 22, 2017	LRA	A.1.35 B.2.35
18	Implement the Selective Leaching Inspection as described in LRA Section B.2.36.	April 22, 2017	LRA	A.1.36 B.2.36
19	Implement the Small Bore Class 1 Piping Inspection as described in LRA Section B.2.37.	April 22, 2017.	LRA	A.1.37 B.2.37

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
20	Enhance the Structures Monitoring Program to: • Include and list the structures within the scope of license renewal that credit the program for aging management. • Include aging effect terminology (e.g., loss of material, cracking, change in material properties, and loss of form). • List ACI 349.3R-96 and ANSI/ASCE 11-90 as references and indicate that they provide guidance for the selection of parameters monitored or inspected. • Clarify that a "structural component" for inspection includes each of the component types identified within the scope of license renewal as requiring aging management. • Require the responsible engineer to review site raw water pH, chlorides, and sulfates test results prior to the inspection to take into account the raw water chemistry for any unusual trends during the period of extended operation. Raw water chemistry data shall be collected at least once every five years. Data collection dates shall be staggered from year to year (summer-winter-summer) to account for seasonal variation. [continued]	April 22, 2017	LRA	A.1.39 B.2.39

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
20 [continued]	• Include a special provision to monitor below-grade inaccessible concrete components before and during the period of extended operation. Perform a below-grade examination of concrete below elevation 570 (groundwater elevation) of an in-scope structure prior to the period of extended operation. The inspection will include concrete examination using acceptance criteria from NUREG-1801 XI.S6 Program element 6. The examination of concrete below elevation 570 feet may be conducted during maintenance activities. Any degradation found that exceeds the acceptance criteria will be trended and processed through the FENOC Corrective Action Program. • Specify that, upon notification that a below-grade structural wall or other in-scope concrete structural component will become accessible through excavation, a follow-up action is initiated to the responsible engineer to inspect the exposed surfaces for age-related degradation. Such inspections will include concrete examination using acceptance criteria from NUREG-1801 XI.S6 Program element 6. Any degradation found that exceeds the acceptance criteria will be trended and processed through the FENOC Corrective Action Program. [continued]	April 22, 2017	LRA	A.1.39 B.2.39

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
20 [continued]	• List ACI 349.3R-96, ANSI/ASCE 11-90, and EPRI Report 1007933 as references and indicate that they provide guidance for detection of aging effects. • Add an action to follow the documentation requirement of 10 CFR 54.37, including submittal of records of structural evaluations to records management. • Indicate that ACI 349.3R-96 provides acceptable guidelines which will be considered in developing acceptance criteria for concrete structural elements, steel liners, joints, coatings, and waterproofing membranes.	April 22, 2017	LRA	A.1.39 B.2.39

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
21	Enhance the Water Control Structures Inspection to: • Include the Service Water Discharge Structure which is within the scope of license renewal. • Include parameters monitored and inspected for water control structures, including the Service Water Discharge Structure, in accordance with applicable inspection elements listed in Section C.2 of Regulatory Guide 1.127 Revision 1. Descriptions of concrete conditions will conform with the appendix to the American Concrete Institute (ACI) publication, ACI 201. The use of photographs for comparison of previous and present conditions will be included as a part of the inspection program. • Specify that water control structure periodic inspections are to be performed at least once every five years. • Add an action to follow the documentation requirement of 10 CFR 54.37, including submittal of records of structural evaluations to records management. • List ACI 349.3R-96 as a reference and indicate that it will be considered in developing acceptance criteria for inspection of water control structures.	April 22, 2017	LRA	A.1.40 B.2.40
22	FENOC commits to enclose or otherwise protect the safety-related station ventilation radiation monitors located in the Turbine Building such that leakage and spray from surrounding piping systems does not adversely impact the intended function of the radiation monitors.	April 22, 2017	N/A	N/A

Table A-1
Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
23	In association with the TLAA for cracking of the high pressure injection / makeup nozzle thermal sleeves, FENOC commits to replace all four high pressure injection / makeup nozzle thermal sleeves and safe ends prior to the period of extended operation. In addition, FENOC commits to evaluate the environmental effects on the replacement HPI nozzle safe ends and associated welds in accordance with NUREG/CR-6260 and the guidance of EPRI Technical Report MRP-47, “Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application.” Any nickel-based alloy locations will be evaluated in accordance with NUREG/CR-6909.	April 22, 2017	LRA	A.2.7.4
24	The elements of corrective actions, confirmation process, and administrative controls in the Quality Assurance Program Manual will be applied to the credited aging management programs and activities for the structures and components determined to require aging management for the period of extended operation.	April 22, 2017	LRA	A.1
25	FENOC commits to create a preventive maintenance task to periodically replace the letdown coolers (DB-E21-1 & 2) at a set frequency.	April 22, 2017	LRA	2.3.3.18

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APPENDIX B

AGING MANAGEMENT PROGRAMS

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APPENDIX B

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B.0 AGING MANAGEMENT PROGRAMS

B.1 INTRODUCTION

B.1.1 OVERVIEW

License renewal aging management program (AMP) descriptions are provided in this appendix for each program credited for managing aging effects based upon the aging management review results provided in Sections 3.1 through 3.6.

Each aging management program described in this appendix is evaluated on the basis of 10 program elements in accordance with the guidance in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR).

B.1.2 METHOD OF DISCUSSION

For those existing AMPs that are comparable to the programs described in Sections X and XI of NUREG-1801, the "Generic Aging Lessons Learned (GALL) Report," the program evaluation is presented in the following summary format:

- **Aging Management Program Description** – An abstract of the overall program is provided.
- **NUREG-1801 Consistency** – A statement is made regarding consistency between the Davis-Besse program and the corresponding NUREG-1801 program.
- **Exceptions to NUREG-1801** – Exceptions to NUREG-1801 programs are identified when elements of the Davis-Besse program are different from the NUREG-1801 program elements or when elements of the NUREG-1801 program are not applicable to Davis-Besse. Each exception is listed along with the affected element. A justification is provided for each exception.
- **Enhancements** – Enhancements to existing programs necessary to ensure consistency with NUREG-1801 or to expand the scope of the program for license renewal are identified. Each enhancement is listed along with the affected program element and a proposed schedule for completion of the enhancement.
- **Operating Experience** – Discussion of operating experience information specific to the program is provided.
- **Conclusion** – A conclusion section provides a statement of reasonable assurance that the program is effective, or will be effective, once enhanced or developed.

For those programs that are either new or plant-specific, the above format is generally followed along with the additional provision of a discussion of each of the 10 elements associated with the program.

B.1.3 QUALITY ASSURANCE PROGRAM AND ADMINISTRATIVE CONTROLS

Three elements of an effective aging management program that are common to each of the aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the FirstEnergy Nuclear Operating Company (FENOC) Quality Assurance Program Manual (QAPM), which implements the requirements of 10 CFR 50 Appendix B. The QAPM is incorporated by reference in the Updated Safety Analysis Report (USAR) Section 17.

Prior to the period of extended operation, the elements of corrective actions, confirmation process, and administrative controls in the QAPM will be applied to required aging management programs for both safety-related and nonsafety-related structures and components determined to require aging management during the period of extended operation. The corrective actions, confirmation process, and administrative controls in the QAPM, to be applied to the credited aging management programs and activities for the structures and components determined to require aging management, are consistent with the related discussions in the Appendix on Quality Assurance for Aging Management Programs in NUREG-1801, Volume 2.

The elements of corrective actions, confirmation process, and administrative controls of the QAPM are described in the sections below, including a general comparison to the associated elements of the corresponding NUREG-1801 aging management programs.

Corrective Actions:

Corrective actions are implemented through the FENOC Corrective Action Program that satisfies the requirements of 10 CFR 50, Appendix B, Criterion XVI. Conditions adverse to quality, an all inclusive term used in reference to failures, malfunctions, deficiencies, defective items, and non-conformances are identified, reported to management, and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the root cause is determined and that corrective actions are taken to preclude recurrence.

The Corrective Action Program is the subject of periodic NRC examination and Davis-Besse self-assessment and audit. In general, problems are effectively identified, evaluated, and prioritized, and effective corrective actions implemented for conditions adverse to quality. Some program shortfalls have been identified, but corresponding process improvements have been developed and implemented. The current program is, therefore, adequate for aging management considerations.

Confirmation Process:

The focus of the confirmation process is on the follow-up actions taken to verify effective implementation of corrective actions and to preclude repetition of significant conditions adverse to quality. The Corrective Action Program includes the requirement that measures be taken to preclude repetition of significant conditions adverse to quality. These measures include actions to verify effective implementation of proposed corrective actions. The confirmation process is part of the Corrective Action Program and, for significant conditions adverse to quality, includes:

- reviews to assure proposed actions are adequate,
- tracking and reporting of open corrective actions,
- root cause, and
- reviews of corrective action effectiveness.

Effectiveness reviews are conducted as part of the Corrective Action Program to ensure that corrective actions have been completed and to identify any repetition of events. The Corrective Action Program is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of follow-up actions in the Corrective Action Program.

Administrative Controls:

Administrative controls that govern aging management activities are established within the document control procedures that implement: (1) industry standards related to administrative controls and quality assurance for the operational phase of nuclear power plants, and (2) the requirements of 10 CFR 50, Appendix B, Criterion VI.

Plant policies, directives, and procedures are written and controlled to specify and manage various activities, particularly those related to compliance with 10 CFR 50, Appendix B. The phrase “administrative control” refers to the adherence to the policies, directives, and procedures, and includes the formal review and approval process that the plant policies, directives, and procedures undergo as they are issued (and subsequently revised). The individual documents (i.e., the plant policies, directives, and procedures), in conjunction with the plant’s quality assurance program documents, provide the overall administrative framework to ensure regulatory requirements are met.

B.1.4 OPERATING EXPERIENCE

The operating experience review demonstrates the effectiveness of the plant programs and activities that are credited with aging management for the period of extended operation. Industry and plant-specific operating experience for existing and new programs and for components to be managed by new Davis-Besse plant programs and activities was reviewed as an input to the aging management program evaluations. Industry operating experience was incorporated into the license renewal process through the use of license renewal guidance documents that incorporated operating experience regarding aging effects requiring management. Industry operating experience applicable to Davis-Besse since issuance of the industry guidance documents (2005) was reviewed and evaluated. The search of industry operating experience (OE) was performed through a search of NRC generic communications (Bulletins, Information Notices, Generic Letters, Regulatory Issue Summaries, etc.), and a search of industry operating experience from the Institute for Nuclear Power Operations (INPO) and from the World Association of Nuclear Operators (WANO) as contained in the FENOC Corrective Action Program.

Plant procedures require that the discovery of conditions adverse to quality be documented in accordance with the FirstEnergy Nuclear Operating Company Corrective Action Program. A review of plant records from January 2001 and later was performed to identify examples of age-related degradation related to current plant operation. The scope of the review included reports generated under the Corrective Action Program and licensee event reports. These records provide documentation of situations where systems, structures, and components exhibit adverse conditions, including conditions adverse to quality and age-related degradation. Keywords related to aging and degradation were used to search the records.

The industry and plant-specific operating experience review provides the basis for the determination that existing programs are either effective or require enhancement; that one-time inspections are appropriate to verify that either aging is not occurring or that aging is being effectively managed by an existing program; or that a new program is required to be established to manage the effects of aging.

The operating experience review included consideration of the results of programmatic assessments performed by Davis-Besse and of those performed by outside agencies, including the NRC. Past corrective actions resulting in program enhancements are included in the evaluation of program effectiveness. Industry operating experience was considered for existing programs and for new programs. The operating experience review provides objective evidence that the effects of aging will be managed for the period of extended operation.

B.1.5 AGING MANAGEMENT PROGRAMS

Table B-1 provides a listing of the NUREG-1801 aging management programs and the corresponding aging management programs for Davis-Besse. Table B-2 provides a summary of the aging management programs for Davis-Besse with respect to consistency with NUREG-1801 aging management programs. Table B-2 also provides information on whether programs are existing or new, whether enhancements are required, and whether the programs are plant-specific. Each aging management program credited for license renewal is addressed in Section B.2.

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B.2 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 programs and Davis-Besse aging management programs is shown in the following table. The table is organized by the NUREG-1801 program number, first for Chapter X, then for Chapter XI, and finally for plant-specific programs.

Table B-1
Correlation of NUREG-1801 and Davis-Besse Aging Management Programs

Number	NUREG-1801 Program	Corresponding Davis-Besse AMP
NUREG-1801 Chapter X and XI		
X.E1	Environmental Qualification (EQ) of Electrical Components	Environmental Qualification (EQ) of Electrical Components Program See Section B.2.14.
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Fatigue Monitoring Program See Section B.2.16.
X.S1	Concrete Containment Tendon Prestress	Not applicable. Davis-Besse has a free-standing steel containment vessel with a reinforced concrete Shield Building that does not contain pre-stressed tendons, as described in USAR Section 3.8.2.
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Inservice Inspection Program See Section B.2.24.
XI.M2	Water Chemistry	PWR Water Chemistry Program See Section B.2.33.
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs Program See Section B.2.34.
XI.M4	BWR Vessel ID Attachment Welds	Not applicable. Davis-Besse is a PWR.
XI.M5	BWR Feedwater Nozzle	Not applicable. Davis-Besse is a PWR.
XI.M6	BWR Control Rod Drive Return Line Nozzle	Not applicable. Davis-Besse is a PWR.
XI.M7	BWR Stress Corrosion Cracking	Not applicable. Davis-Besse is a PWR.
XI.M8	BWR Penetrations	Not applicable. Davis-Besse is a PWR.

Table B-1
Correlation of NUREG-1801 and Davis-Besse Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Davis-Besse AMP
XI.M9	BWR Vessel Internals	Not applicable. Davis-Besse is a PWR.
XI.M10	Boric Acid Corrosion	Boric Acid Corrosion Program See Section B.2.6.
XI.M11	Nickel-Alloy Nozzles and Penetrations	Plant-specific aging management program is credited for aging management; Nickel-Alloy Management Program (See Section B.2.28).
XI.M11A	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	Nickel-Alloy Reactor Vessel Closure Head Nozzles Program See Section B.2.29.
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not credited for aging management. Davis-Besse has no CASS components other than pump casings and valve bodies subject to thermal embrittlement. As reduction of fracture toughness of these components is managed by the Inservice Inspection Program (See Section B.2.24), a program similar to XI.M12 is not required.
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not credited for aging management. The only CASS components subject to both thermal and radiation embrittlement are portions of the reactor vessel internals. As reduction of fracture toughness of these components is managed by the PWR Reactor Vessel Internals Program (See Section B.2.32), a program similar to XI.M13 is not required.
XI.M14	Loose Parts Monitoring	Not credited for aging management. This program is not credited for aging management of any line item in NUREG-1801 Section IV.
XI.M15	Neutron Noise Monitoring	Not credited for aging management. This program is not credited for aging management of any line item in NUREG-1801 Section IV.
XI.M16	PWR Vessel Internals	Plant-specific aging management program is credited for aging management; PWR Reactor Vessel Internals Program (See Section B.2.32).

Table B-1
Correlation of NUREG-1801 and Davis-Besse Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Davis-Besse AMP
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion (FAC) Program See Section B.2.19.
XI.M18	Bolting Integrity	Bolting Integrity Program See Section B.2.4.
XI.M19	Steam Generator Tube Integrity	Steam Generator Tube Integrity Program See Section B.2.38.
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water Program See Section B.2.31.
XI.M21	Closed-Cycle Cooling Water System	Closed Cooling Water Chemistry Program See Section B.2.8.
XI.M22	Boraflex Monitoring	Plant-specific aging management program is credited for aging management; Boral® Monitoring Program (See Section B.2.5). Spent fuel racks at Davis-Besse use Boral® as the neutron absorber (rather than Boraflex).
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Cranes and Hoists Inspection Program See Section B.2.10.
XI.M24	Compressed Air Monitoring	Not credited for aging management. Operating experience shows that the air and gas is dry except in certain locations for which the One-Time Inspection (See Section B.2.30) is credited. In addition, the plant-specific Air Quality Monitoring Program (See Section B.2.3) ensures that compressed air in the Instrument Air System is dry and free of contaminants.
XI.M25	BWR Reactor Water Cleanup System	Not applicable. Davis-Besse is a PWR.
XI.M26	Fire Protection	Fire Protection Program See Section B.2.17.
XI.M27	Fire Water System	Fire Water Program See Section B.2.18.

Table B-1
Correlation of NUREG-1801 and Davis-Besse Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Davis-Besse AMP
XI.M28	Buried Piping and Tanks Surveillance	Not credited for aging management. NUREG-1801 XI.M34 is an acceptable option and is credited for aging management. See the Buried Piping and Tanks Inspection Program (See Section B.2.7).
XI.M29	Aboveground Steel Tanks	Aboveground Steel Tanks Inspection Program See Section B.2.2.
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry Program See Section B.2.20.
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program See Section B.2.35.
XI.M32	One-Time Inspection	One-Time Inspection See Section B.2.30.
XI.M33	Selective Leaching of Materials	Selective Leaching Inspection See Section B.2.36.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program See Section B.2.7.
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	Small Bore Class 1 Piping Inspection See Section B.2.37.
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring Program See Section B.2.15.
XI.M37	Flux Thimble Tube Inspection	Not credited for aging management. Davis-Besse is a Babcock & Wilcox design that does not have flux thimble tubes.

Table B-1
Correlation of NUREG-1801 and Davis-Besse Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Davis-Besse AMP
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Not credited for aging management. The External Surfaces Monitoring Program (See Section B.2.15) is credited instead for aging management of internal surfaces where the internal and external environments are the same (e.g., air-indoor uncontrolled). Confirmation that aging is not occurring on internal surfaces that are not the same as the external environment (i.e., internal environments of air-outdoor or condensation) is provided by the One-Time Inspection (See Section B.2.30).
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis Program See Section B.2.26.
XI.S1	ASME Section XI, Subsection IWE	Inservice Inspection (ISI) Program – IWE See Section B.2.22.
XI.S2	ASME Section XI, Subsection IWL	Not applicable. Davis-Besse has a free-standing steel containment vessel with a reinforced concrete Shield Building that does not contain pre-stressed tendons, as described in USAR Section 3.8.2.
XI.S3	ASME Section XI, Subsection IWF	Inservice Inspection (ISI) Program – IWF See Section B.2.23.
XI.S4	10 CFR Part 50, Appendix J	10 CFR Part 50, Appendix J Program See Section B.2.1.
XI.S5	Masonry Wall Program	Masonry Wall Inspection See Section B.2.27.
XI.S6	Structures Monitoring Program	Structures Monitoring Program See Section B.2.39.
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Water Control Structures Inspection See Section B.2.40.

Table B-1
Correlation of NUREG-1801 and Davis-Besse Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Davis-Besse AMP
XI.S8	Protective Coating Monitoring and Maintenance Program	Not credited for aging management. Davis-Besse does not credit coatings inside the Containment to manage the effects of aging for structures and components or to ensure that the intended functions of coated structures and components are maintained. Therefore, these coatings do not have an intended function and do not require aging management for license renewal.
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program See Section B.2.12.
XI.E2	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program See Section B.2.13.
XI.E3	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program See Section B.2.21.
XI.E4	Metal-Enclosed Bus	Not credited for aging management. Davis-Besse does not utilize metal-enclosed bus.
XI.E5	Fuse Holders	Not applicable. A review of Davis-Besse documents indicated that fuse holders utilizing metallic clamps are either part of an active electrical panel or are located in circuits that perform no license renewal intended function. Therefore, fuse holders with metallic clamps at Davis-Besse are not subject to aging management review.
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection See Section B.2.11.

Table B-1
Correlation of NUREG-1801 and Davis-Besse Aging Management Programs (continued)

Number	NUREG-1801 Program	Corresponding Davis-Besse AMP
Davis-Besse Plant-Specific Programs		
N/A	Plant-Specific Program	Air Quality Monitoring Program See Section B.2.3.
N/A	Plant-Specific Program	Boral® Monitoring Program See Section B.2.5.
N/A	Plant-Specific Program	Collection, Drainage, and Treatment Components Inspection Program See Section B.2.9.
N/A	Plant-Specific Program	Leak Chase Monitoring Program See Section B.2.25
N/A	Plant-Specific Program	Nickel-Alloy Management Program See Section B.2.28.
N/A	Plant-Specific Program	PWR Reactor Vessel Internals Program See Section B.2.32.

Table B-2
Consistency of Davis-Besse Aging Management Programs with NUREG-1801

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
10 CFR Part 50, Appendix J Program Section B.2.1	Existing	Yes	--	--	--
Aboveground Steel Tanks Inspection Program Section B.2.2	Existing	Yes	--	--	Yes
Air Quality Monitoring Program Section B.2.3	Existing	--	--	Yes	--
Bolting Integrity Program Section B.2.4	Existing	--	Yes	--	--
Boral® Monitoring Program Section B.2.5	New	--	--	Yes	--
Boric Acid Corrosion Program Section B.2.6	Existing	Yes	--	--	--
Buried Piping and Tanks Inspection Program Section B.2.7	Existing	Yes	--	--	Yes
Closed Cooling Water Chemistry Program Section B.2.8	Existing	--	Yes	--	--
Collection, Drainage, and Treatment Components Inspection Program Section B.2.9	New	--	--	Yes	--

Table B-2
Consistency of Davis-Besse Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Cranes and Hoists Inspection Program Section B.2.10	Existing	Yes	--	--	--
Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection Section B.2.11	New	Yes	--	--	--
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program Section B.2.12	New	Yes	--	--	--
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program Section B.2.13	New	Yes	--	--	--

Table B-2
Consistency of Davis-Besse Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Environmental Qualification (EQ) of Electrical Components Program Section B.2.14	Existing	Yes	--	--	--
External Surfaces Monitoring Program Section B.2.15	Existing	Yes	--	--	Yes
Fatigue Monitoring Program Section B.2.16	Existing	Yes	--	--	Yes
Fire Protection Program Section B.2.17	Existing	--	Yes	--	--
Fire Water Program Section B.2.18	Existing	Yes	--	--	Yes
Flow-Accelerated Corrosion (FAC) Program Section B.2.19	Existing	Yes	--	--	--
Fuel Oil Chemistry Program Section B.2.20	Existing	--	Yes	--	--
Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program Section B.2.21	New	Yes	--	--	--

Table B-2
Consistency of Davis-Besse Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Inservice Inspection (ISI) Program – IWE Section B.2.22	Existing	Yes	--	--	--
Inservice Inspection (ISI) Program – IWF Section B.2.23	Existing	Yes	--	--	--
Inservice Inspection Program Section B.2.24	Existing	Yes	--	--	--
Leak Chase Monitoring Program Section B.2.25	Existing	--	--	Yes	--
Lubricating Oil Analysis Program Section B.2.26	Existing	Yes	--	--	--
Masonry Wall Inspection Section B.2.27	Existing	Yes	--	--	Yes
Nickel-Alloy Management Program Section B.2.28	Existing	--	--	Yes	--
Nickel-Alloy Reactor Vessel Closure Head Nozzles Program Section B.2.29	Existing	Yes	--	--	--
One-Time Inspection Section B.2.30	New	Yes	--	--	Yes
Open-Cycle Cooling Water Program Section B.2.31	Existing	--	Yes	--	--

Table B-2
Consistency of Davis-Besse Aging Management Programs with NUREG-1801 (continued)

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
PWR Reactor Vessel Internals Program Section B.2.32	New	--	--	Yes	--
PWR Water Chemistry Program Section B.2.33	Existing	Yes	--	--	--
Reactor Head Closure Studs Program Section B.2.34	Existing	Yes	--	--	Yes
Reactor Vessel Surveillance Program Section B.2.35	Existing	Yes	--	--	Yes
Selective Leaching Inspection Section B.2.36	New	Yes	--	--	--
Small Bore Class 1 Piping Inspection Section B.2.37	New	Yes	--	--	--
Steam Generator Tube Integrity Program Section B.2.38	Existing	Yes	--	--	--
Structures Monitoring Program Section B.2.39	Existing	Yes	--	--	Yes
Water Control Structures Inspection Section B.2.40	Existing	--	Yes	--	Yes

B.2.1 10 CFR Part 50, Appendix J Program

Program Description

The 10 CFR Part 50, Appendix J Program monitors Containment leak rate. Containment leak rate tests are required to assure that: (a) leakage through primary Containment and systems and components penetrating primary Containment will not exceed allowable values specified in technical specifications, and (b) periodic surveillance of primary Containment penetrations and isolation valves is performed so that proper maintenance and repairs are made. Appendix J, Option B is utilized. The Containment leak rate tests are performed in accordance with the guidelines contained in NRC Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program" (as modified by approved exceptions) and NEI 94-01, "Industry Guidance for Implementing Performance-Based Options of 10 CFR Part 50 Appendix J."

NUREG-1801 Consistency

The 10 CFR Part 50, Appendix J Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S4, "10 CFR Part 50, Appendix J."

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

For Davis-Besse, the integrated leakage rates for Type A tests, including any additions for B and C leakage rate test penalties or volume change corrections, have been less than the maximum allowable leakage rates specified in the Technical Specifications.

During the Cycle 15 refueling outage, approximately 47% of the local leak rate tests were performed to fulfill inservice inspection pressure testing requirements. Since the Cycle 15 refueling outage was the only refueling outage scheduled during the inspection interval period, all local leak rate tests performed to fulfill pressure testing requirements had to be completed. An electrical penetration assembly exceeded its individual component administrative leakage criteria but subsequently returned to within limits. A containment isolation valve exceeded its individual component administrative leakage criteria. The administrative limit for the isolation valve was temporarily raised. The isolation valve was reworked. The Minimum Pathway Leakage total is less than 25% of allowable for both Total Bypass and Combined Total.

The results of the most recent Type A test are shown below. No Type A tests have failed to meet their acceptance criteria at Davis-Besse. The NRC reviewed the last Type A test during the Cycle 13 refueling outage (March 2002 - 2004) and found it to have been performed successfully.

Test Results:

Date	Outage	Test Results Type A As-left	Acceptance Criteria	Performance Criteria
April 2003	Cycle 13	0.1671 wt.% / day	0.75 L_a (0.375 wt.% / day)	1.0 L_a (0.5 wt.% / day)

Conclusion

The 10 CFR Part 50, Appendix J Program has been demonstrated to be capable of detecting and managing aging effects for the Containment and systems and components penetrating primary Containment. The continued implementation of the 10 CFR Part 50, Appendix J Program provides reasonable assurance that the aging effects will be managed such that the Containment will continue to perform its intended function consistent with the current licensing basis for the period of extended operation.

B.2.2 ABOVEGROUND STEEL TANKS INSPECTION PROGRAM

Program Description

The Aboveground Steel Tanks Inspection Program manages the effects of corrosion on the external surfaces and inaccessible locations of the steel fire water storage tank and diesel oil storage tank. The Aboveground Steel Tanks Inspection Program is a condition monitoring program that consists of periodic visual inspections for loss of material, and a volumetric examination of the tank bottoms. This program includes an assessment of the condition of tank surfaces protected by a coating, although the paint is not credited to perform a preventive function. Performing inspection of the tank bottoms ensures that degradation or significant loss of material will not occur in inaccessible locations. The frequency of tank bottom volumetric inspection will be based on the findings of an inspection performed prior to the period of extended operation.

NUREG-1801 Consistency

The Aboveground Steel Tanks Inspection Program is an existing Davis-Besse program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M29, "Aboveground Steel Tanks."

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- **Scope, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, Acceptance Criteria**

  The program will be enhanced to include a volumetric examination of tank bottoms to detect evidence of loss of material due to crevice, general, or pitting corrosion, or to confirm a lack thereof. The enhancement will include establishing the examination technique, the inspection locations, and the acceptance criteria for the examination of the tank bottoms. Unacceptable inspection results will be entered into the Corrective Action Program. The volumetric examination of the tank bottoms will be performed prior to the period of extended operation.

Operating Experience

The Aboveground Steel Tanks Inspection Program is an ongoing program for which plant operating experience has shown the system walkdowns to effectively manage the effects of corrosion on the external surfaces of the fire water storage tank and the diesel oil storage tank. The visual inspection methods are consistent with accepted industry practices.

The system walkdown activities have identified numerous cases of paint degradation, including flaking, blistering, peeling, and chipping throughout the plant. This confirms that the visual inspections are capable of detecting the condition of painted surfaces. No cases of corrosion degradation specific to the tank exterior surfaces were identified.

In 2002, an inspection of the exterior of the diesel oil storage tank revealed rust and corrosion at the base flange of the tank and corroded bolts at the lower access plate at the base of the tank. The work order system was used to address painting and preservation of the corroded areas of the tank.

In 2008, an inspection of the exterior of the tank revealed minor paint blemishes (scratches and chipping) with no corrosion. The work order system was used to address cleaning and repainting of the affected areas.

Corrosion at the sand to metal interface on the bottom of the fire water storage tank is recognized as an area of interest. The tank design is such that it sits on a layer of oiled sand over compacted fill with the tank bottom six inches above grade. No cases of corrosion degradation specific to the bottom exterior surface of the tanks were identified. Inspection prior to the period of extended operation will determine the condition of the tank bottom. The timing and techniques for inspection of the tank bottom will consider industry operating experience with similar configurations. Industry operating experience is monitored by the site on an ongoing basis.

Conclusion

The Aboveground Steel Tanks Inspection Program has been demonstrated to be capable of managing loss of material for the accessible external surfaces of the fire water storage tank and the diesel oil storage tank. The continued implementation of the Aboveground Steel Tanks Inspection Program, with enhancement, provides reasonable assurance that the effects of aging will be managed such that the tanks will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.2.3 AIR QUALITY MONITORING PROGRAM

Program Description

The purpose of the Air Quality Monitoring Program is to ensure that the Instrument Air System remains dry and free of contaminants, to ensure that there are no aging effects requiring management. The program is based on existing commitments to NRC Generic Letter 88-14 and comprises periodic air quality sampling from the Instrument Air System. The Air Quality Monitoring Program is implemented via the work order system. The Air Quality Monitoring Program is a preventive program.

NUREG-1801 Consistency

The Air Quality Monitoring Program is an existing plant-specific program for Davis-Besse. While NUREG-1801 includes a Compressed Air Monitoring Program (XI.M24), the Air Quality Monitoring Program is considered plant-specific, and is therefore evaluated against the 10 elements described in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR).

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The scope of the Air Quality Monitoring Program includes periodic sampling of the air quality in the Instrument Air System piping and piping components to ensure that the compressed air environment remains dry and free of contaminants, thereby ensuring that there are no aging effects requiring management for this system. These components are exposed to compressed air during normal operation. The Air Quality Monitoring Program includes periodic sampling of system air quality, consistent with Generic Letter 88-14, and corresponding actions, if unacceptable moisture or contaminants are detected.

- Preventive Actions
  The Air Quality Monitoring Program includes periodic sampling of the air quality of components in the Instrument Air System, to ensure that the air remains dry and free of contaminants.

- Parameters Monitored or Inspected
  As described in the *Preventive Actions* element above, the Air Quality Monitoring Program periodically samples the compressed air within components of the Instrument Air System for hydrocarbons, dew point, and particulates to verify proper air quality and ensure that the intended function of the system is maintained.

- Detection of Aging Effects
  The Air Quality Monitoring Program does not directly inspect for or detect the effects of aging in the Instrument Air System. Rather, as described for the *Preventive Actions* element above, the presence of an environmental stressor (moisture), which could lead to corrosion of system components, is detected and moisture, if any, is removed to ensure air quality (and intended function) is maintained.

- Monitoring and Trending
  Air quality sampling of the Instrument Air System is performed periodically with a frequency dependent on the results of previous testing. Results are sent to the plant or system engineer and are available for trending analysis as necessary.

- Acceptance Criteria
  Acceptance criteria for compressed air are specified for particulates (< 2.0 milligrams per cubic meter for < 3 micron particles), hydrocarbons (< 1.0 parts per million), and dew point (1 of 3 readings must be ≤ -37°F dew point atmospheric) (as necessary) for sampling of the Instrument Air System. If specified acceptance criteria are not met, then the failure is entered into the Corrective Action Program which drives corrective actions to meet the acceptance criteria.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  As described in the Davis-Besse responses to Generic Letter 88-14, and confirmed by subsequent site operating experience, air quality monitoring continues to show that the instrument air is dry and contaminant free. There have been no failures or significant degradation of components in the Instrument Air System. Industry operating experience is also considered in the program.

Review of Davis-Besse operating experience did not reveal a loss of component intended function for components exposed to instrument air that could be attributed to an inadequacy of the Air Quality Monitoring Program. Abnormal air system conditions are promptly identified, evaluated, and corrected.

For example, in 2007, one out of nine air samples drawn for particulate testing exceeded the Preventive Maintenance established limit. This limit was established as a threshold for further investigation. The work order system was used to investigate and characterize the system piping that produced the high particulate loading.

Enhancements

None.

Conclusion

The Air Quality Monitoring Program has been demonstrated to be capable of ensuring that the Instrument Air System remains dry and free of contaminants, thereby ensuring that there are no aging effects requiring management for this system.

B.2.4 BOLTING INTEGRITY PROGRAM

Program Description

The Bolting Integrity Program is a condition monitoring program that consists of existing Davis-Besse activities that, in conjunction with other credited programs (identified below), address the management of aging for the bolting of subject mechanical components and structural connections within the scope of license renewal. The Bolting Integrity Program relies on manufacturer and vendor information, as well as on industry recommendations for a comprehensive bolting and bolting maintenance program that addresses proper selection, assembly, and maintenance of bolting for pressure-retaining closures and structural connections.

The Bolting Integrity Program includes periodic inspection of bolted closures and connections for indications of degradation such as leakage, loss of material due to corrosion, loss of preload, and cracking due to stress corrosion cracking. It also includes preventive measures to preclude or minimize loss of preload and cracking.

The program inspections are implemented through the following other aging management programs: Inservice Inspection Program; Inservice Inspection (ISI) Program – IWE; Inservice Inspection (ISI) Program – IWF; Structures Monitoring Program; and External Surfaces Monitoring Program.

NUREG-1801 Consistency

The Bolting Integrity Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801 Section XI.M18, “Bolting Integrity,” with the following exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope, Preventive Actions, Corrective Actions**

  The Bolting Integrity Program does not explicitly address the guidelines outlined in EPRI NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” or those as further delineated in NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants” for safety-related bolting (the programs and activities outlined in these documents apply only to safety-related bolting, and primarily to nuclear steam supply system bolting). However, the Bolting Integrity Program does rely on the recommendations of the manufacturer, the vendor and the industry in general, as contained in EPRI documents TR-104213 and TR-111472, for bolting maintenance.

- **Monitoring and Trending**

  NUREG-1801 recommends weekly or biweekly follow up inspections of bolted connections that are reported to be leaking. Periodic inspection of bolting, other than of ASME Class 1, 2, 3 and MC bolting, is performed through the External Surfaces Monitoring Program or the Structures Monitoring Program.

  Leaks that are "conditions adverse to quality" (i.e., that could result in a challenge to a system or component function) are entered into the FENOC Corrective Action Program. The FENOC Corrective Action Program is relied upon to ensure evaluations are performed and appropriate corrective actions are applied. Depending on the magnitude and significance of the leak, corrective actions may include periodic monitoring and trending of leakage.

  Leaks that do not constitute a condition adverse to quality are documented and entered into the Work Management Process. Operators performing daily rounds, Maintenance personnel in the plant, System Engineers performing walkdowns, and other personnel passing through accessible plant areas provide additional resources to identify leaks that could result in a challenge to system or component intended functions.

  Davis-Besse operating experience has not shown a need for a pre-set inspection frequency (e.g., daily, weekly, or biweekly) applicable to all cases involving bolting of pressure-retaining components.

Enhancements

None.

Operating Experience

Review of site operating experience shows that the Bolting Integrity Program has been effective in managing the effects of aging on bolted closures. A few instances of failed or improper bolting (fasteners) have been identified and some corroded bolting or closure (facing) surfaces (e.g., from general corrosion or leakage) have been identified at Davis-Besse and corrected.

Leakage from borated water systems is a primary cause of bolting degradation. The related operating experience is addressed separately for the Boric Acid Corrosion Program, and is not discussed here.

Review of refueling and outage inspection reports since 2002 and a search of the Corrective Action Program revealed instances of bolting problems, both design and degradation related, being identified and corrected via the existing activities included in the Bolting Integrity Program. Examples include:

- The head of one of two bolts holding the emergency diesel generator jacket water elbow to the head of a cylinder was found to be loose. The head came off with minimal effort. No evidence of leakage was found around the affected area. It could not be readily determined if the bolt head was over-torqued during the previous assembly, corroded while in service, or damaged during the removal of the power pack. The bolt was replaced.
- During walkdowns on multiple systems in 2002 it was determined that nut-to-bolt thread engagement varied from bolt tip flush with the nut to one thread below the surface of the nut. As a result, calculations, specifications, and an instructional memo were developed (or updated) to address acceptable nut-to-bolt thread engagement. This acceptable thread engagement information has been incorporated into related site maintenance procedures.
- A corroded expansion anchor for a tubing support was found. The subject expansion anchor had been corroded by ground water leaking through an adjacent wall penetration. The leak was corrected and the anchor bolt was repaired.

Conclusion

The Bolting Integrity Program has been demonstrated to be capable of managing loss of material, loss of preload, and cracking for the bolting of pressure-retaining mechanical components. The Bolting Integrity Program will provide reasonable assurance that the aging effects will be managed such that bolting will continue to perform its intended functions consistent with the current licensing basis for the period of extended operation.

B.2.5 BORAL® MONITORING PROGRAM

Program Description

The Boral® Monitoring Program is a new plant-specific aging management program that will be implemented prior to the period of extended operation. The Boral® Monitoring Program will provide reasonable assurance that potentially detrimental aging effects will be adequately detected such that the neutron absorber intended functions will be maintained consistent with the current licensing basis for the period of extended operation.

The Boral® neutron absorbers exposure to the spent fuel pool environment would be less than 40 years at the end of the period of extended operation.

Boral® monitoring is not required by the current licensing basis based on the NRC Safety Evaluation Report received for the spent fuel pool re-rack project and an NRC letter to Holtec (the rack vendor) stating that there was no current requirement for in-service surveillance on Boral® in spent fuel pool storage racks.

The Boral® Monitoring Program detects degradation of Boral® neutron absorbers in the spent fuel storage racks with in situ testing. From the monitoring data, the stability and integrity of Boral® in the storage cells are assessed. Periodic monitoring of Boral® permits early determination of aging degradation. Adverse conditions will be documented in the Corrective Action Program.

NUREG-1801 Consistency

The Boral® Monitoring Program is a new plant-specific program for Davis-Besse. There is no corresponding aging management program described in NUREG-1801. The program is evaluated against the 10 elements described in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR).

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The scope of the new Boral® Monitoring Program consists of in situ testing of the Boral® neutron absorbing material in the spent fuel storage racks at Davis-Besse.

  The Boral® Monitoring Program is credited for detecting loss of material aging effects of the Boral® neutron absorbers in the spent fuel racks.

- Preventive Actions
  The program is a condition monitoring program that does not include preventive actions. No actions are taken as part of the Boral® Monitoring Program to prevent aging effects or mitigate age-related degradation.

- Parameters Monitored or Inspected
  The Boral® Monitoring Program monitors changes that can lead to loss of material or change of physical form of the Boral® neutron absorbers in the spent fuel racks. The program monitors changes in physical properties of the Boral® by in situ testing.

  The program provides for additional, optional measurement parameters and actions, including radiography, destructive wet chemical analysis or inspection of the Boral® panels. These additional actions provide options for confirming or further investigating results of in situ testing.

- Detection of Aging Effects
  The Boral® Monitoring Program monitors the condition of the absorber material with in situ testing. Visual inspections and measurements, as appropriate, are used to determine and assess the extent of degradation in the Boral® before there is a loss of intended function.

- Monitoring and Trending
  In situ testing of Boral® will provide information on the radiological effects, thermal effects, and chemical effects of the spent fuel pool environment on the Boral® panels. Visual inspections determine the extent of loss of material. These inspections will be reported in a manner which allows trending of results.

- Acceptance Criteria
  The most significant measurements taken are for evaluation of thickness (to monitor for swelling). There is no evidence that neutron attenuation testing (to confirm the concentration of Boron-10 in the Boral®) will serve any useful purpose. Based on the monitoring methods used, acceptance criteria for measurements will be established prior to the period of extended operation. Changes in excess of the acceptance criteria will require investigation and engineering evaluation to identify whether further testing or corrective actions may be necessary.

  Other measurement parameters will also be examined for early indications of the potential onset of Boral® degradation that would suggest a need for further attention. These include:

  - Visual or photographic evidence of unusual geometric changes
  - The existence of areas of reduced boron density

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Boral® Monitoring Program is a new aging management program proposed for the period of extended operation. No similar program has existed, therefore no specific plant operating experience is available. A review of the Corrective Action Program did not identify instances of Boral® aging at Davis-Besse. Boral® monitoring is not required by the current licensing basis based on the Safety Evaluation Report received for the spent fuel pool re-rack project and an NRC letter to Holtec stating that there was no current requirement for in-service surveillance on Boral® in spent fuel pool storage racks. All available industry operating experience for Boral® shows that there has been no significant reduction in Boral® neutron attenuation capability.

  A search of industry experience revealed the same conclusions as described above except for a Boral® blistering issue. Boral® blistering has been observed in the industry. These cases were deemed to be 10 CFR Part 21 issues. Root cause analysis and additional testing concluded that blisters did not affect neutron attenuation and did not affect the structural integrity of Boral® canisters. While Boral® is subject to both generalized corrosion and local corrosion in spent fuel pools, the overall performance to date has been acceptable. This conclusion is based on the data from utility coupon surveillance programs that have shown no reduction in Boron-10 loading due to these effects. Similarly, in-pool blistering of Boral® has, to date, proved to be primarily an esthetic effect. However, potential effects on fuel assembly clearance and the reactivity state of racks have been described.

  FENOC re-racked the spent fuel pool in the Cycle 13 refueling outage (February 2002 to March 2004) with Boral® as the neutron absorber. As a result, the Boral® neutron absorbers exposure to the spent fuel pool environment would be less than

40 years at the end of the period of extended operation. The overall performance of the Boral® at Davis-Besse currently (less than 10 years) would be similar to the results evaluated by EPRI from industry coupon surveillance programs such that the Boral®'s neutron attenuation capability remains acceptable. An EPRI report on neutron absorber materials contains a compilation of data and operating experience for all neutron absorber materials used or proposed for spent fuel storage and transportation applications over the last 40 years.

The NRC Safety Evaluation Report issued for the Davis-Besse spent fuel pool re-rack project states that Boral® is the neutron absorbing material used in the new spent fuel pool rack arrays. Boral® is a hot-rolled ceramic-metal (cermet) of aluminum and boron carbide clad in 1100 alloy aluminum. Boron carbide has a high boron content and is physically stable and chemically inert. Boral® also provides a high cross-section for removing thermal neutrons. The 1100 alloy aluminum provides corrosion resistance through a hydrated aluminum oxide film that develops on the surface, within a few days, after exposure to the atmosphere or water. As this film forms, the corrosion layer penetrates the surface of the aluminum cladding only a few microns with no net loss of aluminum cladding. Hydrogen, a byproduct of the corrosion process, may cause deformation of the sheathing holding the Boral® panels attached to the racks resulting in deformation of the storage cells. To prevent this degradation from occurring, the Boral® is contained in a sheathing cavity attached to the racks with spot welding, allowing the gases to vent. The neutron absorbing capability of Boral® is not affected by this corrosion process. Based on the evaluation, the NRC staff concluded that the materials used in the fabrication of the spent fuel rack arrays are compatible with the spent fuel pool environment at Davis-Besse. The degradation of the sheathing holding the Boral® panels is prevented by venting the corrosion hydrogen byproduct. In addition, the corrosion process does not affect the neutron absorbing capability of Boral®. Therefore, the materials used in the new spent fuel rack arrays are acceptable to the NRC staff.

In October 2009, the NRC issued Information Notice (IN) 2009-26 which provides industry operating experience on the degradation of neutron absorbing materials in spent fuel pools. IN 2009-26 addressed issues of degradation of the Carborundum neutron-absorbing materials and the deformation of Boral® panels in spent fuel pools. The operating experience on degradation of Boral® is applicable to Davis-Besse. IN 2009-26 described Beaver Valley inspections in 2007 of the Boral® neutron absorber material coupons that identified numerous blisters of the aluminum cladding, while only a few small blisters had been identified in 2002. In region 1 fuel storage racks, blisters can displace water from the flux traps between storage cells and challenge dimensional assumptions used in the criticality analysis. Based on these inspections, FENOC determined that the Boral® aluminum cladding blistering was an aging effect and that it would credit the existing Boral® Surveillance Program with management of this aging effect at Beaver Valley. The other operating experience was at Susquehanna where the licensee had identified a significant bulge in a poison can wall. Although the licensee has not definitively determined the cause of the bulge, the licensee's letter states that it may be the result of hydrogen gas generation from either moisture contained in the Boral® at the time of manufacture or a leaking seal weld in the poison can. This bulge prevented the placement of a blade guide into the deformed cell. The spent fuel racks at Davis-Besse are vented to prevent this condition.

In May 2010, the NRC issued License Renewal Interim Staff Guidance LR-ISG-2009-01, "Aging Management of Spent Fuel Pool Neutron-Absorbing Materials other than Boraflex," providing guidance as to one acceptable approach for managing the effects of aging during the period of extended operation for neutron-absorber material in spent fuel pools within the scope of the License Renewal Rule. Recent operating experience has documented several instances of degradation and deformation of the neutron-absorber materials in the spent fuel pools of operating reactors, as described in IN 2009-26. LR-ISG-2009-01 highlighted that a plant-specific aging management program should be submitted that addresses neutron-absorber material in order to detect and mitigate the aging of the material that could impact the neutron-absorbing function during the period of extended operation. The applicant should consider both plant-specific and industry operating experience.

Enhancements

None.

Conclusion

The new plant-specific Boral® Monitoring Program will provide reasonable assurance that potentially detrimental aging effects will be adequately detected such that the Boral® neutron absorber intended functions will be maintained consistent with the current licensing basis for the period of extended operation.

B.2.6 BORIC ACID CORROSION PROGRAM

Program Description

The Boric Acid Corrosion Program manages the effects of boric acid leakage on the external surfaces of structures and components potentially exposed to boric acid leakage. The Boric Acid Corrosion Program is a condition monitoring program consisting of visual inspections.

The Boric Acid Corrosion Program is an existing program that provides for management of loss of material due to boric acid corrosion. The program includes provisions to identify, inspect, examine and evaluate leakage, and initiate corrective action. The program relies in part on implementation of recommendations of NRC Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Components in PWR Plants." The Boric Acid Corrosion Program ensures that the pressure boundary integrity and material condition of the subject structures and components are maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Boric Acid Corrosion Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M10, "Boric Acid Corrosion."

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

As documented in Licensee Event Report (LER) 2002-02, significant degradation of the original Davis-Besse reactor vessel closure head was discovered. Performance deficiencies in the implementation of the boric acid corrosion control program and Corrective Action Program allowed the reactor coolant system pressure boundary leakage to occur undetected for a prolonged period of time resulting in the head degradation. Program compliance reviews were performed to ensure proper interface with supporting plant programs, proper consideration of industry experience, proper staffing, and timely resolution of identified weaknesses. Detailed reviews were performed to ensure the programs were conducted in accordance with the governing processes.

The current Boric Acid Corrosion Program incorporates the recommendations of Generic Letter (GL) 88-05 and additionally includes consideration of the systems outside Containment that contain boric acid.

Quarterly health reports are prepared for the Boric Acid Corrosion Program. The health reports evaluate the overall program and the specifics of program personnel, infrastructure, implementation, and equipment performance.

A self-assessment of the Boric Acid Corrosion Program was conducted in October 2008. The assessment identified a strength in conservatively obtaining management approval for temporary delay of an inspection for boric acid. Improvements included identifying acceptance criteria for pump seal leakage, ensuring that conclusion statements in the Corrective Action Program have sufficient level of detail to summarize the issue and resolution, monitoring the effectiveness of corrective actions for packing adjustments.

As documented in NRC inspection report 05000346/2008002, the NRC performed a review in 2008 of the boric acid corrosion control inspection activities against commitments made in response to GL 88-05. The inspection activities included plant walkdowns, review of procedures and records, and review of Corrective Action Program documentation, including corrective actions. The NRC report concluded that no findings of significance were identified.

NRC inspection report 05000346/2007003 documented that FENOC performed a detailed, systematic evaluation of the Boric Acid Corrosion Control program, and made comprehensive programmatic improvements to the program. The NRC found that the programmatic boric acid issues that resulted in LER 2002-02 were properly resolved.

A self-assessment of the Boric Acid Corrosion Program was conducted in November 2005. The assessment noted a strength in the use of computer based training to facilitate personnel qualifications. The program was found to be effectively implemented, meeting current industry requirements, and to have incorporated industry beneficial practices.

Conclusion

The Boric Acid Corrosion Program has been demonstrated to be capable of managing loss of material due to boric acid corrosion for susceptible structures and components. The continued implementation of the Boric Acid Corrosion Program provides reasonable assurance that the aging effects will be managed such that structures and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.7 BURIED PIPING AND TANKS INSPECTION PROGRAM

Program Description

The Buried Piping and Tanks Inspection Program manages the effects of corrosion on the external surfaces of piping, tanks and associated bolting exposed to a buried (soil) environment. Piping and tanks that are not in contact with a soil environment are not within the scope of this program. The Buried Piping and Tanks Inspection Program is a combination of a mitigation program (consisting of protective coatings) and a condition monitoring program (consisting of visual inspections). The Buried Piping and Tanks Inspection Program ensures that the intended function of the subject components will be maintained consistent with the current licensing basis during the period of extended operation.

The Buried Piping and Tanks Inspection Program manages loss of material for steel piping, tanks and associated bolting, which are provided with protective coatings. The program also manages loss of material due to corrosion for gray cast iron piping and piping components, which are not provided with protective coatings. Loss of material due to selective leaching of gray cast iron is managed by the Selective Leaching Inspection.

The buried piping and piping components within the scope of this program are in the following plant systems:

- Emergency Diesel Generators (EDG) System – fuel oil subsystem
- Fire Protection System
- Service Water System

The buried tanks within the scope of the program are the EDG Fuel Oil Storage Tanks (DB-T153-1, DB-T153-2).

The buried bolting within the scope of the program is associated with the Fire Protection System piping.

Degradation or leakage found during inspections is entered into the FENOC Corrective Action Program to ensure evaluations are performed and appropriate corrective actions are taken.

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection Program is an existing Davis-Besse program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M34, "Buried Piping and Tanks Inspection."

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- **Scope**

  Add the emergency diesel fuel oil storage tanks (DB-T153-1, DB-T153-2) to the scope of the program. The existing program scope includes only buried piping.

  Add bolting for buried Fire Protection System piping to the scope of the program.

- **Detection of Aging Effects**

  Add a requirement that an inspection of coated and wrapped buried piping or tank be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40). Specify that if an opportunistic inspection has not occurred between year 30 and year 38, then an excavation of a section of coated and wrapped buried piping or tank for the purpose of inspection will be performed before year 40.

  Add a requirement that an additional inspection of coated and wrapped buried piping or tank be performed within 10 years after entering the period of extended operation (i.e., between year 40 and year 50). Specify that if an opportunistic inspection has not occurred between year 40 and year 48, then an excavation of a section of coated and wrapped buried piping for the purpose of inspection will be performed before year 50.

  Add a requirement that an inspection of uncoated cast iron buried piping be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40). Specify that if an opportunistic inspection has not occurred between year 30 and year 38, then an excavation of a section of uncoated cast iron buried piping for the purpose of inspection will be performed before year 40.

  Add a requirement that an additional inspection of uncoated cast iron buried piping be performed within 10 years after entering the period of extended operation (i.e., between year 40 and year 50). Specify that if an opportunistic inspection has not occurred between year 40 and year 48, then an excavation of a section of uncoated cast iron buried piping for the purpose of inspection will be performed before year 50.

Add a requirement that an inspection of buried Fire Protection System bolting will be performed when the bolting becomes accessible during opportunistic or focused inspections.

Add a requirement that the inspections of buried piping be conducted using visual (VT-3 or equivalent) inspection methods. Also, to ensure that a sufficient inspection area of the buried component is exposed, the excavation shall be of approximately 10 linear feet of piping, with all surfaces of the pipe exposed.

Operating Experience

A search of Davis-Besse operating experience identified an Emergency Diesel Generator (EDG) underground fuel oil piping leak due to corrosion that appeared to be the result of damage to the piping coating and wrapping. The leak was first documented in the Corrective Action Program in 1995 and the piping system was repaired in 1997. Later evaluations of the fuel oil piping conditions concluded that a more robust cathodic protection system could further mitigate piping damage due to coating and wrapping deficiencies. A new cathodic protection system was installed in 2008 for the fuel oil piping.

An assessment of the condition of the external surfaces of buried piping was also performed in 2002. The assessment found no signs of significant degradation of the buried piping. One holiday on the coatings for the emergency diesel fuel oil supply piping was identified and repaired. Another assessment was recommended.

The second assessment of the condition of the external surfaces of buried piping was performed in 2008. UT inspection to determine the condition of the external surfaces of buried circulating water piping was performed in January 2008. The UT was performed from the inside due to the depth of the buried piping. The inspections determined the piping to be in good condition. The Corrective Action Program documents (August 2008) damaged coatings (holidays) on three sections of buried emergency diesel fuel oil lines with instances of pitting and minor corrosion. Two areas of coating damaged were thought to be the result of probe strikes in an earlier effort to locate the buried piping. A UT examination was performed on the areas where pitting was identified. The wall thickness was found to be greater than the nominal thickness for the pipe and was determined acceptable. The defects were considered to be minor and the overall condition of the pipe was noted to be very good.

The Corrective Action Program documents (October 2008) a leak in buried carbon steel piping associated with a three-inch condensate demineralizer backwash line. A corrective action was the establishment of a buried piping integrity program for Davis-Besse. The root cause of the piping leak was identified as general corrosion due to coating damage and a non-functioning cathodic protection system. The degraded section of piping was replaced with polyethylene plastic piping. A second item in the Corrective Action Program documents (also October 2008) damaged coating on buried Circulating Water System blowdown piping expected to have resulted from excavation associated with repair of the condensate demineralizer backwash line. Prior to repairing the damaged coating, UT of the piping determined the wall thickness to be acceptable.

The industry has issued EPRI TR-1016456, “Recommendations for an Effective Program to Control the Degradation of Buried Pipe,” which includes a six step process to have an effective buried piping program. FENOC has implemented the program, which has identified all systems and components potentially susceptible to the buried piping conditions and their risk of degradation through a Systems Susceptibility Risk Ranking Criteria. The criteria include radiological process fluid, EPA concern, safety related, Limiting Condition for Operation risk, and others.

Davis-Besse operating experience demonstrates that the coating of buried steel piping and tanks is now effective in managing the effects of aging. Plant design considerations addressed the potential for degradation of buried steel piping and tanks through the application of protective coatings. Review of site operating experience demonstrates that the uncoated cast iron piping is resistant to corrosion in the buried environment by virtue of no identified instances of noted degradation or failures. Industry operating experience has been addressed in the implementation of the EPRI buried piping program, and will continue to be addressed as industry operating experience is gained.

Conclusion

The Buried Piping and Tanks Inspection Program has been demonstrated to be capable of managing loss of material due to corrosion for piping in buried (soil) environments. The continued implementation of the Buried Piping and Tanks Inspection Program, with enhancement, provides reasonable assurance that the effects of aging on buried piping, tanks and bolting will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.8 CLOSED COOLING WATER CHEMISTRY PROGRAM

Program Description

The purpose of the Closed Cooling Water Chemistry Program is to mitigate damage due to loss of material, cracking, and reduction in heat transfer of plant components within the scope of license renewal that contain treated water in a closed cooling water system or component (e.g., heat exchanger) served by or connected to a closed cooling water system. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material, cracking, or reduction in heat transfer through proper monitoring and control of corrosion inhibitor concentrations consistent with current EPRI water chemistry guidelines. The Closed Cooling Water Chemistry Program is a condition monitoring and mitigation program.

The Closed Cooling Water Chemistry Program also includes corrosion rate measurement at selected locations in the closed cooling water systems. In addition, the Closed Cooling Water Chemistry Program is supplemented by the One-Time Inspection, which provides verification of the effectiveness of the program in managing the effects of aging.

NUREG-1801 Consistency

The Closed Cooling Water Chemistry Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M21, "Closed-Cycle Cooling Water System," with the following exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria**

  The program does not include performance or functional testing for aging management. Based on Davis-Besse operating experience, the Closed Cooling Water Chemistry Program has been determined to be effective in maintaining the intended functions of subject components in closed cooling water systems without the use of performance monitoring or functional testing. However, it does include measurement of corrosion rates in select locations, via corrosion coupons, and inspections of opportunity when systems are open for maintenance. The corrosion coupons are periodically replaced and evaluated to provide information on the effectiveness of the chemical treatment program and corrosion rate data.

In addition, to confirm adequate condition monitoring and mitigation of loss of material and cracking in low flow and stagnant areas and adequate mitigation of reduction in heat transfer, the program is supplemented by the One-Time Inspection, which includes closed cooling water system locations and heat exchangers served by closed cooling water systems.

Enhancements

None.

Operating Experience

The Closed Cooling Water Chemistry Program is an ongoing program that incorporates EPRI closed cooling water guidelines as well as “lessons learned” from operating experience. The program is subject to assessment of its ability to manage the relevant conditions that could lead to or are indicative of a loss of material, cracking, or reduction in heat transfer of components.

A recent internal assessment was performed to assess the programs for the primary, secondary, and auxiliary closed cooling water systems. The assessment found that for the auxiliary systems, which include component cooling water and emergency diesel generator jacket water, the chemistry parameters are being sampled and analyzed in accordance with the chemistry procedures. The major conclusion developed was that the action levels and responses in the procedure are generally consistent with those provided in the EPRI Closed Cooling Water Chemistry Guidelines. However, enhancements were recommended for frequency gaps and action level responses. The assessment resulted in improvements to the program to ensure consistency with the EPRI Closed Cooling Water Chemistry Guidelines.

During the data review for the fourth quarter 2008 Closed Cooling Water Chemistry Quarterly Report it was determined that the Davis-Besse typical closed cooling water sulfate concentration has historically been above the current EPRI guideline specification of 150 ppb for hydrazine-treated systems. All other closed cooling water chemistry parameters were found to be within the current EPRI guideline values. A review of corrosion coupon corrosion rate trends since 2000 determined consistent rates of less than 0.1 millimeters per year for all metals which is an indication of "excellent" corrosion control in the system. Sulfate monitoring frequency was increased from monthly to weekly until the value was returned to less than 150 parts per billion in April 2009.

Review of Corrective Action Program documents indicates that abnormal chemistry conditions are identified, evaluated, and corresponding adjustments made, through the corrective action process, to correct the chemistry conditions before a loss of component intended function, and that industry operating experience is considered for impact to the program.

For example, in 2008, an evaluation of nitrite levels was performed in the EDG Jacket Water System that were outside the station specification levels but less than the EPRI action level for high nitrite. The controlling chemistry procedure was enhanced to ensure actions are included when exceeding the station upper limit, including evaluation of microbiological activity trend and other control parameters.

In 2004, an event at McGuire was evaluated in which their CCW System experienced a buildup of nitrogen gas due to naturally occurring bacteria in the water that produces nitrogen as a byproduct. Sodium Nitrite, the corrosion inhibitor at the time, is a nutrient source for bacteria which enable them to proliferate and thereby produce nitrogen gas. This OE was screened out for Davis-Besse because a different corrosion inhibitor is used and biocide additions are made as needed.

Review of Davis-Besse operating experience did not reveal a loss of component intended function of subject components exposed to closed cooling water that could be attributed to an inadequacy of the Closed Cooling Water Chemistry Program.

Conclusion

The Closed Cooling Water Chemistry Program has been demonstrated to be capable of managing loss of material, cracking, and reduction in heat transfer for susceptible components through monitoring and control of the corrosion inhibitor concentrations and relevant parameters in closed cooling water systems and the components that are connected to or served by those systems. The Closed Cooling Water Chemistry Program, as supplemented by the One-Time Inspection, provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.9 COLLECTION, DRAINAGE, AND TREATMENT COMPONENTS INSPECTION PROGRAM

Program Description

The Collection, Drainage, and Treatment Components Inspection Program is a new plant-specific program for Davis-Besse. The program will consist of visual inspections of steel or other metal components exposed to raw (untreated) water, that are not covered by other aging management programs, for evidence of loss of material, as well as cracking or reduction in heat transfer. Opportunistic inspections, when surfaces are accessible during maintenance, repair, or surveillance, will ensure that the existing environmental conditions in collection, drainage, and treatment service are not causing material degradation that could result in a loss of component intended function during the period of extended operation. If an opportunistic inspection has not been conducted prior to the period of extended operation, a focused inspection will be conducted prior to entering the period of extended operation. The Collection, Drainage, and Treatment Components Inspection Program is a condition monitoring program.

NUREG-1801 Consistency

The Collection, Drainage, and Treatment Components Inspection Program is a new plant-specific program for Davis-Besse. There is no corresponding aging management program described in NUREG-1801. The program is evaluated against the 10 elements described in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR).

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The scope of the Collection, Drainage, and Treatment Components Inspection Program includes visual inspections of the internal surfaces of copper alloy (including copper alloy greater than 15% zinc), gray cast iron, stainless steel (including cast austenitic stainless steel), and steel components exposed to untreated water, in collection, drainage, or treatment service, that are not covered by other aging management programs. These inspections will ensure that the existing environmental conditions are not causing cracking, loss of material, or reduction in heat transfer that could result in a loss of component intended functions.

  The environmental conditions vary depending on the service, from water maintained by the PWR Water Chemistry Program up to the point of drainage, potable water for treatment of Control Room air, raw fire protection water or diesel fire pump coolant or makeup water, to miscellaneous collection, plumbing, or drainage water.

The piping and components (filter bodies, flexible connections, heat exchanger shell and tubes, humidifier tubing, orifices, pump casings (including bolting), rupture discs, strainer bodies, tanks, tubing, and valve bodies) in the scope of this program are in the following systems:

- Auxiliary Building Heating, Ventilation and Air Conditioning (HVAC) – Control Room Normal Ventilation System
- Fire Protection System (including diesel fire pump)
- Gaseous Radwaste System
- Makeup and Purification System
- Makeup Water Treatment System
- Miscellaneous Liquid Radwaste System
- Reactor Coolant Vent and Drain System
- Spent Fuel Cooling and Cleanup System
- Station Plumbing, Drains, and Sumps System

Loss of material due to selective leaching of gray cast iron or copper alloy greater than 15% zinc components in the raw (untreated) water environment will be managed separately by the Selective Leaching Inspection.

- Preventive Actions
  The Collection, Drainage, and Treatment Components Inspection Program does not include any actions to prevent or mitigate the effects of aging. It is a condition monitoring program.

- Parameters Monitored or Inspected
  Inspections of the surfaces of collection, drainage, treatment, and other miscellaneous components that are exposed to raw (untreated) water, but are not addressed by other aging management programs, will be performed during maintenance and surveillance activities, when the surfaces are accessible for inspection.

  If opportunities for inspection do not arise, then a focused inspection will be performed as described for the *Detection of Aging Effect*s element below.

  Parameters monitored or inspected are directly related to degradation of the components under review and include visible evidence of material degradation due to, loss of material (corrosion), as well as due to cracking, of susceptible materials, or reduction in heat transfer (fouling) for susceptible components.

- Detection of Aging Effects
  The Collection, Drainage, and Treatment Components Inspection Program provides for detection of aging effects prior to the loss of component intended function. These inspections will be opportunistic visual inspections performed when component surfaces are accessible during maintenance, repair, and surveillance activities.

  The program will be implemented after the issuance of the renewed license and prior to the end of the current operating license for Davis-Besse. If opportunistic inspections have not occurred in this time-period, then a focused inspection, inclusive of each material in the scope of the program, will be performed prior to entering the period of extended operation.

  The inspections will be conducted using visual (VT-3 or equivalent) inspection methods performed by qualified personnel following procedures consistent with the ASME Code and 10 CFR 50, Appendix B. Any evidence of degradation that could lead to a loss of component intended function will be documented and evaluated through the Corrective Action Program to determine the need for subsequent inspections, expansion, and for monitoring and trending the results.

  Visual inspection by qualified personnel will detect a loss of material or fouling of surfaces exposed to raw (untreated) water prior to a loss of component function. In addition, visual inspection combined with evaluation of conditions by qualified personnel will also detect cracking of susceptible materials exposed to raw (untreated) water, at temperatures above 140°F or with ammonia or ammonium compounds present, prior to a loss of component function. These visual inspections will be supplemented by enhanced visual inspection of components susceptible to cracking.

- Monitoring and Trending
  Inspection findings will be evaluated by assigned engineering personnel. Inspection findings not meeting the acceptance criteria will be evaluated and tracked through the Corrective Action Program. The Corrective Action Program will be used to identify the corrective actions including additional inspections or expansion. Degradation of surfaces exposed to raw (untreated) water will be evaluated to determine other potentially susceptible locations. The susceptible locations will be monitored or inspected based on engineering evaluation. Trending the results of previous inspections may be used as a qualitative tool for identifying susceptible locations that may require additional examinations.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are

not met, then the indications and conditions will be evaluated under the Corrective Action Program to assess the material condition and determine whether the component intended function is affected.

Unacceptable inspection findings will include visible evidence of cracking, loss of material, or reduction in heat transfer due to fouling that could lead to loss of component intended function during the period of extended operation.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The operating experience confirms that periodic surveillance and maintenance activities, and as-needed repairs, are conducted for components exposed to raw (untreated) water.

  For example, a review of operating experience for the diesel fire pump radiator and cooling circuit identified instances of venting and filling the radiator with coolant and monitoring the performance of the radiator and cooling circuit, but did not identify any degradation of the components or inspection of component surfaces.

  Similarly, minor corrosion was identified and evaluated on the interior surface of the fire water storage tank (FWST) in 2004. It was determined to be acceptable and not to impact component intended function.

  Review of Davis-Besse operating experience did not identify degradation that could be attributed to exposure to the raw water in the Makeup Water Treatment System, or to the water that is periodically drained from the Makeup and Purification and Spent Fuel Pool Cooling and Cleanup demineralizers.

In 2005, an evaluation and repair of a leak between the boric acid mix tank (BAMT) and miscellaneous waste drain tank (MWDT) was performed, but did not include indication of component internal condition or of the need for future inspections.

Review of Davis-Besse operating experience did not identify other failures that could be attributed to frequent or prolonged exposure to raw (untreated) component drainage water, station plumbing (domestic) water, to gaseous radwaste moisture accumulation (condensation), or miscellaneous liquid radwaste collection water.

The elements that comprise the Collection, Drainage, and Treatment Components Inspection Program inspections (i.e., the scope of the inspections and inspection techniques) will be consistent with industry practice. Industry and plant-specific operating experience will be considered in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be incorporated, as appropriate.

Enhancements

None.

Conclusion

Implementation of the Collection, Drainage, and Treatment Components Inspection Program will provide reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.10 CRANES AND HOISTS INSPECTION PROGRAM

Program Description

The Cranes and Hoists Inspection Program is credited with managing loss of material for the structural components of cranes (including bridge, trolley, rails, and girders), monorails, and hoists within the scope of license renewal. The cranes, monorails and hoists within the scope of license renewal are those defined by NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," and light load handling systems related to refueling.

The Cranes and Hoists Inspection Program is a condition monitoring program that is based on guidance contained in American National Standards Institute (ANSI) B30.2 for overhead and gantry cranes, ANSI B30.11 for monorail systems and underhung cranes, and ANSI B30.16 for overhead hoists. The inspections monitor structural members for signs of corrosion and wear. The inspections are performed periodically for installed cranes and hoists.

NUREG-1801 Consistency

The Cranes and Hoists Inspection Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

A review of crane and hoist inspections previously conducted at Davis-Besse, program and system health reports, the FENOC Corrective Action Program, and industry operating experience confirms the reasonableness and acceptability of the inspections and their frequency, in that degradation of cranes (including bridge, trolley, rails, and girders), monorails, and hoists was detected prior to loss of function. Related crane and hoist inspections have found isolated minor age-related degradation such as minor corrosion and paint chipping due to mechanical damage.

For example, one issue identified in the Corrective Action Program in 2009 indicated age-related degradation found while performing Intake Gantry Crane preventive maintenance. The Intake Gantry Crane is exposed to weather. The Corrective Action Program document noted that parts of the crane structure have areas of missing paint and corrosion. In areas around the bridge drive gear, bolts were degraded from corrosion. The grout on the crane bridge rails was cracked. No loose grout was noted, but the grout was considered to be susceptible to freeze thaw damage. The work order system was used to address the identified issues.

Review of select completed work orders from 2005 through 2008 and a review of plant-specific operating experience through a search of Corrective Action Program documentation from 2000 and later revealed minor issues of flaking paint and loss of material due to corrosion (e.g., polar crane handrail - 2003). A 2004 Corrective Action Program item described action taken from industry operating experience, in that several metal filings were found on the rail of a Fuel Building Overhead Crane at another nuclear plant. A follow-up communication to the crane engineer at the plant revealed that the shavings were determined to be “flaking” from the crane rails and were not metal filings from wear of the bridge wheels or rails. Corrective action taken at Davis-Besse was to add an inspection step to look for wear products on the rails, bridge wheels and trolley wheels for fuel handling and spent fuel pool cask cranes. The remaining adverse conditions identified in the Corrective Action Program dealt with issues unrelated to aging, including issues such as active components not properly working, procedural issues, rigging issues, operator qualification, clearance tagging, and human-related events.

Conclusion

The Cranes and Hoists Inspection Program has been demonstrated to be capable of detecting and managing loss of material for cranes (including bridge, trolley, rails, and girders), monorails, and hoists within the scope of license renewal. The continued implementation of the Cranes and Hoists Inspection Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.11 ELECTRICAL CABLE CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS INSPECTION

Program Description

The purpose of the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection is to detect and identify aging effects for the metallic parts of electrical cable connections that are not required to be environmentally qualified but are within the scope of license renewal.

This inspection is a new activity that will address external cable connections that are used to connect cable conductors to other cables or electrical end devices, such as motor terminations, switchgear, motor control centers, bus connections, transformer connections, and passive electrical boxes such as fuse cabinets. The most common types of connections used in nuclear power plants are splices (butt splices or bolted splices), crimp-type ring lugs, connectors, and terminal blocks. Most connections involve insulating material and metallic parts. The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection will focus primarily on bolted connections. This aging management inspection will account for aging stressors such as thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation of the metallic parts. Implementation of this inspection will provide added assurance that the electrical connections in the plant have electrical continuity and are not overheating due to increased resistance (from a loosened or degraded connection). The inspection will be performed via the use of thermography, with the optional use of contact resistance testing as a supplement.

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection is a new aging management activity (a one-time inspection) that will be conducted prior to the period of extended operation.

NUREG-1801 Consistency

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection is a new one-time inspection that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements,” as clarified by LR-ISG-2007-02.

Exceptions to NUREG-1801

None.

Enhancements

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The metallic parts of electrical cable connections, not subject to 10 CFR 50.49, and associated with cables that are within the scope of license renewal, are part of this activity, regardless of their association with active or passive devices. This includes external cable connections terminating at active or passive devices associated with cables that are within the license renewal scope. Wiring connections internal to an active assembly are considered part of the active assembly and are therefore not within the scope of this activity.

  The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection is applicable to non-environmentally qualified electrical cable connections that are within the scope of license renewal.

- Preventive Actions
  No actions are taken as part of this activity to prevent or mitigate aging degradation.

- Parameters Monitored or Inspected
  This one-time inspection will focus on the metallic parts of electrical cable connections. The inspection will include detection of loosened bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. A representative sample of electrical cable connections will be inspected. The following factors will be considered for sampling: connection type (e.g., bolted splices, bolted terminations, lug terminations, bolted cable terminations), circuit application (medium, or low voltage), circuit loading (high load), and physical location (e.g., high temperature, high humidity, vibration) with respect to connection stressors. The technical basis for the sample selected will be documented. If an unacceptable condition or situation is identified in the sample, a determination is made as to whether the same condition or situation is applicable to other connections not tested. The inspection will confirm that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, chemical contamination, corrosion, vibration, or oxidation is not an aging effect that requires a periodic aging management program.

- Detection of Aging Effects
  A representative sample of the metallic electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements and within the scope of

license renewal will receive a one-time inspection via thermography (augmented with optional contact resistance testing) prior to the period of extended operation. Thermography is a proven test method for detecting loose connections and degraded connections (i.e., chemical contamination, corrosion, oxidation) leading to increased resistance, and will be used to test a sample of electrical connections at a variety of plant locations. Thermography can detect aging effects due to thermal cycling, ohmic heating, vibration, and electrical transients. Thermography is an effective tool for inspecting connections that are covered by close fitting electrical tape, insulating boots or covers, heat-shrink material, and sleeving. The optional use of contact resistance testing of a sample of motor termination connections and other connections will also be utilized, as applicable. The one-time inspection provides additional confirmation that the electrical connections in the plant have not experienced general or repeated failures and that existing installation and maintenance practices are effective.

- Monitoring and Trending
  No actions are taken as part of the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection to monitor or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

  Sample size will be determined by engineering evaluation, as described for the *Detection of Aging Effects* element above. Results of the inspection activities that require further evaluation or resolution (e.g., if degradation is detected), if any, will be evaluated using the Corrective Action Program, including expansion of the sample size and inspection locations to determine the extent of the degradation.

- Acceptance Criteria
  The acceptance criteria will be based on the acceptance criteria already used for the thermography process at Davis-Besse; the acceptance criteria for any contact resistance tests will be defined in the implementing procedure.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

  For the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection, an engineering evaluation is performed when the test acceptance criteria are not met in order to ensure that the intended functions of the electrical cable system can be maintained consistent with the current licensing basis. Such an evaluation is to consider the significance of the test results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes for not meeting the test acceptance criteria, the corrective actions required, and the likelihood of recurrence. When an unacceptable condition or situation is identified, a determination is made on whether the same condition or situation is applicable to other in-scope cable connections not tested.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Operating experience has shown that loosening of connections and corrosion of connections are aging mechanisms that, if left unmanaged, could lead to a loss of electrical continuity and potential arcing or fire. Industry operating experience that forms the basis for this program is included in the operating experience element of the corresponding NUREG-1801, aging management program description.

  Based on review of plant-specific and industry operating experience, the identified aging effects will require inspection to determine the presence (and extent) of any degradation with the non-environmentally qualified electrical cable connections.

  Plant operating experience has shown that the Corrective Action Program has addressed issues related to degraded cable connections (primarily terminations) in recent years. For example, the use of routine thermography has identified terminations at circuit breakers with elevated temperatures, typically caused by increased resistance at phase terminations. A hot spot was found on a disconnect switch in the plant switchyard, due to a misaligned phase arm on the switch. Motor control center terminations have been identified with higher temperatures (via thermography), indicating increased resistance at the termination points. The use of thermography has been effective in identifying degraded cable connections. Industry operating experience will be considered in development of this activity.

Conclusion

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection will detect and identify aging issues related to the metallic parts of non-environmentally qualified electrical cable connections. The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Inspection will provide reasonable assurance that aging effects will be identified (and addressed) such that the non-environmentally qualified electrical cable connections within the scope of this program will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.2.12 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS PROGRAM

Program Description

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program manages the aging of electrical cables and connections that are not required to be environmentally qualified but are within the scope of license renewal that are subject to adverse localized environments. The program provides for the periodic visual inspection of accessible, non-environmentally qualified electrical cables and connections, in order to determine if age-related degradation is occurring. Accessible electrical cables and connections installed in adverse localized environments will be visually inspected for signs of accelerated age-related degradation such as embrittlement, discoloration, cracking, or surface contamination. The program will provide reasonable assurance that the electrical components will continue to perform their intended functions for the period of extended operation.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new aging management program that will be implemented prior to the period of extended operation. The visual inspections will be performed on a 10-year interval, with the first inspection taking place prior to the end of the current operating license.

NUREG-1801 Consistency

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E1, “Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

Exceptions to NUREG-1801

None.

Enhancements

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is credited with managing aging effects from adverse localized environments in non-environmentally qualified cables and connections.

  The program inspections will be prioritized based on location rather than component identification or function.

  Particular attention will be given to the identification of adverse localized environments. The inspection program will define these areas through a review of plant engineering data (e.g., environmental qualification records, environmental surveys) and also via performance of plant walkdowns to identify adverse localized environments. An adverse localized environment is defined as a condition in a limited plant area that is significantly more severe than the specified design or bounding plant environment for the general area. Adverse localized environments are addressed in EPRI report TR-109619, "Guideline for the Management of Adverse Localized Equipment Environments."

- Preventive Actions
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is an inspection program; no actions are taken to prevent or mitigate aging degradation. The program is based on visual observation (and detection) only.

- Parameters Monitored or Inspected
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will provide for the visual inspection of accessible cables and connections located in adverse localized environments. Adverse localized environments will be determined based upon temperature, radiation levels, and moisture levels that are significantly more severe than the specified environments for the cables and connections.

  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Program focuses on a visual inspection of accessible cables and connections. Accessible is defined as easily viewed from the ground or from a platform (including scaffolding, if utilized). The cables and connections will not be touched during the inspection (either lifted, separated, felt, or handled in any way). The inspection merely records the visible condition of the cable jacket or the visible condition of the connection (e.g., splice, terminal block, fuse block).

For inspection of connections (i.e., fuse holders), it may be necessary to open an electrical box to view the passive components. This is an acceptable practice with respect to the definition of accessible, for electrical boxes at a floor level.

Inspection of the visible portions of cables and connections (the cable jackets and the insulating bases) is reflective of the condition of the insulation.

- Detection of Aging Effects
  As described above in *Parameters Monitored or Inspected*, the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program provides for a visual inspection of a representative sample of accessible electrical cables and connections located in adverse localized environments. The visual inspections will be performed on a 10-year interval, with the first inspection taking place within the 10-year period prior to the end of the current operating license. The program will inspect the accessible cables and connections for aging effects due to adverse localized environments caused by heat, radiation, or moisture, in the presence of oxygen. The visible effects of aging are embrittlement, discoloration, cracking, and surface contamination. The visible evidence of aging (on the cable jackets and the connection insulating bases) is considered representative of aging to the cable insulation and the connection insulation.

- Monitoring and Trending
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will not include trending actions. If anomalies are found during the visual inspection process, they will be addressed through the Corrective Action Program.

- Acceptance Criteria
  The inspections of accessible cables and connections will identify visual indications of surface anomalies, such as embrittlement, cracking, discoloration, crazing, crumbling, melting, and any other distinct visual evidence of oxidation, material deterioration, or other visible degradation. If the acceptance criteria are not met, then the anomalies will be evaluated under the Corrective Action Program to determine whether they could result in a loss of component intended function during the period of extended operation.

  The implementing documents for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will provide specific guidance on the identification of surface degradation.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

  In addition, for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Requirements Program, all unacceptable visual indications of cable and connection jacket surface anomalies are subject to an engineering evaluation. The evaluation will consider the age and operating experience of the component, as well as the severity of the anomaly and whether the anomaly has previously been correlated to degradation of the conductor insulation or connections. Corrective actions may include, but are not limited to, testing, shielding, or otherwise changing the environment, or the relocation or replacement of the affected cable or connection. When an unacceptable condition or situation is identified, a determination is made as to whether the same condition or situation is applicable to other accessible or inaccessible cables or connections.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

  Plant operating experience has shown that the Corrective Action Program has addressed issues of cable degradation in recent years. Cables have been identified with degraded insulation, primarily as a result of exposure to adverse localized environments caused by excessive localized overheating. Examples documented in the Corrective Action Program include a cracked feeder cable for a condensate pump, and brittle and cracked thermocouple wiring for containment air cooler motor instruments. Industry operating experience will be considered in the development of this program.

Conclusion

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will be capable of managing aging effects due to heat and radiation in the presence of oxygen, for non-environmentally qualified cables and connections. The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will provide reasonable assurance that the aging effects will be managed such that the non-environmentally qualified cables and connections within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.13 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS USED IN INSTRUMENTATION CIRCUITS PROGRAM

Program Description

The purpose of this aging management program is to manage the age-related degradation associated with high voltage, low current instrumentation cables and connections that are not required to be environmentally qualified but are within the scope of license renewal. This program addresses a subset of the overall in-scope, non-environmentally qualified cable and connection population at Davis-Besse, which is primarily addressed by the program guidelines of NUREG-1801, Section XI.E1, via visual inspection.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a condition monitoring program that applies to in-scope, non-environmentally qualified electrical cables and connections used in neutron monitoring and radiation monitoring circuits with sensitive, low current signals. The sensitive nature of these circuits is such that visual inspection alone may not detect degradation to the insulation resistance function of the conductor insulation. This program will manage the aging of the low current instrumentation cables and connections that are not required to be environmentally qualified but are within the license renewal scope.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new Davis-Besse program that will be consistent with the 10 elements of an effective aging management program, as described in NUREG-1801, Section XI.E2, “Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.”

Exceptions to NUREG-1801

None.

Enhancements

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is credited with identifying aging effects for sensitive, high voltage, low current signal applications that are in-scope for license renewal at Davis-Besse. These sensitive circuits are potentially subject to reduction in insulation resistance (IR) when found in adverse localized environments.

  The program is applicable to non-environmentally qualified in-scope neutron monitoring and radiation monitoring circuits.

- Preventive Actions
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a testing program designed to identify cable and connection degradation; no actions are taken to prevent or mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters monitored (tested) by the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program are either instrumentation system performance or insulation condition. In addition, the program retains the ability to utilize the NUREG-1801 (XI.E2) option of performing a calibration records review for selected circuits.

- Detection of Aging Effects
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program will perform testing of the cable systems of sensitive, high voltage, low current instrumentation circuits to identify reduction in IR. The testing methodology will utilize a proven test to detect degradation of the insulation. The test methodology will be specified prior to the first test, which will occur during the 10-year period prior to the end of the current operating license. Subsequent testing will be conducted at least once every 10 years, with the frequency to be determined by engineering evaluation. Selected circuits may be evaluated via the NUREG-1801 (XI.E2) option of a calibration records review.

- Monitoring and Trending
  The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program will not include trending actions. If anomalies are found during the testing process, they will be addressed at that time through the Corrective Action Program. The records of the testing will be retained so that any negative trends may be noted.

- Acceptance Criteria
  The acceptance criteria for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program will be provided by the implementing documents for the program. The test results will be evaluated against the acceptance criteria. Results outside the acceptance criteria will be evaluated in accordance with the Corrective Action Program.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

  Corrective actions such as recalibration and circuit trouble-shooting are implemented when calibration or surveillance results or findings of surveillances do not meet the acceptance criteria. An engineering evaluation is performed when the test acceptance criteria are not met in order to ensure that the intended functions of the electrical cable system can be maintained consistent with the current licensing basis. Such an evaluation is to consider the significance of the test results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes for not meeting the test acceptance criteria, the corrective actions required, and the likelihood of recurrence.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Plant operating experience has shown that the Corrective Action Program has addressed issues of neutron detector and connection degradation in recent years. For example, in 2003, the NI-5 power range detector was experiencing intermittent connection problems on the center conductor internal to the detector. In 2002 and 2003, the source range NI-1 and NI-2 instrumentation was found to experience circuit noise due to shielding problems in the cables. While not aging related, these problems highlighted the sensitive nature of the low current instrumentation circuits. Likewise, the Corrective Action Program has identified issues with radiation monitor and connection degradation. In 2005, the radiation detector associated with RE 1413 (for Component Cooling Water) was found to be degraded due to aging. In 2009, an intermittent connection failure was noted for RE 4597BB (for the connection between the detector and the pre-amplifier). Industry operating experience will be considered in development of this program.

Conclusion

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program will manage reduction in insulation resistance for non-environmentally qualified cables and connections used in sensitive, high voltage, low current circuits. The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program will provide reasonable assurance that the aging effects will be managed such that the non-environmentally qualified cables and connections used in sensitive, high voltage, low current circuits, that are within the scope of this program, will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.14 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRICAL COMPONENTS PROGRAM

Program Description

The Environmental Qualification (EQ) of Electrical Components Program is an existing program that implements the requirements of 10 CFR 50.49 (as further defined and clarified by the Division of Operating Reactors (DOR) Guidelines, NUREG-0588, Regulatory Guide (RG) 1.89, Revision 1 and RG 1.97, Revision 3). The program has been established to demonstrate that certain electrical components located in harsh plant environments are qualified to perform their safety functions in those harsh environments, consistent with 10 CFR 50.49 requirements. The program manages component thermal, radiation and cyclical aging, as applicable, through the use of aging evaluations. The program requires action to be taken before individual components in the scope of the program exceed their qualified life. Actions taken include replacement on a specified time interval of piece parts or complete components to maintain qualification and reanalysis.

As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. Some aging evaluations for EQ components specify a qualification of at least 40 years and are considered time-limited aging analyses for license renewal. The program ensures that these EQ components are maintained within the bounds of their qualification bases.

Reanalysis of an aging evaluation to extend the qualifications of components is performed on a routine basis as part of the program. Important attributes for the reanalysis of an aging evaluation include analytical models, data collection and reduction methods, underlying assumptions, acceptance criteria and corrective actions (if acceptance criteria are not met). These attributes are discussed below.

<u>Analytical Models</u>

The analytical models used in the reanalysis of an aging evaluation are the same as those previously applied during the prior evaluation. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40 year normal radiation dose by 1.5 (that is, 60 years/40 years). Use of actual plant operating history to re-evaluate and establish the normal integrated radiation dose for the 60-year period may also be used. The 60-year normal radiation dose is added to the accident radiation dose to obtain the total integrated dose for the component. For cyclical aging, a similar approach may be used. Other models may be justified on a case-by-case basis.

Data Collection and Reduction Methods

Reducing excess conservatism in the component service conditions (for example, temperature, radiation and cycles) used in the prior aging evaluation is frequently employed for a reanalysis. Temperature data used in an aging evaluation is to be conservative and based on plant design temperatures or on actual plant temperature data. When used, actual plant temperature data can be obtained in several ways, including monitors used for compliance with Technical Specifications, other installed monitors, measurements made by plant operators during rounds and temperature sensors on large motors (while the motor is not running). When used, a representative number of temperature measurements are conservatively evaluated to establish the temperatures used in an aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as (a) directly applying the plant temperature data in the evaluation or (b) using the plant temperature data to demonstrate conservatism when using plant design temperatures for an evaluation. Any changes to material activation energy values as part of a reanalysis are justified on a case-specific basis. Similar methods of reducing excess conservatism in the component service conditions used in prior aging evaluations may be used for radiation and cyclical aging.

Underlying Assumptions

EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.

Acceptance Criteria and Corrective Actions

The reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component is maintained, replaced, or re-qualified prior to exceeding the period for which the current qualification remains valid. The reanalysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace, or re-qualify the component if the reanalysis is unsuccessful).

NUREG-1801 Consistency

The Environmental Qualification (EQ) of Electrical Components Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electrical Components."

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The elements that comprise the Environmental Qualification (EQ) of Electrical Components Program are consistent with industry practice and have proven effective in maintaining the material condition of Davis-Besse plant systems and components.

The Davis-Besse EQ program includes consideration of operating experience to modify qualification bases and conclusions, including qualified life. Compliance with 10 CFR 50.49 provides reasonable assurance that components can perform their intended functions during accident conditions after experiencing the effects of in-service aging.

The EQ program health report (1st quarter 2009) shows the program has a "Green" status, highest ranking available, for overall program performance. In addition, the EQ program has been and continues to be subject to periodic internal and external assessments that effect continuous improvement. Administrative controls require periodic formal assessments of the EQ program by knowledgeable personnel from outside the site EQ group.

In the year 2005, a site focused self assessment was performed to evaluate the effectiveness of the Davis-Besse EQ program. The scope of the assessment was to compare the Davis-Besse EQ program documentation against the INPO Engineering Good Practice Guide, for Environmental Qualification of Electrical Equipment. Interfacing procedures and maintenance and engineering procedures which implement EQ requirements were also reviewed. The Davis-Besse EQ program was found to be effective in establishing and maintaining the environmentally qualified status of electrical equipment important to safety located in an EQ harsh environment. The assessment determined that maintenance procedures reflect EQ requirements and preventive maintenance activities are in place to perform the activities necessary to maintain EQ equipment status.

Conclusion

The Environmental Qualification (EQ) of Electrical Components Program has been demonstrated capable of managing component thermal, radiation and cyclical aging, as applicable, through the use of aging evaluations. The Environmental Qualification (EQ) of Electrical Components Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.15 EXTERNAL SURFACES MONITORING PROGRAM

Program Description

The External Surfaces Monitoring Program manages the aging of external surfaces, and internal surfaces in cases where environment is the same, of mechanical components within the scope of license renewal.

The External Surfaces Monitoring Program is a condition monitoring program that consists of periodic visual inspections and surveillance activities of component external surfaces to manage loss of material. The program includes components located in plant systems within the scope of license renewal that are constructed of copper alloy (copper, brass, bronze, and copper-nickel), stainless steel (including cast austenitic stainless steel), and steel (carbon and low-alloy steel and cast iron) materials. Loss of material from the external surfaces of these metals will be evidenced by surface irregularities or localized discoloration and be detectable prior to loss of intended function.

The External Surfaces Monitoring Program, supplemented by the One-Time Inspection, includes inspection and surveillance of elastomers and polymers that are exposed to air-indoor uncontrolled and air-outdoor environments, but are not replaced on a set frequency or interval (i.e., are long-lived), for evidence of cracking and change in material properties (hardening and loss of strength).

In addition, the External Surfaces Monitoring Program consists of plant-specific inspection of the following components (exposed to an air-outdoor environment) for conditions that could result in a reduction in heat transfer, evidenced by visible dirt or other foreign material buildup on tube and fin external surfaces:

- Control room emergency ventilation system air-cooled condensing unit cooling coil tubes and fins
- Station blackout diesel generator radiator tubes and fins

NUREG-1801 Consistency

The External Surfaces Monitoring Program is an existing Davis-Besse program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M36, “External Surfaces Monitoring.”

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- **Scope**

  Systems that credit the External Surfaces Monitoring Program for license renewal, but which do not have Maintenance Rule intended functions, will be added to the scope of the program.

- **Scope, Detection of Aging Effects**

  Surfaces that are inaccessible or not readily visible during either plant operations or refueling outages, such as surfaces that are insulated, will be inspected opportunistically during the period of extended operation.

- **Scope, Parameters Monitored/Inspected, Detection of Aging Effects, Acceptance Criteria**

  The External Surfaces Monitoring Program, supplemented by the One-Time Inspection, will perform inspection and surveillance of elastomers and polymers exposed to air-indoor uncontrolled or air-outdoor environments, but not replaced on a set frequency or interval (i.e., are long-lived), for evidence of cracking and change in material properties (hardening and loss of strength). Acceptance criteria for these components will consist of no unacceptable visual indications of cracks or discoloration that would lead to loss of function prior to the next scheduled inspection.

  The External Surfaces Monitoring Program will perform inspection and surveillance of the control room emergency ventilation system air-cooled condensing unit cooling coil tubes and fins and the station blackout diesel generator radiator tubes and fins for visible evidence of external surface conditions that could result in a reduction in heat transfer. Acceptance criteria for these components will consist of no unacceptable visual indications of fouling (build up of dirt or other foreign material) that would lead to loss of function prior to the next scheduled inspection.

Operating Experience

The elements that comprise the External Surfaces Monitoring Program are consistent with industry practice and have proven effective in maintaining the material condition of Davis-Besse plant systems and components.

A review of recent (from 2002 and later) plant-specific operating experience, through a search of plant Corrective Action Program documents, revealed that component leakage, damage, and degradation are routinely identified by the inspections and surveillance activities which comprise the External Surfaces Monitoring Program, with subsequent corrective actions taken in a timely manner; and that no loss of pressure boundary integrity has occurred that was, or could have been, attributed to the applicable aging effects that are in the scope of the program. Various Corrective Action Program items address the finding and correction of minor rust and leakage identified during station walkdown inspections, or of deficiencies that are not related to aging of passive components (but would have identified age-related degradation, if any). In addition, system health and condition is reported quarterly in plant health reports.

Conclusion

The External Surfaces Monitoring Program has been demonstrated to be capable of detecting and managing loss of material for metallic components. The continued implementation of the External Surfaces Monitoring Program, with enhancement, provides reasonable assurance that the effects of aging on both metallic and non-metallic components will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.16 FATIGUE MONITORING PROGRAM

Program Description

The Fatigue Monitoring Program manages fatigue of select primary and secondary components, including the reactor vessel, reactor internals, pressurizer, and steam generators by tracking thermal cycles as required by Technical Specification 5.5.5, “Component Cyclic or Transient Limit.”

The Fatigue Monitoring Program uses the systematic counting of plant transient cycles to ensure that the design cycles are not exceeded, thereby ensuring that component fatigue usage limits are not exceeded.

The Fatigue Monitoring Program acceptance criteria are to maintain the number of counted transient cycles below the design cycles for each transient. The program periodically updates the cycle counts. When the accumulated cycles approach the design cycles, corrective action is taken to ensure the analyzed number of cycles is not exceeded. Corrective action may include update of the fatigue usage calculation. Any re-analysis will use an NRC-approved version of the ASME Code or an NRC-approved alternative (e.g., NRC-approved code case) to determine a valid cumulative usage factor.

For license renewal, the effects of the reactor coolant environment on component fatigue life have been addressed by assessing the impact of the environment on a sample of critical components as identified in NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components.” Environmental effects were evaluated in accordance with NUREG/CR-6260 and the guidance of EPRI Technical Report MRP-47, “Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application.” Components identified in NUREG/CR-6260 were evaluated using material specific guidance presented in NUREG/CR-6583, “Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels,” and in NUREG/CR-5704, “Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels.”

NUREG-1801 Consistency

The Fatigue Monitoring Program is an existing program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section X.M1, “Metal Fatigue of Reactor Coolant Pressure Boundary.”

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- **Preventive Actions, Monitoring and Trending, Acceptance Criteria**

  For locations, including NUREG/CR-6260 locations, projected to exceed a cumulative usage factor (CUF) of 1.0, the program will implement one or more of the following:

  (1) Refine the fatigue analyses to determine valid CUFs less than 1.0. An analysis using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case) may be performed to determine a valid CUF.

  (2) Manage the effects of aging due to fatigue at the affected locations by an inspection program that will be reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC).

  (3) Repair or replacement of the affected locations.

- **Parameters Monitored or Inspected**

  The Fatigue Monitoring Program will be enhanced to monitor any transient where the 60-year projected cycles were used in an environmentally-assisted fatigue evaluation and to establish an administrative limit that is equal to or less than the 60-year projected cycles.

Operating Experience

Industry operating experience has been factored into the Fatigue Monitoring Program through consideration of NRC documents (information notices, bulletins, regulatory issue summaries, and regulatory guides), vendor notices, industry documents (NEI, INPO, and EPRI), and other utility license renewal applications. Specific examples of that experience showing how the Davis-Besse program has remained responsive to emerging issues and concerns, are provided below. Continued program improvements based on industry experience provide evidence that the program will remain effective for managing cumulative fatigue damage for passive components.

NRC document RIS 2008-30 deals with the use of single dimension stress factors in on-line fatigue analyses. Davis-Besse reviewed RIS 2008-30 and determined that no changes were required to the Fatigue Monitoring Program. Davis-Besse has no on-line fatigue analyses. Davis-Besse's fatigue analyses of record evaluate multi-dimensional stresses and analyze the dimensions appropriate to each component.

NRC and vendor information caused Davis-Besse to assess thermal stratification of the pressurizer surge line. This resulted in changes to the fatigue analyses of record and to the cycles being counted.

Ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

During the program review phase of the Cycle 13 refueling outage (ended March 2004) restart effort it was discovered that the Fatigue Monitoring Program (Allowable Operating Transient Cycles program) had not been updated or reviewed for a period of approximately four years. The Corrective Action Program was used to document deficiencies in various aspects of the Fatigue Monitoring Program. This item in the Corrective Action Program was processed as a significant condition adverse to quality, with a root cause analysis performed in order to provide the appropriate level of attention to the Fatigue Monitoring Program deficiencies. As a result of the root cause analysis, several program changes were made including the addition of a requirement to perform periodic self-assessments. Other corrective actions included evaluation of monitored transients against the Babcock & Wilcox functional specification to verify the cycle limit and basis, update of transient cycle counts, comparison of accrued cycles to allowable cycles (none of the allowable cycles were exceeded), preparation of a job familiarization guide to address program owner qualification requirements, and performance of a program self-assessment.

The self-assessment report was completed in October 2005. The purpose of this assessment was to determine the effectiveness of the changes made to the Allowable Operating Transient Cycles program due to implementation of the Corrective Action Program corrective actions. In summary, the assessment determined that the procedure changes have been effective in driving the collection, documentation, and evaluation of the required transient data. The programmatic changes have been shown to be effective in providing management involvement in the program through oversight and qualification of the program owner. Updates to the allowable operating transient cycles status and event log were evident and submittals to records management were within the allowable time period.

Conclusion

The Fatigue Monitoring Program uses the systematic counting of plant transient cycles to ensure that the numbers of design cycles are not exceeded, thereby ensuring that component fatigue usage limits are not exceeded. When the accumulated cycles approach the design cycles, corrective action is taken to ensure the design cycles are not exceeded. The Fatigue Monitoring Program provides reasonable assurance that the aging effect of cracking due to fatigue, will be adequately managed and that components will continue to perform their intended functions for the period of extended operation.

B.2.17 FIRE PROTECTION PROGRAM

Program Description

The Fire Protection Program is an existing program that manages the aging effects for components in the scope of license renewal that have a fire barrier function; including fire damper framing, fire-rated penetration seals, fire wraps, fire proofing, fire doors and fire barrier walls, ceilings, and floors. In addition, the Fire Protection Program supplements the Fuel Oil Chemistry Program through performance monitoring of the diesel fire pump. The Fire Protection Program is a combination condition and performance monitoring program, comprised of tests and inspections in accordance with the applicable National Fire Protection Association (NFPA) recommendations.

NUREG-1801 Consistency

The Fire Protection Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M26, "Fire Protection," with the following exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria**

  Fixed Halon or carbon dioxide suppression systems are not installed within the protected area at Davis-Besse, as described in the Fire Hazards Analysis Report and corresponding safety evaluation reports. Therefore, the associated portions of the NUREG-1801, XI.M26 program are not applicable to the Fire Protection Program for Davis-Besse.

- **Acceptance Criteria**

  The Fire Protection Program does not include specific confirmation of "no corrosion in the fuel oil supply line for the diesel fire pump." Rather, the Fire Protection Program includes periodic performance testing of the diesel fire pump. Degradation noted for the fuel oil supply line during these periodic tests, if any, is evaluated prior to loss of intended function. In addition, the One-Time Inspection characterizes the internal surface condition of the fuel oil supply line (tubing) for confirmation of the effectiveness of the Fuel Oil Chemistry Program.

Enhancements

None.

Operating Experience

A review of fire barrier, fire rated penetration seal, fire wrap, fire door, and diesel fire pump system inspections previously conducted at Davis-Besse confirms the reasonableness and acceptability of the inspections and their frequency in that degradation of the subject components was detected prior to loss of function.

The NRC presently conducts triennial fire protection team inspections at the Davis-Besse site to assess whether an adequate fire protection program has been implemented and maintained at Davis-Besse. The most recent of these inspections was conducted in April of 2007. The inspection team verified that the fire protection-related issues are entered into the Corrective Action Program at an appropriate threshold for evaluation. The inspection team also reviewed the program for implementing compensatory measures in place for out-of-service, degraded, or inoperable fire protection, with no findings identified. The inspection team evaluated the adequacy of fire area barriers, penetration seals, fire doors, fire wrap, and fire rated electrical cables. The team observed the material condition and configuration of the installed barriers, seals, doors, and cables. In addition, the team reviewed Davis-Besse documentation, such as NRC safety evaluation reports, and deviations from NRC regulations and the NFPA codes to verify that fire protection features met license commitments. No findings of significance were found. In addition, a past triennial NRC inspection of the Davis-Besse Fire Protection Program, conducted in October of 2004, identified one non-significant, non-cited violation. No findings of significance were found. The violation found that previously submitted licensing correspondence, regarding the basis for not protecting ventilation system cables, was no longer accurate. This issue is not related to the portions of the program credited with aging management.

A review of recent audits, health reports, and self-assessments revealed no NRC or Davis-Besse management concerns with respect to inspection, testing, or maintenance of the Fire Protection System. These documents found the program to be effectively implemented with good performance.

A review of recent plant-specific operating experience, such as that included in Corrective Action Program documents, demonstrates that the Fire Protection Program is an effective program, consistent with industry practices. When conditions were found that required correction, they were repaired and evaluated using the work order system and the Corrective Action Program. Examples include degraded penetration seals and fire barriers that were found during periodic surveillance activities and repaired.

Conclusion

The Fire Protection Program has been demonstrated to be capable of detecting and managing the effects of aging for components in the scope of license renewal that have fire barrier intended functions. The periodic Fire Protection Program inspections and tests of the diesel fire pump fuel supply line supplement the aging management provided by the Fuel Oil Chemistry Program. The Fire Protection Program provides reasonable assurance that aging effects will be managed such that structures and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.18 FIRE WATER PROGRAM

Program Description

The Fire Water Program (a sub-program of the overall Fire Protection Program) is an existing program that applies to the fire water supply and water-based suppression systems, which include sprinkler heads (spray nozzles), fittings, valve bodies, hydrants, hose stations, standpipes, a water storage tank, and aboveground and underground piping and components. The Fire Water Program is a condition monitoring program that comprises tests and inspections in accordance with applicable NFPA recommendations.

The program is credited with managing loss of material, as well as cracking of susceptible materials, for fire water supply and water-based fire suppression components in the scope of license renewal. The periodic inspection and testing activities include hydrant and hose station inspections, fire main (and hydrant) flushes, flow tests, tank inspections, and sprinkler system inspections. Such inspection and testing assures functionality of the fire water supply and water-based suppression systems. Also, the portions of the fire water supply and water-based suppression systems that are normally maintained at required operating pressure are monitored such that leakage resulting in loss of system pressure is promptly detected and corrective actions initiated.

In addition, all sprinkler heads in the scope of license renewal will either be replaced or a sample population field service tested, prior to seeing 50 years of service (in-place) using the guidance of NFPA 25, “Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,” 2002 edition. Sprinkler head testing, if selected, will occur at 10-year intervals following this baseline inspection, until such time as there are no untested sprinkler heads that will see 50 years of service through the end of the period of extended operation.

For fire water supply and water-based suppression systems that are not flow tested, per NFPA 25, the Fire Water Program also includes wall thickness evaluations (i.e., ultrasonic testing or internal visual inspection). These wall thickness examinations of representative fire water supply and water-based suppression piping locations that are not periodically flow tested but contain, or have contained, stagnant water are performed prior to the period of extended operation and at appropriate intervals thereafter, based on engineering evaluation of the results.

NUREG-1801 Consistency

The Fire Water Program is an existing Davis-Besse program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M27, “Fire Water System.”

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- **Parameters Monitored or Inspected, Detection of Aging Effects**

  Add a program requirement to perform periodic ultrasonic testing for wall thickness of representative above-ground water suppression piping that is not periodically flow tested but contains, or has contained, stagnant water. The ultrasonic testing will be performed prior to the period of extended operation and at appropriate intervals thereafter, based on engineering evaluation of the initial results.

- **Detection of Aging Effects**

  Add a program requirement to perform at least one opportunistic or focused visual inspection of the internal surface of buried fire water piping and of similar above-ground fire water piping, within the five-year period prior to the period of extended operation, to confirm whether conditions on the internal surface of above-ground fire water piping can be extrapolated to be indicative of conditions on the internal surface of buried fire water piping.

  Add a program requirement to perform representative sprinkler head sampling (laboratory field service testing) or replacement prior to 50 years in-service (installed), and at 10-year intervals thereafter, in accordance with NFPA 25, or until there are no untested sprinkler heads that will see 50 years of service through the end of the period of extended operation.

  Add a program requirement, if certain conditions are met, to perform opportunistic fire water supply and water-based suppression system internal inspections each time a fire water supply or water-based suppression system (including fire pumps) is breached for repair or maintenance. To be considered acceptable, these internal visual inspections must be demonstrated to be: 1) representative of water supply and water-based suppression locations, 2) performed on a reasonable basis (frequency), and 3) capable of evaluating wall thickness and flow capability. If the internal inspections cannot be completed of a representative sample, then ultrasonic testing inspections will be used to complete the representative sample.

Operating Experience

Water-suppression portions (subsystems) of the Fire Protection System are inspected, tested, and maintained following NFPA recommendations and at the intervals recommended by the corresponding NFPA standards, or as evaluated and adjusted by FENOC.

The NRC presently conducts triennial fire protection team inspections at the Davis-Besse site to assess whether an adequate fire protection program has been implemented and maintained. The most recent of these inspections was conducted in March-April of 2007 and is documented in Inspection Report (IR) 2007-006. FENOC intends to adopt the NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition." Therefore, the 2007 triennial inspection was conducted in accordance with the NRC inspection procedure for the NFPA 805 transition period. There were no findings of significance during this inspection. The inspectors evaluated the adequacy of fire suppression and detection systems in select areas, including observation of material condition and configuration of the installed fire detection and suppression systems. The inspection verified that fire suppression and detection systems met license commitments. In addition, the inspectors reviewed the Corrective Action Program procedures and samples of corrective action documents and verified that FENOC was identifying issues related to the fire protection program at an appropriate threshold and entering them in the Corrective Action Program.

Another past triennial NRC inspection of the Fire Protection Program (including the Fire Water Program) was conducted in October of 2004 and documented in IR 2004-009. A single Non-Cited Violation was identified during this inspection. The Non-Cited Violation was related to licensing and the basis for an exemption being changed via modification. It was entered in the Corrective Action Program and was not related to the Fire Water Program. Otherwise, the conclusions of the 2004 inspection were similar to the results of the 2007 inspection.

No NRC concerns or Davis-Besse management concerns (through periodic audits, self-assessments, and heath reports) were identified with respect to inspection, testing, and maintenance of fire water supply or water-based suppression portions of the Fire Protection System.

A review was performed for the purposes of license renewal of Corrective Action Program documentation related to the Fire Protection System, with respect to aging effects in the fire water suppression systems. This review concluded that when conditions were found that required correction they were evaluated and corrected as necessary using the FENOC Corrective Action Program, for example, the fire water storage tank was replaced in 1998 as a result of corrosion of the internal surfaces.

Areas for improvement were also identified and implemented through the Corrective Action Program, as appropriate. In addition, for license renewal purposes, a sampling of the results of the credited surveillance and test procedures were reviewed for recent monthly, semiannual, annual, and refueling interval inspections, flushes and flow tests. Any deviations from the acceptance criteria were evaluated and corrected in accordance with the Corrective Action Program.

Conclusion

The Fire Water Program has been demonstrated to be capable of detecting and managing loss of material, as well as fouling, for susceptible components. The Fire Water Program, with enhancement, will provide reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.19 FLOW-ACCELERATED CORROSION (FAC) PROGRAM

Program Description

The Flow-Accelerated Corrosion (FAC) Program manages loss of material for steel piping and other components of systems that are susceptible to flow-accelerated corrosion, also called erosion-corrosion, when exposed to single-phase water above 190°F or two phase steam at any temperature.

The Flow-Accelerated Corrosion (FAC) Program is a condition monitoring program that implements the recommendations of NRC Generic Letter 89-08, “Erosion/Corrosion Induced Pipe Wall Thinning,” and follows the guidance and recommendations of EPRI NSAC-202L, R3, “Recommendations for an Effective Flow-Accelerated Corrosion Program,” to ensure that the integrity of piping systems susceptible to flow-accelerated corrosion is maintained. The program combines: a) predictive analysis, b) baseline inspections to determine the extent of thinning, and c) follow-up inspections to confirm predictions or initiate repair or replacement of components as necessary.

NUREG-1801 Consistency

The Flow-Accelerated Corrosion (FAC) Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M17, “Flow-Accelerated Corrosion.”

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The Flow-Accelerated Corrosion (FAC) Program is a mature, well-structured program at Davis-Besse. The program implements the recommended actions of NRC Generic Letter 89-08, and is effective in managing flow-accelerated corrosion in steel piping and components containing high-energy fluids. The program has been the subject of internal assessments (with industry participation), and improvements, as well as of fleet-wide assessments (including comparison to corresponding industry peer programs). It includes the evaluation of industry operating experience for impact to the program.

A recent assessment in late 2005 found the program to be comprehensive and to meet the requirements of EPRI NSAC-202L. In the same time frame (following the Cycle 14 refueling outage), the program was enhanced, based on industry benchmarking, to implement EPRI CHECWORKS Steam Feedwater Application version 2.1, to include alloy (chrome) testing as appropriate as a tool to fine tune the flow-accelerated corrosion model and to preclude further ultrasonic testing of chrome bearing components, and to enter component data for select large and small bore not-modeled lines into CHECWORKS (which manages ultrasonic testing thickness data) to facilitate future inspections.

In 2006, a steam leak was discovered on the moisture separator reheater 1 first stage reheat drain line that should have been detected by the Flow-Accelerated Corrosion (FAC) Program but resulted in a power reduction to facilitate repairs. The program was enhanced at that time to improve the documentation on quality of the software model and to include a second level of verification for entering data into CHECWORKS.

Results of inspections and evaluations are compiled into an outage flow-accelerated corrosion report for each cycle. Flow-accelerated corrosion inspections at 95 locations were conducted during the recent Cycle 15 refueling outage. This was the first outage utilizing CHECWORKS Steam Feedwater Application version 2.1. No significant issues were noted using the updated software. Approximately 120 feet of eight-inch piping in the stage reheat drains system and approximately 160 feet of 18-inch feedwater piping were replaced with 2.25% chrome piping during the Cycle 15 refueling outage. An eight-foot section of 18-inch pipe downstream of the feedwater common section was also replaced as scheduled. An additional six-foot section of pipe downstream of a tee near the feedwater common section was replaced after ultrasonic testing thickness readings showed that the component would most likely not reach the Cycle 16 refueling outage without exceeding the minimum allowable thickness. The examination was extended beyond the thinned area. The Cycle 14 refueling outage inspection included 90 segments and one additional baseline inspection. In addition, four 18-inch locations downstream of plate type flow elements in condensate and feedwater (single-phase lines) were inspected. All piping segments inspected had a minimum allowable wall thickness calculated by design engineering prior to the start of the inspections. A planned replacement of approximately 60 feet of large bore feedwater piping was accomplished in the Cycle 14 refueling outage with 2.25% chrome (flow-accelerated corrosion resistant) material.

Conclusion

The Flow-Accelerated Corrosion (FAC) Program has been demonstrated to be capable of detecting and managing loss of material due to flow-accelerated corrosion for susceptible components. The Flow-Accelerated Corrosion (FAC) Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.20 FUEL OIL CHEMISTRY PROGRAM

Program Description

The Fuel Oil Chemistry Program verifies and maintains the quality of the fuel oil consumed in the emergency diesel generators, diesel fire pump, and station black out diesel generator in order to mitigate the effects of aging for the storage tanks and associated piping and components containing fuel oil that are within the scope of license renewal. The program manages the presence of contaminants, such as water or microbiological organisms, which could lead to the onset and propagation of loss of material or cracking through proper monitoring and control of fuel oil consistent with plant Technical Specifications and ASTM standards for fuel oil. Exposure to these contaminants is minimized by a) verifying the quality of new fuel oil before it enters the storage tanks, b) periodic sampling of tank contents to ensure the fuel oil is free of water and particulates, and c) periodic cleaning and inspection of tanks containing fuel oil. The Fuel Oil Chemistry Program is a mitigation program.

The effectiveness of the Fuel Oil Chemistry Program is verified by the One-Time Inspection. The One-Time Inspection will include ultrasonic thickness measurement of a sample of fuel oil tank bottoms to ensure that significant degradation is not occurring.

NUREG-1801 Consistency

The Fuel Oil Chemistry Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M30, “Fuel Oil Chemistry,” with the following exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope, Acceptance Criteria**

  Davis-Besse does not explicitly use ASTM D6217. Davis-Besse uses ASTM D2276 versus ASTM D6217 for guidance on the determination of particulate contamination. ASTM D2276 is used, with an acceptance criterion of a total particulate contamination of less than 10 milligrams per liter.

- **Scope, Parameters Monitored or Inspected, Acceptance Criteria**

  Davis-Besse does not explicitly use ASTM D1796, and uses D4176 or D2709. ASTM D1796 provides guidance for water and sediment determination in No. 4D diesel fuel, which is not used at Davis-Besse. Davis-Besse uses ASTM D4176 for guidance on the determination of (grade 2D) fuel oil appearance or ASTM D2709 for guidance on determination of water and sediment contamination.

ASTM D4176 or ASTM D2709 is used, with acceptance criterion of clear and bright appearance with proper color, or water and sediment contamination less than 0.05% by volume, respectively.

- **Parameters Monitored or Inspected**

  A filter with a pore size of 3.0 microns is not used when testing fuel oil for particulates. Instead, a filter with 0.8 micron pore size is used, as recommended by ASTM D2276. The use of a filter with a smaller pore size results in a larger sample of particulates because smaller particles are retained. Thus, use of a 0.8 micron filter is more conservative than use of a 3.0 micron filter.

- **Detection of Aging Effects**

  Multilevel sampling is not performed. Composite samples are from three separate locations in the lower portion of the emergency diesel generator fuel oil storage tanks, where contaminants may collect.

- **Preventive Actions**

  Preventive actions do not include the routine addition of biocides, stabilizers, or corrosion inhibitors to the fuel oil. The combination of ensuring the specified physical and chemical properties of new fuel oil are within specified limits and periodic cleaning and draining of the tanks has been shown to mitigate corrosion inside the tanks and fuel oil degradation. If necessary, fuel oil additive may be used at the program owner's discretion.

Enhancements

None.

Operating Experience

The Fuel Oil Chemistry Program is an ongoing program that utilizes sampling and analysis to ensure that adequate diesel fuel quality is maintained to minimize degradation (prevent loss of material and fouling) in the various in-scope fuel oil systems. Exposure of fuel oil to contaminants such as water and particulates is also minimized by periodic draining of accumulated water, tank interior cleaning, and by verifying the quality of new oil before its introduction into the storage tanks. Furthermore, no instances of fuel oil system component failure due to instances of contamination have been identified at Davis-Besse.

Water has occasionally been discovered in various Davis-Besse diesel fuel oil storage tanks during sampling activities. In accordance with sampling and analysis procedures, any detected water is removed from the affected tank as part of the sampling process.

Abnormal fuel oil chemistry conditions, such as high particulate levels and suspended solids, are identified, evaluated, and corresponding adjustments made through the Corrective Action Program to correct the chemistry conditions well before a loss of function. Examples include:

- The monthly particulate and non particulate tests following cleaning of the fuel oil day tank for the station blackout diesel generator in 2007 were within specification; however an increase in the time to perform the particulate test for that tank was noted. Samples were reanalyzed for indications of microbiology and corrective actions taken to re-circulate tank contents through a filter.

- Higher than normal particulate levels were noted during sampling of one of the emergency diesel generator fuel oil day tanks in 2006. The tank was re-sampled with the results being more consistent with past values (and within specification). To minimize sludge/particulate transport to the diesel day tanks during preventive maintenance evolutions, corrective actions were implemented to blow excess fuel lines into the day tank using air, perform a longer purge of transport lines to remove old fuel that was in the transfer pipe, and a cautionary note added to sampling procedures.

- High particulate levels were identified in 2003 and determined to be the result of using high sulfur diesel fuel and not adding stabilizer to the fuel. After additional evaluation, it was determined that the use of low sulfur diesel would ensure the operational control limits will be more consistently met. The use of alternate fuel stabilizers to ensure the tank inventory did not degrade was recommended.

Cleaning and visual inspection of fuel oil tanks is also conducted on a regular basis. These inspections have revealed acceptable conditions for the tank internal surfaces; that is, no significant material loss or obvious changes to the condition of the tank. Some minor corrosion was noted at the top of one of the emergency diesel generator fuel oil storage tanks during scheduled cleaning of the tank in 2003. This fuel oil storage tank corrosion led to partial clogging of fuel filters and was evaluated for continued use, but did not reveal a loss of component function of subject components that contain fuel oil which could be attributed to an inadequacy of the Fuel Oil Chemistry Program. Also, regular cleaning of the diesel fire pump day tank was implemented in 2002 as a result of an evaluation of a clogged filter. The station blackout diesel generator fuel oil day tank was recently cleaned and inspected in 2006 with no issues.

An important element of fuel oil (or any other) analysis is operation of the testing laboratory. Fuel oil samples from Davis-Besse are sent to Beta Laboratory (a FENOC subsidiary) after an initial set of factors are measured at the Davis-Besse site. The laboratory completes the oil analysis.

A fleet oversight quality assurance audit was conducted to assess the operation practices and regulatory compliance of the Beta Laboratory facility. The principal tool for this assessment was the FENOC Quality Assurance Program Manual. The audit identified multiple areas for improvement and Corrective Action Program items were generated to document and track the recommended improvements.

Conclusion

The Fuel Oil Chemistry Program has been demonstrated to be capable of managing loss of material, as well as cracking, in fuel oil for susceptible components through monitoring and control of contaminants. The continued implementation of the Fuel Oil Chemistry Program, supplemented by the One-Time Inspection, provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.21 Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

Program Description

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will manage the aging of non-environmentally qualified inaccessible medium-voltage electrical cables susceptible to aging effects caused by moisture and voltage stress, such that there is reasonable assurance that the cables will perform their intended function in accordance with the current licensing basis during the period of extended operation.

In-scope, inaccessible medium-voltage cables exposed to significant moisture and significant voltage will be tested to provide an indication of the condition of the conductor insulation. The specific type of test performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, as described in EPRI TR-103834-P1-2, or other testing that is state-of-the-art at the time the test is performed. Testing will be conducted at least once every 10 years, with initial testing to be completed prior to the period of extended operation.

In addition, manholes associated with inaccessible non-EQ medium-voltage cables will be inspected for water accumulation and the water removed, as necessary. These inspections for water collection will be conducted at least once every two years, with the initial inspection to be completed prior to the period of extended operation.

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E3, “Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

Exceptions to NUREG-1801

None.

Enhancements

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program applies to inaccessible, non-environmentally qualified medium-voltage (2-kV to 35-kV) cables within the scope of license renewal that are exposed to significant moisture simultaneous with significant voltage exposure.

  The program defines significant moisture as periodic exposure to moisture that lasts more than a few days (e.g., cable in standing water). Periodic exposure to moisture, which lasts less than a few days (i.e., normal rain and drain) is not significant.

  The program defines significant voltage exposure as being subject to system voltage for more than 25% of the time.

  The program defines “inaccessible” cable as cable that is located in conduit, duct bank, cable trenches or troughs, underground vaults, or is direct buried.

- Preventive Actions
  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will require periodic preventive actions to inspect for water collection in electrical manholes and for water removal, if necessary. Inspections will be conducted at least once every two years, with the initial inspection to be completed prior to the period of extended operation.

- Parameters Monitored or Inspected
  The specific type of test to be utilized in the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will be determined prior to the initial test, and is to be a proven test (such as partial discharge, power factor, or other test that is state-or-the-art at the time the testing is to be performed) for detecting the deterioration of the insulation system due to wetting (and energization). Testing of in-scope, inaccessible medium-voltage cables exposed to significant moisture and significant voltage will provide an indication of the condition of the conductor insulation.

- Detection of Aging Effects
  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will test in-scope medium-voltage cables at least once every 10 years, with the first tests completed prior to the period of extended operation.

  The program will also conduct inspections of the electrical manholes at least once every two years. The inspection frequency will be based on actual plant experience with water accumulation in the manhole, with the first inspection to be completed prior to the period of extended operation.

- Monitoring and Trending
  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will not include trending actions. If anomalies are found during the testing, they will be addressed at that time via the Corrective Action Program.

- Acceptance Criteria
  The acceptance criteria for each test in the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will be defined by the specific type of test to be performed and the specific cable tested.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

  In addition, for the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Program, an engineering evaluation is performed when the test acceptance criteria are not met in order to ensure that the intended functions of the electrical cables can be maintained consistent with the current licensing basis. Such an evaluation will consider the significance of the test results, the operability of the components, the reportability of the event, the extent of concern, the potential root causes, the corrective actions required, and the likelihood of recurrence. When an unacceptable condition or situation is identified, a determination will be made as to whether the same condition or situation is applicable to other in-scope medium-voltage cables.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

  Plant operating experience has shown that the Corrective Action Program has addressed issues of cable degradation in recent years. Cables have been identified with degraded insulation, primarily as a result of exposure to excessive localized overheating and exposure to wetting. There have also been failures of medium-voltage cable at Davis-Besse, both cables within the license renewal scope and cables that are not in-scope.

  The Davis-Besse response to Generic Letter 2007-01 contains a listing of the inaccessible or underground power cable failures, a listing of degraded cables identified through testing (prior to failure), and a description of testing activities on the electrical power cables. The Generic Letter 2007-01 response is documented in FENOC Letter to NRC, Serial 3333, "Response to NRC Generic Letter 2007-01 (TAC No. MD4320)," dated May 8, 2007 and FENOC Letter to NRC, L-08-013, "Supplemental Information Regarding Response to Generic Letter 2007-01 (TAC No. MD4320)," dated January 18, 2008.

  For example, in 1999, component cooling water pump #2 tripped due to a cable fault caused by prolonged exposure to water. The cable was replaced. In 2002, the feed cables to makeup pump #1 were found to have low insulation resistance; they were replaced. In 2004, an underground feed cable associated with a 13.8-kV breaker failed, resulting in the loss of circulating water pump #1 and two nonsafety 4-kV substations.

  In addition, as part of the Maintenance Rule program, inspections have been performed on various electrical manholes at Davis-Besse (as part of a structural inspection). Evaluation worksheets were prepared for each manhole inspected, photographs were taken, and the as-found conditions were documented. There are also preventive maintenance orders for performing inspections of the in-scope electrical manholes, which address water intrusion, the wireway, the conduits, the manhole sump pumps, and the electrical supports.

  There are also regular preventive maintenance activities (inspections and repair, if necessary) performed on the electrical manholes. The work activity includes a visual check of the conduit and raceway supports in the manholes, and a functional check of installed sump pumps. If water is found, the manholes are pumped out. All of the in-scope manholes at Davis-Besse have been inspected in recent years (2005 through 2008), with some water intrusion noted (from an inch or so on the floor, up to three feet of water). The manholes with water were pumped out. No submergence of safety-related cables was noted.

The quarterly Plant Health Report includes a system health evaluation of the medium-voltage AC system. A large part of this evaluation involves underground medium-voltage cables. The evaluation addresses Davis-Besse and industry operating experience on medium-voltage cable issues, and also provides a listing of cables that are planned to be replaced in the near future.

Industry operating experience will be considered in development of this program, along with input from EPRI guidance documents.

Conclusion

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will manage degradation of conductor insulation for inaccessible, non-environmentally qualified medium-voltage cables, and will also provide for inspection of the electrical manholes (and draining of the manholes, if necessary). The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will provide reasonable assurance that the aging effects will be managed such that the inaccessible, non-environmentally qualified medium-voltage cables within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.22 INSERVICE INSPECTION (ISI) PROGRAM – IWE

Program Description

The Inservice Inspection (ISI) Program – IWE establishes responsibilities and requirements for conducting ASME Code Section XI, Subsection IWE inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWE includes examination and/or testing of accessible surface areas of the steel containment vessel; containment hatches and airlocks; seals, gaskets and moisture barriers; and containment pressure-retaining bolting. These examinations are in accordance with the requirements of the ASME Code, Section XI, 1995 Edition through the 1996 Addenda.

The inservice examinations conducted throughout the service life of Davis-Besse will continue to comply with the requirements of the ASME Code Section XI edition and addenda incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC. This is consistent with NRC Statements Of Consideration associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

NUREG-1801 Consistency

The Inservice Inspection (ISI) Program – IWE is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S1, "ASME Section XI, Subsection IWE."

The Code year (e.g., 1992 Edition through 2001 Edition including the 2002 and 2003 Addenda), as endorsed by the NRC in 10 CFR 50.55a, is specifically included in the NUREG-1801 XI.S1 aging management program. Consistent with provisions in 10 CFR 50.55a to use the ASME Code in effect twelve months prior to the start of the inspection interval, the applicable ASME Code for the current Third Ten-Year Inspection Interval for Davis-Besse is ASME Section XI, 1995 Edition, through the 1996 Addenda.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

Davis-Besse containment examinations and tests required by the Inservice Inspection program have been implemented in accordance with the established schedule.

There have been three conditions identified which have required engineering evaluation or repair or replacement activities.

1. Prior to the implementation date of IWE, the "sand pocket" in the annulus was found to hold moisture which resulted in scale on the containment vessel surface in this region. The sand and scale were removed from this area and the containment vessel in this area was recoated. When the scale was removed, pitting of the containment vessel was identified. Ultrasonic thickness measurements verified that the minimum recorded vessel thickness was greater than the minimum required wall thickness. An engineering evaluation determined that the pitting was not detrimental to the containment vessel. The cause of the moisture in the sand pocket region was plugged floor drains.

2. During the Cycle 12 refueling outage, seepage of water between the containment vessel and the floor of the sand pocket in the annulus was noted. Similar seepage was also noted during the Cycle 13 refueling outage and documented in the Corrective Action Program. A plant modification was implemented to add a moisture barrier to this region. The seepage wets the containment vessel at the interface between the containment vessel and the floor only. Access to perform examinations in this area is not available. Therefore, this area was addressed in the Cycle 12 and Cycle 13 refueling outages in accordance with 10 CFR 50.55a(b)(2)(ix)(A), which requires that when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas, the following information be provided in the Inservice Inspection summary report required by ASME Section XI, IWA-6000:

   (1) A description of the type and estimated extent of degradation, and the conditions that led to the degradation;

   (2) An evaluation of each area, and the result of the evaluation, and;

   (3) A description of necessary corrective actions.

3. Corrective Action Program documentation identified that gaps had formed at two areas between the containment vessel and the concrete ledge on the inside of Containment at the 565-foot elevation. Although no actual degradation has been identified as a result of these gaps, the affected areas were designated as surface areas requiring augmented examination (examination category E-C) as required by ASME Section XI, IWE-1240. Access to these areas of the containment vessel is only available from one side in the annulus area. Ultrasonic thickness readings were taken in these areas from the annulus in Cycle 13 and Cycle 15 refueling outages in accordance with ASME Code Case N-605 requirements. The thicknesses in these areas

have remained essentially unchanged since the initial Cycle 13 refueling outage ultrasonic thickness readings.

All of the examinations scheduled since the third period of the second inspection interval have been completed. All of these examinations and tests performed to date have satisfied the acceptance standards contained within ASME Section XI, IWE-3000. Inservice inspection records are maintained in accordance with ASME Section XI, IWA 6000 in permanent plant file storage.

Conclusion

The Inservice Inspection (ISI) Program – IWE has been demonstrated to be capable of detecting and managing loss of material for steel surfaces of the containment. The continued implementation of Inservice Inspection (ISI) Program – IWE provides reasonable assurance that the aging effects will be managed such that the structures and components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.2.23 INSERVICE INSPECTION (ISI) PROGRAM – IWF

Program Description

The Inservice Inspection (ISI) Program – IWF establishes responsibilities and requirements for conducting ASME Code Section XI, Subsection IWF inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWF includes visual examination for supports based on sampling of the total support population. The sample size varies depending on the ASME class. The largest sample size is specified for the most critical supports (ASME Class 1). The sample size decreases for the less critical supports (ASME Classes 2 and 3). Discovery of support deficiencies during regularly scheduled inspections triggers an increase of the inspection scope, in order to ensure that the full extent of deficiencies is identified. The primary inspection method employed is visual examination. Degradation that potentially compromises support function or load capacity is identified for evaluation. These examinations are in accordance with the requirements of the ASME Code, Section XI, 1995 Edition through the 1996 Addenda.

The in-service examinations conducted throughout the service life of Davis-Besse will continue to comply with the requirements of the ASME Code Section XI edition and addenda incorporated by reference in 10 CFR 50.55a(b) twleve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC. This is consistent with NRC Statements Of Consideration associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

NUREG-1801 Consistency

The Inservice Inspection (ISI) Program – IWF is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S3, “ASME Section XI, Subsection IWF.”

The Code year (e.g., 1989 Edition through 2001 Edition including the 2002 and 2003 Addenda), as endorsed by the NRC in 10 CFR 50.55a, is specifically included in the NUREG-1801 XI.S3 aging management program. Consistent with provisions in 10 CFR 50.55a to use the ASME Code in effect twelve months prior to the start of the inspection interval, the applicable ASME Code for the current Third Ten-Year Inspection Interval for Davis-Besse is ASME Section XI, 1995 Edition, through the 1996 Addenda.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

Davis-Besse IWF examinations required by the Inservice Inspection program have been implemented in accordance with the established schedule.

Review of Cycle 15, 14, and 13 refueling outage Inservice Inspection summary reports and plant operating experience did not reveal age-related issues that impaired intended functions with regards to ASME Class 1, 2, or 3 supports pertaining to ASME Section XI, Subsection IWF. There have been no conditions identified which have required engineering evaluation, repair, or replacement activities.

1. During the Cycle 14 refueling outage while performing an ISI examination of hangers SW-41-HBC-47-H7 and SW-41-HBC-46-H3 rusted areas were recorded on the I-beams supporting the service water (SW) piping. The rust and rust streaks appeared to be from the humidity condensing on the SW pipe and dripping onto the support I-beams. No evidence of material wastage was noted. These conditions were documented in the Corrective Action Program and evaluated. No corrective action was required.

2. In 2006, while performing a visual examination of sway strut CC-36-HBC-2-H7 for the ISI program, proper thread engagement of the strut paddle bolts could not be verified through the sight hole in the sway strut barrel. This was applicable for both the north and south struts, top strut paddle bolts. These conditions were documented in the Corrective Action Program. A review of the "as-found" condition of the sway strut upper pinned connections determined that the sway strut had been capable of performing its design function even with reduced thread engagement on one of the four threaded connections.

3. In 2005 corrosion was noted during visual inspection of snubber DB-SNC488 on pipe support AF-M1155/H5. The corrosion was noted on the snubber extension eyelet at the pipe clamp and its associated pin. This condition was documented in the Corrective Action Program. Design engineering classified the rust on the extension piece and its snubber as rust staining with areas of minor surface rust. The corrosion appeared to have been caused by age and exposure to a humid environment in containment. There was no loss of material due to this corrosion. The corrosion at the bracket and pin was minor and did not affect the rotation ability of the snubber. Corrective action was taken to inspect this snubber during the Cycle 14 refueling outage. The subject snubber was replaced as routine maintenance and not due to failure

All of the examinations scheduled since the third period of the second inspection interval have been completed. All of the examinations and tests performed to date have satisfied the acceptance standards contained within ASME Section XI, IWF-3000. Inservice inspection records are maintained in accordance with ASME Section XI, IWA 6000 and are in permanent plant file storage.

Conclusion

The Inservice Inspection (ISI) Program – IWF has been demonstrated to be capable of detecting and managing ASME Class 1, 2, and 3 piping supports and supports other than piping supports (Class 1, 2, and 3). The continued implementation of Inservice Inspection (ISI) Program – IWF provides reasonable assurance that aging effects will be managed such that applicable structures and components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.24 INSERVICE INSPECTION PROGRAM

Program Description

The Inservice Inspection Program manages cracking of reactor coolant pressure boundary components and once-through steam generator secondary side components. The Inservice Inspection Program, in conjunction with the PWR Water Chemistry Program, manages loss of material for once-through steam generator secondary side components. The Inservice Inspection Program also manages reduction in fracture toughness for cast austenitic stainless steel pump casings and valve bodies. The Inservice Inspection Program is a condition monitoring program that meets the inservice inspection requirements specified by the ASME Code, Section XI, as modified by 10 CFR 50.55a.

The Inservice Inspection Program includes periodic visual, surface, or volumetric examination and leakage (pressure) testing of ASME Class 1, 2, or 3 components, and their integral attachments, as well as repair, modification, or replacement of same. The inservice examinations (and pressure tests) conducted throughout the service life of Davis-Besse will continue to comply with the requirements of the ASME Code Section XI, Subsections IWB, IWC, and IWD, edition and addenda incorporated by reference in 10 CFR 50.55a(b), twelve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC. This is consistent with NRC Statements of Consideration associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

The Inservice Inspection Program has been augmented to include commitments made to the regulatory authorities beyond the ASME Code, Section XI. Examples include the augmented examination of auxiliary feedwater header components, high pressure injection ASME Class 1 piping welds, and decay heat removal ASME Class 1 pipe to valve welds.

The Inservice Inspection Program is an existing program that will be continued for the period of extended operation.

NUREG-1801 Consistency

The Inservice Inspection Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

The Code year (e.g., 2001 Edition including the 2002 and 2003 Addenda), as endorsed by the NRC in 10 CFR 50.55a, is specifically included in the NUREG-1801 XI.M1 aging management program. Consistent with provisions in 10 CFR 50.55a to use the ASME

Code in effect twelve months prior to the start of the inspection interval, the applicable ASME Code for the current Third Ten-Year Inspection Interval for Davis-Besse is ASME Section XI, 1995 Edition, through the 1996 Addenda, as modified by 10 CFR 50.55a or relief granted in accordance with 10 CFR 50.55a.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

Based on review of plant-specific and industry operating experience, the identified aging effects require management for the period of extended operation.

Recent Davis-Besse operating experience related to inservice inspection is documented in inservice inspection outage summary reports. Specific examples of inservice inspection findings are also documented in the Corrective Action Program. Davis-Besse operating experience is consistent with industry experience; a large number of examinations are being performed, and indications are found and resolved. The extensive site-specific operating experience with the Inservice Inspection Program provides assurance that the program is effective in managing the effects of aging so that components crediting these programs can perform their intended function consistent with the current licensing basis during the period of extended operation.

The Corrective Action Program and an ongoing review of industry operating experience will be used to ensure that the program remains effective in managing the identified aging effects.

Conclusion

The Inservice Inspection Program has been demonstrated to be capable of managing cracking for components of the reactor coolant pressure boundary and steam generator secondary side components, for managing reduction of fracture toughness of cast austenitic stainless steel pump casings and valve bodies, and, in conjunction with the PWR Water Chemistry Program, for managing loss of material for steam generator secondary side components. The Inservice Inspection Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.25 LEAK CHASE MONITORING PROGRAM

Program Description

The Leak Chase Monitoring Program is an existing condition monitoring program, consisting of observation and activities to detect leakage from the spent fuel pool, the fuel transfer pit, and the cask pit liners due to age-related degradation.

The Leak Chase Monitoring Program includes periodic monitoring of the spent fuel pool, the fuel transfer pit, and the cask pit liners leak chase system. Periodic monitoring of leakage from the leak chase system permits early determination and localization of any leakage.

NUREG-1801 Consistency

The Leak Chase Monitoring Program is an existing plant-specific program for Davis-Besse. There is no corresponding aging management program described in NUREG-1801. The program is evaluated against the 10 elements described in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR).

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The Leak Chase Monitoring Program, which includes periodic monitoring of the spent fuel pool, the fuel transfer pit, and the cask pit liners leak chase system, is credited for detecting loss of material aging effects for the spent fuel pool, the fuel transfer pit, and the cask pit liners.

  The Leak Chase Monitoring Program monitors the spent fuel pool, the fuel transfer pit, and the cask pit liners for leakage using the floor and wall monitoring system. Each weld made on the stainless steel wall panels is backed by a channel, and a group of these channels is piped to a common zone drain. The floor welds are backed by a trench in the concrete and, like the wall channels, are grouped together to a common zone drain.

- Preventive Actions
  No actions are taken as part of the Leak Chase Monitoring Program to prevent aging effects or mitigate age-related degradation.

- Parameters Monitored or Inspected
  The spent fuel pool, the fuel transfer pit, and the cask pit liner leak detection drain valves are periodically opened, any leakage is collected, and the amounts are recorded. In addition, leak rates for zone valves are calculated by the volumetric method and recorded.

- Detection of Aging Effects
  The Leak Chase Monitoring Program includes activities to cycle open and close the spent fuel pool, the fuel transfer pit, and the cask pit liner drain valves on a monthly basis. Each valve on the drain line capable of being cycled is opened to allow any water that accumulated in the lines to drain into an open funnel. After a prescribed wait time, leakage is collected. The amount collected and the calculated leak rate are recorded for each of the 21 drain zones. If leakage collected from any zone drain valve is greater than 10 milliliters, then the sample is appropriately labeled and transported to a laboratory for boron analysis. Collected leakage information and boron analysis results are recorded in the work order system. Monitoring of leakage from the leak chase system permits early determination and localization of any leakage.

- Monitoring and Trending
  The Leak Chase Monitoring Program leak detection activities are performed monthly. This routine task requires recording of the leakage amount collected and the calculated leak rate. In addition, if leakage collected from any zone drain valve is greater than 10 milliliters, then the sample is analyzed for boron concentration and the results are also recorded. Leak chase channel results are reviewed by the spent fuel pool system engineer. Adverse conditions are documented in the Corrective Action Program and summarized in system health reports.

- Acceptance Criteria
  Adverse trends (continued increases of leak rates on a particular zone valve) are documented in the Corrective Action Program.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Leak Chase Monitoring Program operating experience has indicated minor leakage from the spent fuel pool, the fuel transfer pit, and the cask pit liners.

  The Spent Fuel Pool System health report (second quarter 2009) shows the system has a "Green" status, highest ranking available, for overall system performance. One of the leak chase drains consistently showed small amounts of leakage during the monthly test, as documented in the third quarter of 2008 health report. Two other leak chase drains showed occasional leakage during this test. The leaks were small and the fluid was captured by the leak collection system. The boron concentration appeared erratic in one sample during the third quarter of 2008. The Corrective Action Program was used to document the condition, but since the leak collection boron concentration is an information-only test, this condition was documented for trending purposes.

  Information Notice 2004-05, "Spent Fuel Pool Leakage to Onsite Groundwater," was evaluated in the Corrective Action Program as it relates to Davis-Besse. The investigation summary provided some historic operating experience on the Leak Chase Monitoring Program. Review of the results of the leak detection testing is performed by the spent fuel pool system engineer. Leakage outside the leak chase drains has been seen in several places over the years. The most extensive visible evidence of leakage was on the wall and ceiling of ECCS Pump Room No. 1 over the period from 2000 to 2001. This leakage was stopped and the area cleaned. Based on the evaluations associated with this past leak, there are no concerns regarding the strength or integrity of the concrete structure associated with these leaks. During the re-racking of the spent fuel pool during Cycle 13, underwater divers used a vacuum box on the weld seams in the spent fuel pool to determine if there were any detectable leaks; none could be located. At the time that there was visible evidence of leakage in ECCS Pump Room No. 1, little leakage was being seen in the leak chases. Additional action was taken by FENOC to open and verify open the 21 leak chase valves and piping in February 2001. It found six of the chases to be totally blocked. A significant amount of trapped fluid was found in several of the blocked leak chases. As a result of the valves found clogged, the normal position of the leak chase valves was changed from open to closed to reduce the likelihood of the boric acid solidifying and blocking the valves and piping. The leak collection isolation valves were cleaned and un-clogged.

The Corrective Action Program documented 140 milliliters of leakage collected during July 2008 for one zone valve. The leakage rate was calculated as 2.8 milliliters per minute, which was higher than the trend data average of 1.0 milliliters per minute over the previous twelve months. Based on a review of the trend data collected since 1999, occasional spikes in flow rate do occur. The Corrective Action Program item was designated for tracking and trending of a condition that occurs periodically in the plant.

Enhancements

None.

Conclusion

The Leak Chase Monitoring Program provides reasonable assurance that potentially detrimental aging effects will continue to be adequately managed such that evidence of leakage from the spent fuel pool, the fuel transfer pit, and the cask pit liners is promptly identified and the pool liner’s intended functions will be maintained consistent with the current licensing basis for the period of extended operation.

B.2.26 LUBRICATING OIL ANALYSIS PROGRAM

Program Description

The Lubricating Oil Analysis Program mitigates the effects of aging for plant components that are within the scope of license renewal and that are exposed to a lubricating oil environment. The program includes requirements to ensure the oil environment in the mechanical systems is maintained to the required quality (i.e., it maintains contaminants [water and particulates] within acceptable limits). The program requires management of the relevant conditions that could lead to the onset and propagation of loss of material due to crevice, galvanic, general, or pitting corrosion, or reduction in heat transfer due to fouling, through monitoring of the lubricating oil consistent with various manufacturers' recommendations and industry standards. The relevant parameters that are monitored, including particulate and water content, viscosity, and, under certain conditions, neutralization number and flash point, are indicative of conditions that could lead to age-related degradation of susceptible materials. The Lubricating Oil Analysis Program is a mitigation program.

The Lubricating Oil Analysis Program is supplemented by a one-time inspection of representative areas of lubricating oil systems under the One-Time Inspection to provide confirmation that loss of material and reduction in heat transfer due to fouling are effectively mitigated.

NUREG-1801 Consistency

The Lubricating Oil Analysis Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M39, "Lubricating Oil Analysis."

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The Lubricating Oil Analysis Program is an ongoing program that effectively incorporates the best practices of the industry. Expert recommendations and industry standards are used to establish quality requirements for lubricating oil. The program incorporates the results of operating experience from Davis-Besse and the industry to optimize testing parameters, sampling frequencies, acceptance criteria, and alarm levels, as required by the FENOC Condition Monitoring Program. The program has been, and continues to be, subject to periodic internal and external performance assessment to identify strengths and areas for improvement.

For example, a self-assessment of the Lubricating Oil Analysis Program was conducted in early 2004. The overall assessment determined that the program was effective in implementing its stated goals. The assessment identified several areas for improvement, including enhancing procedures, consolidation of lubricating oils, addition of oil reservoir breathers and vents in certain locations, addition of sampling ports, and additional training. The FENOC Corrective Action Program was used to address the areas identified for improvement in the assessment.

Review of Davis-Besse operating experience did not reveal a loss of component intended function for components exposed to lubricating oil that could be attributed to an inadequacy of the Lubricating Oil Analysis Program. Abnormal lubricating oil conditions are promptly identified, evaluated, and corrected.

Conclusion

The Lubricating Oil Analysis Program, in conjunction with the One-Time Inspection, has been demonstrated to be capable of managing loss of material and reduction in heat transfer in lubricating oil, for susceptible components, through monitoring of the relevant parameters. The Lubricating Oil Analysis Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.27 MASONRY WALL INSPECTION

Program Description

The Masonry Wall Inspection is implemented as part of the Structures Monitoring Program, conducted for the Maintenance Rule.

The Masonry Wall Inspection is an existing condition monitoring program consisting of inspection activities to detect aging and age-related degradation for masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. Masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program.

NUREG-1801 Consistency

The Masonry Wall Inspection is an existing Davis-Besse program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S5, "Masonry Wall Program."

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- **Scope**

  The Masonry Wall Inspection, included in the Structures Monitoring Program, will include and list the structures within the scope of license renewal that credit the Masonry Wall Inspection for aging management.

- **Monitoring and Trending**

  The Masonry Wall Inspection, included in the Structures Monitoring Program, will follow the documentation requirement of 10 CFR 54.37, including submittal of records of structural evaluations to records management.

- **Acceptance Criteria**

  The Masonry Wall Inspection, included in the Structures Monitoring Program, will specify that for each masonry wall, the extent of observed masonry cracking or degradation of steel edge supports or bracing is evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of masonry cracking or steel degradation is sufficient to invalidate the evaluation basis. An option is to develop a new evaluation basis that accounts for the degraded condition of the wall (i.e., acceptance by further evaluation).

Operating Experience

The Masonry Wall Inspection has been effective in managing age-related degradation. Periodic visual inspections conducted by the Masonry Wall Inspection have identified age-related findings. Specifically, inspections have found minor degradation including cracks in mortar joints, construction joint voids, abandoned bolts, and unfilled drilled holes which did not require further evaluation. Acceptable minor degradation has been noted on Maintenance Rule Evaluation reports and were reviewed and re-inspected during subsequent inspections. Inspected masonry walls are acceptable and are capable of performing their design functions with no design basis violations.

Review of completed Maintenance Rule Evaluation documentation indicated age-related degradation was identified and documented. Degradation requiring repair was addressed through the work order system. Examples of conditions found were:

- Auxiliary Building Rooms 117A and 301 have minor cracking less than 1/16 inch at masonry wall to concrete interface. Auxiliary Building Rooms 122 and 509 have minor cracking less than 1/16 inch at masonry wall to concrete interface above doorway opening. Auxiliary Building Room 318 has minor cracking less than 1/16 inch and chipping on masonry walls. Auxiliary Building Room 512 had two areas of spalling in the west wall that appeared to be caused by removal of anchor bolts. Conditions were judged acceptable.
- Auxiliary Building Rooms 115, 212, 234, 240, 310, 314CC, 318, 319, 320, 320A, 321A, 419, 422A, 428A, 502, 505, 507, 508, 510, 511, and 513 have various unfilled holes or abandoned anchors observed, all of which were determined to have no structural impact.
- Auxiliary Building Rooms 112, 304, and 504 have minor cracking and spalling on the masonry wall above doorway. The area has been repaired in the past. Inspections have not found conditions where degradation penetrated through the wall. The condition was judged acceptable and rework notice was issued.
- Auxiliary Building Rooms 312, 502, 503, 505, 508, 510, 511, 512, and 603 have minor cracking less than 1/16 inch at mortar joints. The condition was judged acceptable.
- Auxiliary Building Room 404 has a small void in block joint adjacent and north of door frame. Inspections have not found conditions where degradation penetrated through the wall. The condition was judged acceptable.

- Office Building condensate storage tank area Room 345 has various unfilled holes observed, all of which were determined to have no structural impact.
- The Relay House's basement south wall has a vertical crack at the location where a future doorway is intended. The future doorway is filled in with masonry block units and the crack is located at the interface between the concrete wall and the masonry block. The work order system was used to request correction of this issue.
- Turbine Building Room 247 has minor spalling on masonry wall corner. Turbine Building Rooms 334, 335, 336, 347, 431, 432, 517, 517A, and 517B have minor cracking observed. Turbine Building Rooms 328, 335, 336, 337, 339, 347, 431, 431A, 432, 517, 517A, and 517B have had various unfilled holes observed. The conditions were judged acceptable.
- Turbine Building Room 330 has both masonry wall vertical joints that butt up to the Turbine Building degraded which required rework. The work order system was used to address this issue.
- Water Treatment Building Room 11 has diagonal crack from top corner of door to lower corner of ventilation register. Water Treatment Building Room 12A has abandoned anchors in masonry wall observed. The conditions were judged acceptable.

The Corrective Action Program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Masonry Wall Inspection, with enhancement, will be capable of detecting and managing aging effects for masonry walls within the scope of license renewal. The continued implementation of the Masonry Wall Inspection, with enhancement, provides reasonable assurance that the effects of aging will be managed so that components within the scope of this inspection will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.28 NICKEL-ALLOY MANAGEMENT PROGRAM

Program Description

The Nickel-Alloy Management Program manages primary water stress corrosion cracking (PWSCC) and stress corrosion cracking / intergranular attack (SCC/IGA) for nickel-alloy pressure boundary components, other than reactor vessel closure head nozzles and steam generator tubes, exposed to reactor coolant. The Nickel-Alloy Management Program is a combination mitigative and condition monitoring program.

Mitigative actions include replacement of Alloy 600/82/182 components with materials known to be less susceptible to PWSCC and SCC/IGA or repair of those components through weld overlay, weld inlay (also known as weld underlay), mechanical stress improvement process or surface conditioning. The condition monitoring portion of the program uses a number of inspection techniques to detect cracking, including volumetric and bare metal visual examinations. The Nickel-Alloy Management Program implements the inspection of components through the Inservice Inspection Program. The program implements component evaluations, examination methods, scheduling, and site documentation as required for compliance with 10 CFR 50, the ASME Code, NRC bulletins, NRC generic letters, and NRC staff-accepted industry guidelines related to nickel-alloy issues. The Nickel-Alloy Management Program includes mitigation and repair activities and strategies to ensure long-term operability of nickel-alloy components.

NUREG-1801 Consistency

The Nickel Alloy Management Program is an existing plant-specific program for Davis-Besse. As NUREG-1801 Section XI.M11, “Nickel-Alloy Nozzles and Penetrations,” does not contain program elements, the Nickel-Alloy Management Program is evaluated against the 10 elements described in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR).

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The Nickel-Alloy Management Program is credited with managing cracking due to PWSCC and SCC/IGA for nickel-alloy pressure boundary components in the reactor vessel, pressurizer, steam generator, and reactor coolant (hot and cold leg) piping.

  The Nickel-Alloy Management Program scope does not include nickel-alloy steam generator tubes (included in the Steam Generator Tube Integrity Program) or nickel-alloy reactor vessel closure head nozzles (included in the Nickel-Alloy Reactor

Vessel Closure Head Nozzles Program). The Nickel-Alloy Management Program scope also does not include non-pressure boundary, nickel-alloy reactor vessel internals components (included in the PWR Reactor Vessel Internals Program).

The Nickel-Alloy Management Program is credited for aging management in conjunction with the PWR Water Chemistry Program and the Inservice Inspection Program.

- Preventive Actions
  The Nickel-Alloy Management Program includes mitigation activities and strategies to ensure the long-term operability of nickel-alloy components. Some of the currently available mitigation techniques include a mechanical stress improvement process or surface conditioning, weld overlay, weld inlay, and replacement of Alloy 600/82/182 materials with materials known to be less susceptible to PWSCC. The program lists the mitigation strategies that are available and provides considerations for selection and implementing a mitigation strategy.

- Parameters Monitored or Inspected
  The parameters inspected by the Nickel-Alloy Management Program include cracks (flaws) in nickel-alloy components that are exposed to reactor coolant. The program maintains a comprehensive list of the components in the plant that are constructed of nickel-alloy materials susceptible to cracking and subjected to the reactor coolant environment. The effects of PWSCC on these components are either mitigated by the program's strategies, based on susceptibility and other considerations, or the components are inspected on a frequency established by the program that is consistent with industry guidelines.

  Nickel-alloy components are inspected in accordance with the Inservice Inspection plan. The Nickel-Alloy Management Program uses a number of inspection techniques to detect cracking due to PWSCC or SCC/IGA. The techniques include volumetric and bare metal visual examinations. The schedule for the examinations is described in the program plan and in the Inservice Inspection plan.

- Detection of Aging Effects
  The Nickel-Alloy Management Program uses a number of inspection techniques to detect cracking due to PWSCC and SCC/IGA, including volumetric examinations and bare metal visual examinations. Bare metal visual examinations are similar to visual (VT-2) examinations but require removal of insulation to allow direct access to the metal surface. The nickel-alloy components have been ranked based on susceptibility (in accordance with EPRI Materials Reliability Program (MRP) guidelines).

Detection of cracking due to PWSCC or SCC/IGA ensures that nickel-alloy components meet required design attributes and maintain their availability to perform their intended functions.

The Nickel-Alloy Management Program is based on ASME Code requirements and on the recommendations of NEI and the EPRI MRP. Industry experience and research has resulted in recommended techniques and frequencies for inspection to detect cracking prior to component failure. Inspection population and sample size are in accordance with ASME Code requirements and MRP guidelines. Data collection (e.g., inspection reports) is incorporated in the program.

- Monitoring and Trending
  Monitoring and trending activities for detection and sizing of cracks in nickel-alloy pressure boundary components are part of the Nickel-Alloy Management Program. The program ranks the nickel-alloy components for inspection based on susceptibility to cracking in accordance with MRP guidelines.

  Davis-Besse uses the guidelines in ASME Section XI Table IWB-2500-1, Code Case N-722, and EPRI MRP-139 Revision 1, “Materials Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline,” for inspection (examination) techniques and frequencies. Flaws found during the inspections are immediately evaluated against criteria contained in ASME Section XI IWB-3000 to predict the extent of degradation and implement timely corrective or mitigative actions. Disposition by analysis is permitted by IWB-3000. Contingencies for repairs, replacement, or mitigative actions such as weld overlays are evaluated prior to each inspection outage. Monitoring of industry operating experience is performed to incorporate any required changes to the Nickel-Alloy Management Program as a result of industry experience.

- Acceptance Criteria
  The Nickel-Alloy Management Program tracks and trends cracking (flaws) in the nickel-alloy components within the scope of the program. The nickel alloy components within the scope of the program are evaluated against the acceptance criteria contained in ASME Section XI. Based on the evaluations, the flaw is accepted by either a repair or replacement activity or by analytical evaluation prior to start-up.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Recent Davis-Besse operating experience related to inspection of Alloy 600 components is documented in inservice inspection outage summary reports. Specific examples of findings are also documented in the Corrective Action Program. Periodic health reports and self-assessment reports are also issued for the Nickel-Alloy Management Program.

  The Corrective Action Program and an ongoing review of industry operating experience will be used to ensure that the program remains effective in managing the identified aging effects.

  The following examples of operating experience provide objective evidence that the Nickel-Alloy Management Program is effective in ensuring that intended functions will be maintained consistent with the current licensing basis for the period of extended operation:

  - In September of 2008, NRC inspectors conducted a review of Davis-Besse's activities regarding dissimilar metal butt weld mitigation and inspection implemented in accordance with the industry self-imposed mandatory requirements of MRP-139. The inspectors verified that the program included baseline inspections, that the baseline inspections of pressurizer locations had been completed, and that the schedule for other baseline inspections was consistent with MRP-139. The inspectors also reviewed the volumetric examinations of the high pressure injection safe end to nozzle weld and decay heat 12 inch branch connection to elbow overlay weld that were completed during the previous outage. The weld was performed in accordance with MRP-139 and the weld overlay was performed in accordance with the NRC staff-approved relief request. The welding was performed by qualified personnel and any deficiencies identified were appropriately dispositioned and resolved. As of the September 2008 date of NRC integrated inspection 50/3462008-004, seven penetrations had been mitigated by structural weld overlay and had received volumetric examinations, with further mitigation or replacement planned for the remaining susceptible welds.

- Periodic self-assessments are performed as part of the program. The most recent self-assessment, performed in September of 2008 in preparation for the NRC integrated inspection, evaluated the degree of compliance with the requirements of EPRI MRP-139 and assessed the program with respect to inspection requirements for dissimilar metal butt welds. The self-assessment noted the quality and depth of site-specific information presented to the industry as a strength of the program. The self-assessment concluded that program has adequately implemented the requirements of MRP-139 to date, and that the existing schedule for inspection or mitigation of the remaining locations would ensure compliance with the MRP-139 implementation date. Some minor discrepancies and improvements were noted during the self-assessment that have been addressed through the Corrective Action Program.

- In January of 2008, a leak in an existing weld was noted in the decay heat (and low pressure injection) nozzle during performance of the mitigative structural weld overlay repair. The structural weld overlay was completed. The extent of condition review assessed other susceptible Alloy 600 material locations associated with the pressurizer and hot leg to ensure adequate inspection or mitigation was performed.

  An ultrasonic examination of the hot leg to decay heat nozzle structural weld overlay was successfully completed, with the weld overlay establishing a surface that facilitates adequate ultrasonic examination. The Inservice Inspection program will periodically perform additional ultrasonic examinations to ensure that the flaw remains contained within the dissimilar metal butt weld. An operating experience report was developed.

Based on review of plant-specific and industry operating experience, cracking due to PWSCC or SCC/IGA of nickel-alloy components exposed to reactor coolant will be adequately managed so that intended function of the nickel-alloy (and nickel-alloy clad) components will be maintained for the period of extended operation.

Enhancements

None.

Conclusion

The Nickel-Alloy Management Program, in conjunction with the PWR Water Chemistry Program and Inservice Inspection Program, provides reasonable assurance that cracking due to PWSCC and SCC/IGA will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.29 NICKEL-ALLOY REACTOR VESSEL CLOSURE HEAD NOZZLES PROGRAM

Program Description

The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program manages cracking of the nickel-alloy control rod drive nozzles and welds in the reactor vessel closure head. The Boric Acid Corrosion Program is credited for managing wastage of associated reactor vessel closure head surfaces. The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program is a condition monitoring program.

The program ensures that inservice inspections of all nickel-alloy reactor vessel closure head penetration nozzles, and associated reactor vessel closure head surfaces, will continue to be performed in accordance with ASME Code Case N-729-1, as modified by 10 CFR 50.55a Section (g)(6)(ii)(D).

NUREG-1801 Consistency

The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M11A, “Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (PWRs only).”

NUREG-1801 program XI.M11A is based on NRC First Revised Order EA-03-009. However, since the publication of NUREG-1801, Order EA-03-009 has been withdrawn and replaced by ASME Code Case N-729-1. 10 CFR 50.55a requires that all licensees of pressurized water reactors shall augment their Inservice Inspection program with ASME Code Case N-729-1 subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(D). The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program complies with 10 CFR 50.55a(g)(6)(ii)(D).

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program detects aging effects using nondestructive examination visual and surface or volumetric techniques to detect and characterize flaws and reactor vessel closure head surface wastage. These techniques are widely used and have been demonstrated effective at detecting degradation due to PWSCC.

In March 2002, significant degradation of the original Davis-Besse reactor vessel closure head was discovered. Performance deficiencies in the implementation of the boric acid corrosion control program and Corrective Action Program allowed the reactor coolant system pressure boundary leakage to occur undetected for a prolonged period of time resulting in the head degradation. Program compliance reviews were performed to ensure proper interface with supporting plant programs, proper consideration of industry experience, proper staffing, and timely resolution of identified weaknesses. Detailed reviews were performed to ensure the programs were conducted in accordance with the governing processes. The original reactor vessel closure head was replaced in 2002.

In March 2010, ultrasonic examinations of the control rod drive mechanism nozzles identified flaws on multiple nozzles. Active leakage was identified on one nozzle. The direct cause was Primary Water Stress Corrosion Cracking. The reactor vessel closure head had been in operation approximately six years. An inside diameter temper bead half-nozzle weld repair was utilized. Post-repair inspections were completed with acceptable results. As provided in Confirmatory Action Letter, Number 3-10-001, Mark A. Satorius (NRC) to Barry S. Allen (FENOC), dated 6-23-2010, FENOC has voluntarily committed to shutdown the Davis-Besse plant no later than October 1, 2011, and replace the reactor pressure vessel head with one manufactured using materials resistant to PWSCC.

The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program has been developed based on relevant plant and industry operating experience. The Corrective Action Program and an ongoing review of industry operating experience ensure that the program is effective in managing the identified aging effects.

Conclusion

The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program manages cracking of the nickel alloy control rod drive nozzles and welds in the reactor vessel closure head and loss of material of the associated reactor vessel closure head surfaces. The Nickel-Alloy Reactor Vessel Closure Head Nozzles Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.30 ONE-TIME INSPECTION

Program Description

One-Time Inspection is a new activity that will be implemented prior to the period of extended operation.

The activity will require one-time inspections to verify the effectiveness of the Closed Cooling Water Chemistry Program, the Fuel Oil Chemistry Program, the Lubricating Oil Analysis Program, and the PWR Water Chemistry Program. One-time inspections are used to address situations where: 1) an aging effect is not expected to occur, but there is insufficient data to completely rule it out, 2) an aging effect is expected to progress very slowly in the specified environment, and the local environment may be more adverse, or 3) the characteristics of the aging effect include a long incubation period.

One-Time Inspection will provide assurance that aging which has not yet manifested itself is indeed not occurring, or that the age-related degradation is so insignificant that an aging management program is not warranted. If evidence of age-related degradation is revealed by a one-time inspection, the routine evaluation of the inspection results will trigger corrective actions to ensure the intended function of the affected components is maintained through the period of extended operation.

The elements of the one-time inspections will include:

- Determination of a representative sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience;
- Identification of the inspection locations in the system or component based on the aging effect, or based on the areas susceptible to concentration of contaminants that promote certain aging effects;
- Determination of the examination technique, including acceptance criteria that would be effective in identifying the aging effects for which the component is examined; and
- Evaluation of the need for follow-up examinations to monitor the progression of identified age-related degradation.

NUREG-1801 Consistency

One-Time Inspection is a new Davis-Besse activity that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801 Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements, which are plant-specific and in addition to the NUREG-1801, Section XI.M32 elements, will be implemented in the identified program elements prior to the period of extended operation.

- **Scope**

  One-Time Inspection will include visual inspections to detect and characterize the material condition of aluminum, copper alloy (including copper alloy > 15% zinc), stainless steel, and steel (including gray cast iron) components exposed to condensation or diesel exhaust. The one-time inspections will provide direct evidence as to whether, and to what extent, cracking, loss of material, or reduction in heat transfer has occurred. Materials in these environments are either plant-specific and not addressed by another aging management program, or a plant-specific program is identified in NUREG-1801.

- **Scope, Parameters Monitored/Inspected, Detection of Aging Effects**

  One-Time Inspection will include visual and physical examination, such as manipulation and prodding, of elastomers (flexible connections). This visual and physical examination will supplement the External Surfaces Monitoring Program and provide direct evidence as to whether, and to what extent, hardening and loss of strength due to thermal exposure, ultraviolet exposure, and ionizing radiation of elastomers has occurred. This enhancement is in response to recent NRC concerns (raised during license renewal audits) that visual examination may not be adequate to identify hardening and loss of strength for elastomers prior to a loss of function.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  One-Time Inspection will require one-time inspections to verify the effectiveness of mitigation aging management programs; to confirm that age-related degradation is not occurring, is insignificant, or is occurring slowly such that component intended function will be maintained through the period of extended operation.

  One-time inspections are required to verify the effectiveness of the Closed Cooling Water Chemistry Program, Fuel Oil Chemistry Program, Lubricating Oil Analysis

Program, and the PWR Water Chemistry Program for managing loss of material, cracking, or reduction in heat transfer in the closed cooling water, treated water, fuel oil, and lubricating oil environments.

The one-time inspections will also provide assurance that:

- Aging effects are not occurring for susceptible materials in environments where degradation is not expected but cannot be ruled out based on available data.
- Aging effects are not occurring, or are progressing very slowly in a specified environment, as well as where the local environment may be more adverse than the bulk environment, or the characteristics of the aging effect include a long incubation period.

The activity will include visual and physical (manipulation or prodding) examination of elastomers (flexible connections) in various environments for evidence of hardening or loss of strength due to thermal exposure, ultraviolet exposure, or ionizing radiation.

In addition, one-time inspections will characterize the material condition of susceptible materials exposed to the “Condensation” and “Diesel Exhaust” environments, which are not addressed by other aging management programs, to verify that unacceptable degradation is not occurring or to trigger additional actions that will assure the intended function of affected components will be maintained through the period of extended operation.

Furthermore, the one-time inspections will include UT exams of the internal bottom surfaces of a sample of fuel oil tanks to ensure that significant degradation is not occurring.

- Preventive Actions
  One-Time Inspection is a condition monitoring activity that will consist of inspections independent of methods to mitigate or prevent degradation. The activity does not include any preventive actions.

- Parameters Monitored or Inspected
  One-Time Inspection will require inspections to be performed by qualified personnel following procedures consistent with the requirements of the ASME Code and 10 CFR 50, Appendix B. Inspections will be performed using a variety of nondestructive examination methods, including visual, volumetric, and surface inspection techniques.

  The activity will inspect parameters directly related to degradation of the metallic components under review such as wall thickness, visual evidence of corrosion, or evidence of fouling. The parameters to be inspected for elastomers include visual evidence of surface degradation, such as cracking or discoloration, as well as hardening and loss of strength identified through manipulation or prodding.

- Detection of Aging Effects
  A representative sample of the system and component population will be inspected using a variety of nondestructive examination methods, including visual inspection, volumetric inspection, and surface inspection techniques. The sample population will be determined by engineering evaluation, and where practical, will be focused on the (bounding or lead) components considered most susceptible to aging degradation due to time in service, the severity of the operating conditions, and the lowest design margin.

  The inspections will be completed with sufficient time to ensure that the aging effects which may impact component intended functions early in the period of extended operation will be appropriately managed. At the same time, the inspections will be timed to allow the components to attain sufficient age to ensure that aging effects with long incubation periods can be identified.

  For elastomers (flexible connections), established visual examination techniques, as well as physical manipulation or prodding, will be performed by qualified personnel on a sample population of subject components to identify evidence of hardening and loss of strength (change in material properties). The sample population will be determined by engineering evaluation and, where practical, focused on the (bounding or lead) components considered most susceptible to aging degradation due to time in service, the severity of the operating conditions, and the lowest design margin.

- Monitoring and Trending
  The inspection sample size will be determined based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience. Inspection findings will be evaluated by assigned engineering personnel. Inspection findings not meeting the acceptance criteria will be evaluated and tracked through the Corrective Action Program. The Corrective Action Program will be used to identify the corrective actions including additional inspections or expansion of the inspection sample size.

- Acceptance Criteria
  Indications or relevant conditions of degradation detected during the one-time inspections will be compared to pre-determined acceptance criteria, such as design minimum wall thickness for piping. Inspection findings will be evaluated by assigned engineering personnel. If the acceptance criteria are not met, then the indications or conditions will be evaluated under the Corrective Action Program to determine

whether they could result in a loss of component intended function during the period of extended operation.

Determination of acceptance criteria will include evaluation of design standards and industry codes or standards, as applicable. Unacceptable inspection findings will include evidence of cracking, loss of material, loss of material flexibility, hardening or loss of strength, or reduction in heat transfer (fouling) that could lead to loss of intended function during the period of extended operation.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Operating experience for select components and environments within the scope of One-Time Inspection was evaluated to ensure use of a one-time inspection was appropriate.

  For example, in 2003, because of chronic rust and particulate accumulation in the diesel air start compressor and filter components, a modification was implemented for the EDG air start system. The modification replaced carbon steel piping and components with stainless steel and added air filters, air dryers, and moisture separators, etc to mitigate rust particulates and moisture effects in the EDG air start subsystem. A similar modification was implemented for the station blackout diesel generator (SBODG) air start system. Review of Davis-Besse operating experience subsequent to these modifications did not identify any aging effects that were attributed to excessive moisture in the compressed air downstream of EDG dryers or SBODG dryer-filters.

  Some corrosion caused by moisture accumulation in Station Air components with a moisture removal function (e.g., aftercooler separator drain trap) has been documented. Corrective action included removing the moisture and rust, and confirming proper trap (automatic drain) operation, but did not result in component replacement or establishment of actions to prevent recurrence.

In 2004, industry operating experience regarding corrosion of refrigeration lines due to condensation forming on cold carbon steel piping surfaces was evaluated for applicability at Davis-Besse. Units were evaluated, including some that are in the scope of One-Time Inspection, and it was determined that copper piping and tubing was not subject to the identified corrosion. Expected surface rust was also identified on many components in Davis-Besse refrigeration systems through walkdown. It was concluded that the concern raised by the OE is not an issue for Davis-Besse.

The elements that comprise the one-time inspections are consistent with industry practice.

Industry and plant-specific operating experience will be considered in the development and implementation of this activity. As additional operating experience is obtained, lessons learned will be incorporated, as appropriate.

Conclusion

Implementation of One-Time Inspection will provide reasonable assurance that the aging effects will be managed so that components within the scope of this inspection will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.31 OPEN-CYCLE COOLING WATER PROGRAM

Program Description

The Open-Cycle Cooling Water Program manages loss of material due to crevice, galvanic, general, pitting, and microbiologically-influenced corrosion (MIC), and also due to erosion for components located in the Service Water System, and for components connected to or cooled by the Service Water System, and also in the Circulating Water System. The program manages fouling due to particulates (e.g., corrosion products) and biological material (micro- and macro-organisms) resulting in reduction in heat transfer for heat exchangers within the scope of the program. In addition, the program manages cracking for copper alloy greater than 15% zinc components that are cooled by the Service Water System.

The Open-Cycle Cooling Water Program consists of inspections, surveillances, and testing to detect and evaluate fouling, loss of material, and cracking, combined with chemical treatments and cleaning activities to minimize fouling, loss of material, and cracking. The existing program is a combination condition and performance monitoring and mitigation program that implements the recommendations of Generic Letter 89-13, “Service Water System Problems Affecting Safety-Related Equipment.”

NUREG-1801 Consistency

The Open-Cycle Cooling Water Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801 Section XI.M20, “Open-Cycle Cooling Water System,” with the following exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Monitoring and Trending**

  NUREG-1801 states that testing and inspections are done annually and during refueling outages. Inspection frequencies for the Open-Cycle Cooling Water Program are based on operating conditions and past history; flow rates, water quality, lay-up, and heat exchanger design, in accordance with Generic Letter 89-13. In the supplemental response to Generic Letter 89-13, Davis-Besse committed to annual heat exchanger inspections for the first three cycles following implementation of Generic Letter 89-13, with the option of then determining the best testing frequency based on past history.

Enhancements

None.

Operating Experience

The Open-Cycle Cooling Water Program for Davis-Besse is an ongoing program that has implemented the recommended actions of Generic Letter 89-13 and has justified any alternatives to those recommendations. The health of the program and corresponding systems are periodically reported, including chemistry trends and material conditions. Industry operating experience is evaluated for impact to Davis-Besse, and periodic self assessments are conducted. As a result, Davis-Besse has programs in place with operating experience to demonstrate that the effects of aging on the Service Water System, and on the safety-related heat exchangers that are served, will be effectively managed during the period of extended operation.

Annual ultimate heat sink performance, as well as related Generic Letter 89-13 systems, components, and controls, is a subject of NRC integrated inspection. In recent years, reviews were performed by NRC inspectors to verify the acceptability of test methods and conditions, acceptance criteria, use of instrument uncertainties, frequency of testing, biofouling controls, compliance with design parameters, and the extrapolation of test data to design conditions. No findings of significance with respect to the effectiveness of the existing program were identified during these integrated inspections. The Open-Cycle Cooling Water Program satisfies Generic Letter 89-13 commitments for managing aging effects due to biofouling, corrosion, protective coating failures, and silting within the various system components.

The program has identified cases (in 2008 and 2007) where ultrasonic thickness measurements of service water piping identified segments that were below procedural limits. The piping segments were evaluated and the reduced wall thicknesses were determined to exceed the minimum operable values and code stress allowable values. In addition, the program has been effective in identifying biofouling through the regular measurements of flow rate and differential pressure – in 2009, an emergency core cooling system room cooler was identified as possibly having marginal biofouling due to an increased differential pressure. The problem ultimately was found to be corrosion in nearby supply and return piping. The coolers are regularly checked for biofouling. In 2008, a thick layer of silt was identified in the service water piping between two system valves related to an auxiliary feedwater train which was undergoing maintenance activities. The affected piping was cleaned with a hydrolazer and drained. Additional cleaning was performed when silt accumulation was found remaining in the piping. The cause was determined to be low flow and stagnant water in the auxiliary feedwater supply piping (the silt decanted from the service water flowing past the auxiliary feedwater piping).

Conclusion

The Open-Cycle Cooling Water Program has been demonstrated to be capable of detecting and managing loss of material, cracking, and reduction in heat transfer for susceptible components in raw water environments. The Open-Cycle Cooling Water Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.32 PWR REACTOR VESSEL INTERNALS PROGRAM

Program Description

The PWR Reactor Vessel Internals Program is a new plant-specific program that will manage change in dimension due to void swelling; cracking due to flaw initiation and growth, SCC/IGA, and irradiation-assisted stress corrosion cracking (IASCC); loss of preload due to stress relaxation; reduction in fracture toughness due to radiation and thermal embrittlement; and loss of material due to wear, for reactor vessel internals components. The PWR Reactor Vessel Internals Program is a condition monitoring program.

The PWR Reactor Vessel Internals Program is based upon the examination requirements for Babcock & Wilcox (B&W) designed pressurized water reactors (PWRs) provided in EPRI Topical Report 1016596, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-Rev. 0)," along with the implementation guidance described in NEI 03-08, “Guideline for the Management of Materials Issues.” MRP-227 has been submitted to the NRC for review and approval. Following NRC approval, MRP-227 will be revised to incorporate any necessary changes to the guidelines and reissued as MRP-227-A. The Davis-Besse PWR Reactor Vessel Internals Program will be revised, as necessary, to incorporate the final recommendations and requirements as published in MRP-227-A.

The EPRI inspection and evaluation guidelines establish the augmented ASME Section XI inservice inspection requirements that will be used to monitor for the aging effects that are applicable to certain susceptible or limiting reactor vessel internals components for B&W designed PWRs.

NUREG-1801 Consistency

The PWR Reactor Vessel Internals Program is a new plant-specific program for Davis-Besse. There is no corresponding aging management program described in NUREG-1801. The program is evaluated against the 10 elements described in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR).

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The PWR Reactor Vessel Internals Program is credited with managing change in dimension due to void swelling; cracking due to flaw initiation and growth, SCC/IGA, and IASCC; loss of preload due to stress relaxation; reduction in fracture toughness

due to radiation and thermal embrittlement; and loss of material due to wear, for reactor vessel internals components. The program scope does not include consumable items such as fuel assemblies, control rod assemblies, and incore instrumentation. The scope also does not include welded attachments to the reactor vessel.

The Davis-Besse reactor vessel internals consist of two basic assemblies, the plenum assembly that is removed during each refueling operation to obtain access to the fuel assemblies, and the core support assembly (CSA) that remains in place in the reactor vessel during refueling, and is removed only to perform scheduled inspections of the reactor vessel interior surfaces or of the core support assembly itself.

- Preventive Actions
  The PWR Reactor Vessel Internals Program is a condition monitoring program and does not include any preventive or mitigative actions.

- Parameters Monitored or Inspected
  The PWR Reactor Vessel Internals Program is credited with managing change in dimension due to void swelling; cracking due to flaw initiation and growth, SCC/IGA, and IASCC; loss of preload due to stress relaxation; reduction in fracture toughness due to radiation and thermal embrittlement; and loss of material due to wear, for the reactor vessel internals components.

  The program contains elements that monitor and inspect for the parameters that govern the progress of each of these aging effects. Section 4 of MRP-227 describes the methodologies that provide the monitoring and inspection of these aging effects. For B&W designed plants, the aging management methodologies include visual examinations, volumetric examinations, and physical measurements. The visual (VT-3) examinations detect the general degradation conditions and the volumetric examinations (ultrasonic testing) indicate the presence of discontinuities or flaws throughout the volume of material in the area of interest. Some aging effects may involve changes in clearances, settings, and physical displacements that can be monitored by visual means, supplemented by physical measurements.

  In addition, as part of the Inservice Inspection Program, a visual (VT-3) examination of the reactor vessel removable core support structure is conducted once per Inservice Inspection interval in accordance with ASME Section XI, Table IWB-2500-1, Examination Category B-N-3.

- Detection of Aging Effects
  MRP-227 describes the examination requirements for the PWR vessel internals Primary and Expansion components for B&W designed plants. Primary components

are highly susceptible to the effects of at least one of the subject aging mechanisms. Expansion components are highly or moderately susceptible to the effects of at least one of the subject aging mechanisms, but for which functionality assessment has shown a degree of tolerance to those effects. The schedule for implementation of aging management requirements for Expansion components will depend on the findings from the examinations of the Primary components at Davis-Besse. The aging management methodologies described in MRP-227 are based on well-documented and well-demonstrated examination methods with which the industry has considerable experience. The aging management methodologies for the B&W designed plants include visual examinations, volumetric examinations, and physical measurements.

The examination requirements defined in MRP-227, as approved by the NRC, will be applied through use of EPRI Topical Report 1016609, "Materials Reliability Program: Inspection Standard for PWR Internals (MRP-228)."

- Monitoring and Trending
  One-time, periodic, and conditional examinations and other aging management methodologies, scheduled in accordance with MRP-227 provide timely detection of aging effects. In addition to the Primary components, Expansion components have been defined should the scope of examination and re-examination need to be expanded beyond the Primary group due to detection of significant aging effects. Flaw indications detected during the required examinations are dispositioned in accordance with the Corrective Action Program.

- Acceptance Criteria
  Section 5 of MRP-227 provides the examination acceptance criteria for the Primary and Expansion components. Any detected condition that does not satisfy these examination acceptance criteria must be dispositioned. Example methodologies that can be used to analytically disposition unacceptable conditions are discussed or referenced in Section 6 of MRP-227. However, other demonstrated and verified alternatives to the Section 6 methodologies may be used.

  The acceptance criteria, against which the need for corrective actions are evaluated, ensure that the component intended functions are maintained under all current licensing basis design conditions during the period of extended operation.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Relatively few incidents of PWR internals aging degradation have been reported in operating U.S. commercial PWR plants. However, a considerable amount of PWR internals aging degradation has been observed in European PWRs, with emphasis on cracking of baffle-former bolting. For this reason, the U.S. PWR owners and operators began a program a decade ago to inspect the baffle-former bolting in order to determine whether similar problems might be expected in U.S. plants. A benefit of this decision was the experience gained with the ultrasonic testing examination techniques used in the inspections. In addition, the industry began substantial laboratory testing projects in order to gather the materials data necessary to support future inspections and evaluations. Another item with existing or suspected material degradation concerns that has been identified for PWR components is cracking in some high-strength bolting. This condition has been corrected primarily through bolt replacement with less susceptible material and improved control of pre-load.

  Stress corrosion cracking has occurred in Alloy A-286 internals bolting in B&W units, including Davis-Besse. The Alloy A-286 bolt failures in B&W PWR internals were subjected to a comprehensive failure analysis that is documented in BAW-1843PA, "The B&W Owners Group Evaluation of Internal Bolting Concerns in 177FA Plants." BAW-1843PA was reviewed and approved by the NRC. This failure analysis addressed probable cause of the cracking, assessment of likelihood and consequences of joint failure, and replacement bolt design. The recommended replacement bolts are Alloy X-750 HTH bolts that are less susceptible to stress corrosion cracking and have overall excellent material properties.

  Davis-Besse has replaced the majority of the Alloy A-286 bolts for the reactor vessel internals (upper core barrel, lower core barrel, lower thermal shield, and surveillance specimen holder tubes) with Alloy X-750 HTH bolts. To satisfy a needed action under NEI 03-08 protocol, Davis-Besse performed ultrasonic testing examinations of 100% of all upper core barrel bolts during the Cycle 16 refueling outage (spring 2010). This inspection did not identify any unacceptable indications.

As part of the Inservice Inspection Program, a visual (VT-3) examination of the reactor vessel removable core support structure is conducted once per Inservice Inspection interval in accordance with ASME Section XI, Table IWB-2500-1, Examination Category B-N-3. These inspections have not identified any unacceptable indications.

FENOC participates in the industry programs for investigating and managing aging effects on reactor vessel internals. Through its participation in EPRI MRP activities, FENOC will continue to benefit from the reporting of reactor vessel internals inspection information, and will share its own internals inspection results with the industry, as appropriate.

Enhancements

None.

Conclusion

The PWR Reactor Vessel Internals Program provides reasonable assurance that change in dimension due to void swelling; cracking due to flaw initiation and growth, SCC/IGA, and IASCC; loss of preload due to stress relaxation; reduction in fracture toughness due to radiation and thermal embrittlement; and loss of material due to wear, of subject reactor vessel internals components will be adequately managed so that intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis for the period of extended operation.

B.2.33 PWR WATER CHEMISTRY PROGRAM

Program Description

The PWR Water Chemistry Program mitigates damage due to loss of material, cracking, and reduction in heat transfer of plant components that are within the scope of license renewal and contain or are exposed to treated water or steam in the primary, secondary, or auxiliary systems. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material, cracking, or reduction in heat transfer through proper monitoring and control consistent with EPRI TR-1014986 Revision 6, “Pressurized Water Reactor Primary Water Chemistry Guidelines" and EPRI TR-102134 Revision 5, “Pressurized Water Reactor Secondary Water Chemistry Guidelines.” The relevant conditions are known detrimental contaminants such as sulfates, halogens (chlorides and fluorides), dissolved oxygen, and conductivity that could lead to, or are indicative of, conditions for corrosion, stress corrosion cracking of susceptible materials, and reduction in heat transfer, as well as erosion. The PWR Water Chemistry Program is a mitigation program.

In addition, the PWR Water Chemistry Program is credited in conjunction with the Nickel-Alloy Management Program, Inservice Inspection Program, Nickel-Alloy Reactor Vessel Closure Head Nozzles Program, PWR Reactor Vessel Internals Program, Steam Generator Tube Integrity Program, and Small Bore Class 1 Piping Inspection to manage the effects of aging for reactor pressure vessel, reactor vessel internals, reactor coolant pressure boundary, and steam generator components.

The PWR Water Chemistry Program is also supplemented by a One-Time Inspection to provide verification of the effectiveness of the program in managing the effects of aging.

NUREG-1801 Consistency

The PWR Water Chemistry Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M2, “Water Chemistry.”

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The PWR Water Chemistry Program is an ongoing program that effectively incorporates the best practices of industry guidance and operating experience in defining chemistry control requirements, monitoring of plant performance with implementation, and continual review of their adequacy. The program incorporates EPRI guidelines as well as "lessons learned" from site and other utility operating experience. The program has been, and continues to be, subject to periodic assessment of performance to identify strengths, potential adverse trends, and areas for improvement. In addition, quarterly program health reports are generated that address chemistry performance indicators.

Review of site-specific operating experience has revealed that PWSCC has occurred. Repair or mitigative actions included structural weld overlay of Alloy 600/82/182 welds with materials known to be less susceptible to PWSCC. Otherwise, site-specific operating experience has revealed no loss of component intended function for components exposed to treated water or steam that could be attributed to an inadequacy of the PWR Water Chemistry Program. Abnormal chemistry conditions are promptly identified, evaluated, and corrected before a loss of function could occur. For example, reactor coolant lithium unexpectedly increased above the upper control band limit in December 2008, and the delithiating demineralizer was placed in service to restore the lithium to within control band limits. Also, the spent fuel pool chemistry trends indicated that sulfates were out of specification. This condition was evaluated through the Corrective Action Program and the spent fuel pool demineralizer was sluiced and charged with fresh resin to remedy the problem.

Furthermore, the program is periodically updated to the latest guidelines. The known chemistry-related problems experienced by other utilities are a consideration in the ongoing refinement of the PWR Water Chemistry Program for Davis-Besse.

The latest self-assessments noted that the Corrective Action Program is used extensively in the Chemistry Department, and that data review and reporting requirements are in compliance with procedures. A recent (2008) self-assessment found that the pressurizer dissolved oxygen parameter prior to 250ºF was in disagreement with the EPRI guideline. This noteworthy item was addressed through the Corrective Action Program. The pertinent procedure has since been revised to reflect the most recent EPRI guideline, which remedied the discrepancy. The assessment also identified an area for improvement in the frequencies of monitoring diagnostic parameters for the various makeup sources for reactor coolant. This area for improvement was also addressed through the Corrective Action Program and tasks added to the chemistry routines to ensure diagnostic sampling is performed at the specified frequencies.

Conclusion

The PWR Water Chemistry Program has been demonstrated to be capable of managing loss of material, cracking, and reduction in heat transfer for susceptible components through monitoring and control of the relevant parameters in treated water (and steam). The PWR Water Chemistry Program is supplemented by the One-Time Inspection to verify effectiveness of the program in managing aging. The PWR Water Chemistry Program is also credited in conjunction with the Nickel-Alloy Management Program, Inservice Inspection Program, Nickel-Alloy Reactor Vessel Closure Head Nozzles Program, PWR Reactor Vessel Internals Program, Steam Generator Tube Integrity Program, and Small Bore Class 1 Piping Inspection. As supplemented, the PWR Water Chemistry Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.34 REACTOR HEAD CLOSURE STUDS PROGRAM

Program Description

The Reactor Head Closure Studs Program manages cracking and loss of material for the reactor head closure stud assemblies (studs, nuts, and washers). The Reactor Head Closure Studs Program is a combination mitigative and condition monitoring program.

The Reactor Head Closure Studs Program includes the preventive measures of NRC Regulatory Guide 1.65, "Materials and Inspection for Reactor Vessel Closure Studs," to mitigate cracking, including the use of a stable lubricant. An approved lubricant, GN Metal Assembly Spray or equivalent, is applied to the threaded areas of studs and nuts and to the concave and convex faces of the spherical washers during each assembly. There are no metal platings applied to the closure studs, nuts, or washers. A manganese-phosphate coating was applied to the studs, nuts and washers during fabrication to act as a rust inhibitor and to assist in retaining lubricant.

The Reactor Head Closure Studs Program examines reactor vessel stud assemblies in accordance with the examination and inspection requirements specified in the ASME Code, Section XI, Subsection IWB (1995 Edition through the 1996 Addenda) and approved ASME Code Cases. Visual examinations (VT-2) for leak detection are performed during system pressure tests.

The Reactor Head Closure Studs Program inspections are implemented by the Inservice Inspection Program. The Inservice Inspection Program will continue to comply with the requirements of the ASME Code Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the inspection interval, subject to prior approval of the edition and addenda by the NRC.

NUREG-1801 Consistency

The Reactor Head Closure Studs Program is an existing Davis-Besse program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M3, "Reactor Head Closure Studs."

The Code year (e.g., 2001 edition including the 2002 and 2003 Addenda), as endorsed by the NRC in 10 CFR 50.55a, is specifically included in the NUREG-1801 XI.M1 aging management program. Consistent with provisions in 10 CFR 50.55a to use the ASME Code in effect twelve months prior to the start of the inspection interval, the applicable ASME Code for the current (third) ten year inspection interval for Davis-Besse is ASME Section XI, 1995 Edition, through the 1996 Addenda, as modified by 10 CFR 50.55a or relief granted in accordance with 10 CFR 50.55a.

Exceptions to NUREG-1801

None.

Enhancements

The following enhancement will be implemented in the identified program elements prior to the period of extended operation.

- **Scope, Preventive Actions**

  The Reactor Head Closure Studs program will be enhanced to select an alternate stable lubricant that is compatible with the fastener material and the environment. A specific precaution against the use of compounds containing sulfur (sulfide), including molybdenum disulfide (MoS_2), as a lubricant for the reactor head closure stud assemblies will be included in the program.

Operating Experience

The Reactor Head Closure Studs Program detects aging effects using nondestructive examination visual, surface, and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements.

Review of Davis-Besse operating experience has not revealed any reactor head closure stud cracking or loss of material.

Nondestructive examinations of reactor head closure studs have been performed during two periods for the most recent (Third) Ten-Year Inspection Interval. These include visual examinations (VT-1) of 36 nuts, 36 washers, and two bushings; ultrasonic examination of 36 studs; and ultrasonic examination of 30 sets of threads in the vessel flange. In addition, visual examination (VT-3) of all 60 studs was performed. No unacceptable indications were noted in these examinations.

The Reactor Head Closure Studs Program has been developed based on relevant plant and industry operating experience. The Corrective Action Program and an ongoing review of industry operating experience will be used to ensure that the new program is effective in managing the identified aging effects.

Conclusion

The Reactor Head Closure Studs Program manages cracking and loss of material for the reactor head closure stud assemblies. The Reactor Head Closure Studs Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.35 REACTOR VESSEL SURVEILLANCE PROGRAM

Program Description

The Reactor Vessel Surveillance Program manages reduction of fracture toughness for the low-alloy steel reactor vessel shell and welds in the beltline region. Davis-Besse participates in the Pressurized Water Reactor Owners Group (PWROG) Master Integrated Reactor Vessel Surveillance Program (MIRVSP) which includes all seven operating B&W 177-fuel assembly plants and six participating Westinghouse-designed plants having B&W fabricated reactor vessels. The MIRVSP is described in topical report BAW-1543 (NP), “Master Integrated Reactor Vessel Surveillance Program,” Revision 4, including supplements, and is an NRC-approved program that implements the requirements of Appendix H to 10 CFR Part 50. The Reactor Vessel Surveillance Program is a condition monitoring program.

Data resulting from the Reactor Vessel Surveillance Program is used to:

- determine pressure-temperature limits, minimum temperature requirements, and end of life upper shelf energy in accordance with the requirements of 10 CFR 50 Appendix G, “Fracture Toughness Requirements,” and
- determine end of life reference temperature for pressurized thermal shock values in accordance with 10 CFR 50.61, “Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock.”

Six surveillance capsules containing Davis-Besse specific materials were inserted into the reactor before initial plant startup. These capsules were designated as TE1-A through TE1-F. The requirements of 10 CFR 50 Appendix H were met by the first four capsules being withdrawn and tested. The remaining two capsules, TE1-C and TE1-E, have been removed and the materials have not been tested. Capsule TE1-C contains the Davis-Besse limiting material and has been exposed to fluence slightly above the 60-year projected fluence for the Davis-Besse plant. The Reactor Vessel Surveillance Program will be enhanced to require testing of capsule TE1-C. Capsule TE1-E has been discarded.

Since Davis-Besse does not have any surveillance capsules remaining inside the reactor vessel, ex-vessel cavity dosimetry is used to monitor neutron fluence.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program is an existing Davis-Besse program that, with enhancement, will be consistent with the elements of an effective aging management program as described in NUREG-1801, Section XI.M31, “Reactor Vessel Surveillance.”

Note: NUREG-1801 Section XI.M31 does not follow the typical 10-element format.

Exceptions to NUREG-1801

None.

Enhancements

The following enhancement will be implemented in the identified program elements prior to the period of extended operation.

- **Monitoring and Trending**

  The Capsule Insertion and Withdrawal Schedule for Davis-Besse will be revised to schedule testing of the TE1-C capsule.

Operating Experience

Review of plant and industry operating experience provides reasonable assurance that the Reactor Vessel Surveillance Program will be effective in managing the effects of aging so that components within the scope of the program will continue to perform their intended function consistent with current licensing basis during the period of extended operation.

Davis-Besse participates in the MIRVSP as described in reports BAW-1543 (NP), supplements to this document, and BAW-10100A, “Compliance with 10 CFR 50, Appendix H, for Oconee Class Reactors.” Participation in the MIRVSP ensures that future operating experience from all participating plants will be factored into the Reactor Vessel Surveillance Program. The NRC has concurred that the MIRVSP is an acceptable program.

Conclusion

The Reactor Vessel Surveillance Program has been demonstrated to be capable of managing reduction of fracture toughness for components of the reactor vessel beltline region. The Reactor Vessel Surveillance Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.36 SELECTIVE LEACHING INSPECTION

Program Description

The Selective Leaching Inspection will detect and characterize the conditions on internal and external surfaces of subject components that are exposed to moist air (including condensation), raw water, soil (buried), and treated water (including closed cycle cooling water). This one-time inspection provides direct evidence through visual inspection, material hardness measurement, or other appropriate examinations (such as chipping, scraping, or other mechanical means), of whether, and to what extent, loss of material due to selective leaching has occurred that could result in a loss of intended function. Evidence of significant aging revealed by the Selective Leaching Inspection will be entered into the Corrective Action Program. The resolution will include evaluation for expansion of the inspection sample size, locations, and frequency.

Implementation of the Selective Leaching Inspection will provide reasonable assurance that intended functions are maintained consistent with the current licensing basis for the period of extended operation. The inspection activities will be conducted just before the beginning of the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching Inspection is a new one-time inspection for Davis-Besse that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M33, “Selective Leaching of Materials.”

Exceptions to NUREG-1801

None.

Enhancements

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The Selective Leaching Inspection is credited for evaluating the condition of selective leaching susceptible components and assessing their ability to perform their intended function during the period of extended operation. Susceptible components include filter bodies, heat exchanger components, hydrants, moisture separators, piping, pump casings, spray nozzles, strainers, trap bodies, tubing, and

valve bodies. Components within the scope of the program are formed of gray cast iron or copper alloy > 15% zinc. The components are exposed to moist air (including condensation), raw water, soil (buried), and treated water (including closed cycle cooling water and steam) environments during normal plant operations. The one-time inspection includes visual inspection, hardness measurement, or other appropriate examinations (such as chipping, scraping, or other mechanical means), of a sample set of components to determine whether, and to what extent, selective leaching is occurring in the period of extended operation.

The aging management activity is credited for the following systems:

- Auxiliary Building Chilled Water System
- Auxiliary Building HVAC System
- Auxiliary Steam and Station Heating System
- Decay Heat Removal (DH) and Low Pressure Injection System (LPI)
- Emergency Diesel Generators (EDG)
- Fire Protection Diesel (DFP)
- Fire Protection System (FP)
- High Pressure Injection System
- Instrument Air System
- Main Steam System (MS)
- Makeup Water Treatment System
- Miscellaneous Liquid Radwaste System
- Service Water System (SW)
- Station Air System
- Station Blackout Diesel Generator (SBODG)
- Station Plumbing, Drains, and Sumps System (SPDSS)

- Preventive Actions
  No actions are taken as part of the Selective Leaching Inspection to prevent aging effects or to mitigate aging degradation. Although the control of water chemistry may reduce selective leaching in treated water environments, no specific credit is taken for water chemistry control as part of this program.

- Parameters Monitored or Inspected
  The Selective Leaching Inspection will perform visual inspection, hardness measurement, or other appropriate examinations (such as chipping, scraping, or other mechanical means), of components within the scope of the program as measures of loss of material due to selective leaching. Follow-up of unacceptable findings includes additional testing, as necessary, and expansion of the inspection sample size and location.

  The Selective Leaching Inspection activities will be conducted after the issuance of the renewed operating license and prior to the end of the current operating license, with sufficient time to implement programmatic oversight prior to the period of extended operation, if necessary. The activities will be conducted just before the period of extended operation, so that conditions are more representative of the conditions expected during that time.

- Detection of Aging Effects
  The Selective Leaching Inspection will include provision for visual inspection, hardness measurement, or other appropriate examinations (such as chipping, scraping, or other mechanical means), of a sample of components with susceptible materials in environments conducive to selective leaching. The program will include the criteria for visual inspection and for hardness measurement, or other appropriate examinations. The results of the inspections will be evaluated to determine the condition of the material. Engineering evaluation in conjunction with the Corrective Action Program will determine whether components with degraded materials are capable of performing their intended functions.

  The aging management activities include (a) determination of the sample size based on an assessment of materials of fabrication, environment/conditions, time in service, and operating experience; (b) identification of the inspection locations in the susceptible system or component; (c) determination of the examination technique, including acceptance criteria; and (d) evaluation of the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize an intended function before the end of the period of extended operation.

  The results of the inspections will be evaluated against the acceptance criteria. Additional testing will be performed, as necessary, based on review of the inspection results.

- Monitoring and Trending
  No actions are taken as part of the Selective Leaching Inspection to monitor or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

The inspection results will be evaluated through the Corrective Action Program, if necessary.

- Acceptance Criteria
  The Selective Leaching Inspection will utilize approved inspection techniques to identify selective leaching. Inspection results that identify selective leaching will be entered into the Corrective Action Program. The Corrective Action Program includes provision for further evaluation of degraded materials and any necessary corrective actions. The evaluation will include a root cause analysis, if necessary.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  Plant design considerations address the potential for degradation of installed components through the application of materials suitable for the expected operating environments, and inspection methods will be consistent with accepted industry practices.

  Review of Davis-Besse operating experience did not identify any instances of loss of material due to selective leaching, graphitization, or dezincification for any in-scope components. Two items were identified for heat exchanger tubing in one heat exchanger not within the license renewal evaluation boundary, and the findings were associated with stagnant and low-flow conditions when the heat exchanger was not in service.

Conclusion

Implementation of the Selective Leaching Inspection will provide reasonable assurance that the aging effect will be managed so that components within the scope of this inspection will continue to perform their intended functions consistent with the current licensing basis during the period of extended operation.

B.2.37 SMALL BORE CLASS 1 PIPING INSPECTION

Program Description

The Small Bore Class 1 Piping Inspection will detect and characterize cracking of small bore ASME Code Class 1 piping less than 4 inches nominal pipe size (NPS 4), which includes pipe, fittings, and branch connections.

The ASME Code does not require volumetric examination of Class 1 small bore piping. The Small Bore Class 1 Piping Inspection will consist of volumetric examination of a representative sample of small bore piping locations that are susceptible to cracking. The inspection sample will include both socket welds and butt welds. The sample size and inspection locations will be based on susceptibility, inspectability, dose considerations, operating experience, and limiting locations of the total population of ASME Code Class 1 small bore piping locations. The guidelines of EPRI Report 1011955, “Materials Reliability Program: Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines (MRP-146),” and the supplemental guidelines issued in EPRI Report 1018330, “Materials Reliability Program: Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines - Supplemental Guidance (MRP-146S),” will be considered in selecting the sample size and locations. Volumetric examinations (including qualified destructive or nondestructive techniques) will be performed by qualified personnel following procedures that are consistent with Section XI of the ASME Code and 10 CFR 50, Appendix B.

If a qualified non-destructive volumetric examination technique does not become available for socket welds, an opportunistic destructive examination will be conducted. Opportunistic destructive examination is performed when a weld is removed from service for other considerations, such as plant modifications. If a socket weld does not become available on an opportunistic bases, one will be selected for destructive testing. This socket weld will be selected from a piping location that is susceptible to cracking.

The inspection provides additional assurance that either age-related degradation of small bore ASME Code Class 1 piping components is not occurring or that the aging is insignificant, such that an aging management program is not warranted during the period of extended operation.

This one-time inspection is appropriate as Davis-Besse has experienced only two instances of cracking of small bore Class 1 piping, possibly due to stress corrosion or thermal and mechanical loading. Should evidence of significant aging be revealed by the one-time inspection or through plant operating experience, periodic inspection will be considered as a plant-specific aging management program.

The Small Bore Class 1 Piping Inspection is a new one-time inspection that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Small Bore Class 1 Piping Inspection is a new one-time inspection for Davis-Besse that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M35, "One-time Inspection of ASME Code Class 1 Small-Bore Piping."

Exceptions to NUREG-1801

None.

Enhancements

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope
  The Small Bore Class 1 Piping Inspection is a one-time inspection of a sample of ASME Code Class 1 piping less than NPS 4. The inspection will include measures to verify that unacceptable degradation is not occurring in Class 1 small bore piping, thereby confirming that an aging management program is not needed for the period of extended operation. See *Monitoring and Trending* below for a discussion of sample selection and inputs.

- Preventive Actions
  The Small Bore Class 1 Piping Inspection will consist of evaluation and inspection activities with no actions to prevent or mitigate aging effects.

- Parameters Monitored or Inspected
  The Small Bore Class 1 Piping Inspection is a one-time inspection that will include volumetric examinations (destructive or nondestructive) performed by qualified personnel, using qualified volumetric examination techniques and following procedures consistent with Section XI of the ASME Code and 10 CFR 50, Appendix B.

- Detection of Aging Effects
  This inspection will perform volumetric examinations on selected weld locations. Davis-Besse has only experienced two instances of cracking of small bore Class 1

piping, possibly due to stress corrosion or thermal and mechanical loading, and therefore this one-time inspection is appropriate. See *Operating Experience* below for discussion of site operating experience.

If a qualified volumetric examination technique does not become available for socket welds, an opportunistic destructive examination will be conducted. Opportunistic destructive examination is performed when a weld is removed from service for other considerations, such as plant modifications. If a socket weld does not become available on an opportunistic bases, one will be selected for destructive testing. This socket weld will be from a piping location that is susceptible to cracking.

- Monitoring and Trending
  The one-time inspection will consist of volumetric examination of a representative sample of small bore piping locations that are susceptible to cracking. The sample size and inspection locations will be based on susceptibility, inspectability, dose considerations, operating experience, and limiting locations of the total population of ASME Code Class 1 small bore piping locations. The guidelines of EPRI Report 1011955 and the supplemental guidelines of EPRI Report 1018330 will be considered in selecting the sample size and locations. Volumetric examinations (including qualified destructive or nondestructive techniques) will be performed by qualified personnel following procedures that are consistent with Section XI of the ASME Code and 10 CFR 50, Appendix B.

  Should evidence of significant aging be revealed by the one-time inspection or through plant operating experience, periodic inspection will be considered as a plant-specific aging management program.

- Acceptance Criteria
  Unacceptable inspection findings will be evaluated by the Corrective Action Program using criteria in accordance with the ASME Code.

- Corrective Actions
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Small Bore Class 1 Piping Inspection is a new one-time inspection activity for which plant operating experience does not indicate the need for an aging management program. The evaluations and examinations to be performed by this activity will use qualified non-destructive volumetric examination techniques or destructive examination techniques with demonstrated capability and a proven industry record to detect cracking in piping weld and base metal.

  Two instances of small bore piping cracking related to stress corrosion cracking have been identified at Davis-Besse.

  The first instance of cracking due to stress corrosion cracking was found in the reactor vessel closure gasket leakage monitoring line. It was determined that the stress corrosion cracking was promoted by chlorides left after water evaporated in the line. The issue was evaluated using the Corrective Action Program and it was determined that these lines are not indicative of other small bore piping. The affected piping was replaced and the procedure was changed to require draining of the line after use.

  The second instance of cracking was an axial indication found on the Reactor Coolant System loop 1 cold leg drain line 1-1 nozzle-to-elbow weld during the Cycle 14 refueling outage. The probable cause is extensive localized weld repair during initial construction. This repair either resulted in a latent flaw or a crack initiation site. The residual stresses from the construction weld repair, combined with the environment in the Reactor Coolant System and the susceptibility of Alloy 600 material, established the presence of the three key elements for the development of primary water stress corrosion cracking in spite of the low susceptibility in cold leg drain lines. This cracking was due to an event (local weld repair) and is not indicative of general aging in small bore lines.

  The evaluation of MRP-146 applicability to Davis-Besse is documented in the Corrective Action Program. As a result of the assessment, the inspection of three Reactor Coolant System drain lines was added to the inservice inspection schedule.

  The Small Bore Class 1 Piping Inspection will be developed based on relevant plant and industry operating experience.

Conclusion

The Small Bore Class 1 Piping Inspection will verify that cracking due to stress corrosion and mechanical loading is not occurring or is insignificant, such that an aging management program is not required during the period of extended operation. The Small Bore Class 1 Piping Inspection will provide reasonable assurance that the aging effects are not occurring such that components within the scope of this inspection will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.38 STEAM GENERATOR TUBE INTEGRITY PROGRAM

Program Description

The Steam Generator Tube Integrity Program is credited for aging management of cracking, denting, loss of material, and reduction in heat transfer of the steam generator tubes; as well as cracking of tube plugs, tube sleeves, and tube support plates. The Steam Generator Tube Integrity Program is performed as part of the overall Steam Generator Management program. The Steam Generator Management program is based on Technical Specification requirements, and is implemented in accordance with NEI 97-06, “Steam Generator Program Guidelines.” The Steam Generator Tube Integrity Program also includes secondary-side examinations to assist in verification of tube integrity and the condition of the tube support plates.

The Steam Generator Tube Integrity Program is a combination condition monitoring and mitigation program. The Steam Generator Tube Integrity Program manages the effects of aging through a combination of prevention, inspection, evaluation, repair, and leakage monitoring. Preventative measures are intended to inhibit degradation and consist of primary-side and secondary-side water chemistry monitoring and control, and foreign material exclusion requirements.

The Steam Generator Tube Integrity Program provides the requirements for non-destructive examinations for the detection of flaws in tubes, plugs, sleeves, and tube support plates. Degradation assessments identify both potential and existing degradation mechanisms. Inservice inspections (i.e., eddy current testing and visual inspections) are used for the detection of flaws. Condition monitoring compares the inspection results against performance criteria, and an operational assessment provides a prediction of tube conditions to ensure that the performance criteria will be met throughout the next operating cycle. Primary-to-secondary leakage is continually monitored during operation.

NUREG-1801 Consistency

The Steam Generator Tube Integrity Program is an existing Davis-Besse program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M19, “Steam Generator Tube Integrity.”

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

During each refueling outage, steam generator degradation assessments are performed in accordance with the provisions of NEI 97-06 and the EPRI pressurized water reactor steam generator examination guidelines. These industry guidelines are based in part on operating experience and inspection results from other operating pressurized water reactors. Degradation assessment topics include steam generator tube degradation mechanisms, inspection and expansion requirements, tube repair criteria, structural limits, guidelines for testing, and chemical cleaning provisions.

Davis-Besse has identified several instances of tube degradation through eddy current examination. Causes were determined to be mechanical equipment degradation, which is primarily a function of time in operation, temperature of operation, and chemistry conditions. Additional causes were predicted to be primary water stress corrosion cracking, stress corrosion cracking or intergranular attack, denting, and outer diameter stress corrosion cracking. Repairs were made through the Corrective Action Program.

As a result of the Cycle 15 refueling outage inspections, 46 steam generator tubes were plugged in once-through steam generator (OTSG) 2-A, bringing the total for that steam generator to 625 tubes plugged (4%). Thirty-five steam generator tubes were plugged in OTSG 1-B, bringing the total for that steam generator to 279 tubes plugged (1.8%). As with all previous inspections, the condition of the steam generators (with the degraded tubes plugged) met industry and regulatory structural and leakage integrity guidance, and were expected to meet these criteria following the outage inspection. Steam generator inspection results are addressed in the Inservice Inspection summary reports that are submitted to the NRC following each outage.

Self assessments of the program are performed periodically and conclude that the program is being effectively implemented, meets FENOC expectations regarding engineering programs, meets current industry requirements, and has incorporated industry identified beneficial practices.

Davis-Besse has not implemented the alternate repair criteria in Generic Letter 95-05, but has amended the Technical Specifications to be consistent with Technical Specification Task Force Report TSTF-449, "Steam Generator Tube Integrity," Revision 4.

The Davis-Besse evaluation of Information Notice 2008-07 concluded that the inspection scopes defined in the degradation assessments are appropriate for monitoring cracking in the expansion transition regions as well as at the upper and lower tube ends.

Using the accepted industry approach to testing and evaluation, and incorporation of pertinent industry operating experience, insures that the Steam Generator Tube

Integrity Program manages the effects of component aging such that the steam generators will continue to perform their intended functions, consistent with the current licensing basis, during the period of extended operation.

Conclusion

The Steam Generator Tube Integrity Program has been demonstrated to be capable of managing age-related degradation of the steam generator tubes, tube plugs, tube sleeves, and tube support plates. The Steam Generator Tube Integrity Program provides reasonable assurance that the aging effects will be managed such that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.39 STRUCTURES MONITORING PROGRAM

Program Description

The Structures Monitoring Program is part of the Maintenance Rule program. It is an existing program that is designed to ensure age-related degradation of the plant structures and structural components within its scope are managed such that each structure and structural component retains the ability to perform its intended function. The Maintenance Rule program is comprised of many existing monitoring and assessment activities which collectively address potential and actual degradation conditions and their effects on the reliability of structures and components.

The Structures Monitoring Program implements provisions of the Maintenance Rule, 10 CFR 50.65, which relate to structures, masonry walls, and water control structures. It conforms to the guidance contained in Regulatory Guide 1.160 and NUMARC 93-01. Concrete, masonry walls, and other structural components that perform a fire barrier intended function are also managed by the Fire Protection Program.

The Structures Monitoring Program encompasses and implements the Water Control Structures Inspection and the Masonry Wall Inspection.

NUREG-1801 Consistency

The Structures Monitoring Program is an existing Davis-Besse program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S6, “Structures Monitoring Program.”

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- **Scope**

  The program procedure will be enhanced by including and listing the structures within the scope of license renewal that credit the Structures Monitoring Program for aging management.

- **Parameters Monitored or Inspected**

  The program procedure will be enhanced by including aging effect terminology (e.g., loss of material, cracking, change in material properties, and loss of form).

- **Parameters Monitored or Inspected**

  The program procedure will be enhanced by listing American Concrete Institute (ACI) 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," and American National Standards Institute / American Society of Civil Engineers (ANSI/ASCE) 11-90, "Guideline for Structural Condition Assessments of Existing Buildings," as references and to indicate that they provide guidance for the selection of parameters monitored or inspected.

- **Parameters Monitored or Inspected**

  The program procedure will be enhanced by providing clarification that a "structural component" for inspection includes each of the component types identified within the scope of license renewal as requiring aging management.

- **Parameters Monitored or Inspected**

  The program procedure will be enhanced by requiring the responsible engineer to review site raw water pH, chlorides, and sulfates test results prior to the inspection to take into account the raw water chemistry for any unusual trends during the period of extended operation. Raw water chemistry data shall be collected at least once every five years. Data collection dates shall be staggered from year to year (summer-winter-summer) to account for seasonal variation.

- **Parameters Monitored or Inspected**

  Davis-Besse's area groundwater is aggressive and operating experience has shown that structural elements have experienced degradation. Although there is no evidence that the aggressive groundwater has contributed to structural degradation, a special provision in the program will be implemented to monitor below-grade inaccessible concrete components before and during the period of extended operation. FENOC will perform a below-grade examination of concrete below elevation 570 feet (groundwater elevation) of an in-scope structure prior to the period of extended operation. That inspection will include concrete examination using acceptance criteria from NUREG-1801 XI.S6 Program element 6. The below-grade examination of concrete below elevation 570 feet may be conducted during maintenance activities. Any degradation found that exceeds the acceptance criteria will be trended and processed through the Corrective Action Program.

- **Parameters Monitored or Inspected**

  The program procedure will be enhanced by specifying that, upon notification that a below-grade structural wall or other in-scope concrete structural component will become accessible through excavation, a follow-up action is initiated to the responsible engineer to inspect the exposed surfaces for age-related degradation. Such inspections will include concrete examination using acceptance criteria from NUREG-1801 XI.S6 Program element 6. Any degradation found that exceeds the acceptance criteria will be trended and processed through the Corrective Action Program.

- **Detection of Aging Effects**

  The Structures Monitoring Program procedure will be enhanced by listing ACI 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," ANSI/ASCE 11-90, "Guideline for Structural Condition Assessments of Existing Buildings," and EPRI Report 1007933, "Aging Assessment Field Guide" as references and to indicate that they provide guidance for detection of aging effects.

- **Monitoring and Trending**

  The program procedure will be enhanced by including requirements to follow the documentation requirements of 10 CFR 54.37 and to submit records of structural evaluations to records management.

- **Acceptance Criteria**

  The program procedure will be enhanced by indicating that ACI 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," provides acceptable guidelines which will be considered in developing acceptance criteria for concrete structural elements, steel liners, joints, coatings, and waterproofing membranes.

Operating Experience

The Structures Monitoring Program has been effective in managing age-related degradation. Visual inspections conducted by the Structures Monitoring Program have found some age-related issues. These age-related issues have been processed through the Corrective Action Program. Inspections also found minor degradation conditions including small shrinkage cracks, construction joint voids, rust, and surface irregularities which did not require further evaluation. Acceptable minor degradation has been noted on Maintenance Rule evaluation documents and reviewed and re-inspected during subsequent inspections. With the exception of the auxiliary feedwater pump turbine exhaust missile barrier, which has a "W" rating indicating that it is acceptable with deficiencies which are being resolved by the Corrective Action Program, all other inspected structures are acceptable and are capable of performing their design functions.

Review of completed Maintenance Rule evaluations indicated that conditions of age-related degradation were identified and documented. Degradation conditions requiring repair were processed through the work order system and the Corrective Action Program.

Examples of conditions found were:

- Auxiliary feedwater pump turbine exhaust missile barrier has spalled concrete and exposed rebar due to its periodic exposure to a harsh environment. The missile barrier continues to perform its design function and the Corrective Action Program is tracking the repair.
- Pipe tunnel has minor surface cracks and chipped area around a doorway. There were signs of water intrusion near a penetration but the condition was determined to be acceptable. ECCS Pump Room No. 1 has signs of water intrusion, no active leakage was noted and the condition was determined to be acceptable.
- Auxiliary Building has various small spalled areas and surface cracks less than 1/16 inch. Shrinkage cracks in seismic joints and block wall to concrete interface were noted in the baseline inspection and subsequent inspections. Efflorescence was noted in some areas with no active leakage. These conditions were deemed acceptable and pose no structural concerns.
- Signs of leakage from a junction box were noted during an Auxiliary Building inspection and were processed through the Corrective Action Program. Separation of expansion joint seals identified in Rooms 601 and 602 was processed through the Corrective Action Program.
- Minor rust and staining on supports from past system leakage was noted during an Auxiliary Building inspection, they weren't properly cleaned and recoated. Rust spots and minor pitting were noted on overhead floor decking. These conditions were deemed acceptable and pose no structural concerns.
- Housekeeping issues in a room with abandoned equipment and various unfilled abandoned anchor bolt holes were noted during an Auxiliary Building inspection.
- Large spalled concrete in Room 236 southwest corner was identified and evaluated through the Corrective Action Program. Large grout undercutting at a column base in Room 313 was identified and processed through the work order system for repair.

- Extensive paint flaking was noted during an Auxiliary Building inspection on structural fireproofing in Room 323 and processed through the work order system for repair. Fireproofing material appears to be unaffected.
- Auxiliary Building roof system conditions are adequate. Minor cracks in the asphalt flashing and some debris blocking roof drain screens were noted, condition was processed through the work order system for repair or rework.
- Borated Water Storage Tank (BWST) trench has active water leakage observed on majority of trench floor due to failed weather seals and a vertical expansion joint seal located in the southeast comer is degraded. The BWST Level Transmitter Building roof insulation joints are taped together with duct tape and various locations exhibit duct tape that has peeled away and active water leakage observed at southeast comer caused by ponding of water on opposite side of wall. No structural implications exist due to water leakage. The work order system was used to address these conditions.
- Containment inspections revealed various small spalled areas, chipped concrete and surface cracks less than 1/16 inch. Shrinkage cracks and worn coating on concrete floor were noted in the baseline inspection and subsequent inspections. Minor rust and staining on supports and structural steel were also noted. These conditions were deemed acceptable and pose no structural concerns.
- Electrical manhole 3005 has some minor cracks and spalling near conduit supports. There was a small amount of water present on the floor of both the north and south cubicles. The water appeared to be draining to the sump pit located in the south cubicle. The source of the water appeared to be from the bottom row of conduits and duct bank. At the upper left corner of the duct bank interface, there was a concrete void and the waterstop material was visible. The work order system was used to have the voided area filled in with new concrete.
- Minor spalling of grout was observed at the base of the Condensate Storage Tanks. The conditions were deemed acceptable and pose no structural concerns.
- The flashing on the Relay House roof has surface rust and requires re-painting. Currently there is no adverse affect to the roof. The precast concrete panels on the exterior of the building have various locations that are spalled and the basement south wall has a vertical crack at the location where a future doorway was intended. The work order system was used to request correction of this issue. The south doorway canopy has a completely sheared rod hanger. The Corrective Action Program was used to evaluate this issue.
- Service water pipe tunnel valve rooms have minor active water in-leakage. The work order system was used to address this issue.

- Small shrinkage cracks and minor spalling where concrete repairs had taken place were noted in the parapet wall at several locations and on the Shield Building dome. The cracks found do not pose any structural concerns. Digital image was taken to provide documentation and reference for future evaluations.
- Pitting corrosion was noted in the sand pocket area of the containment vessel. The vessel has been coated in this region. No new pitting was identified in this area. The existing pitting was identified and evaluated through the Corrective Action Program and found to be acceptable. Ultrasonic thickness measurements verified that the minimum recorded vessel thickness was greater than the minimum required wall thickness. Several locations within the sand pocket area contained standing water. Beveled grout has been installed in the area, the standing water was not in contact with the containment vessel.
- Switchyard structural steel has surface rust present. The surface rust does not adversely affect the structural steel's adequacy. The work order system was used to request re-painting the Switchyard's structural steel.
- Several tower and disconnect switch concrete foundations in the Switchyard are degraded to the point that concrete has spalled off and rebar is visible. The Corrective Action Program was used to evaluate this issue. The Switchyard's ground appeared to be saturated with ground water due to insufficient drainage. The Corrective Action Program was used to evaluate this issue.
- Fire walls between yard transformers have various small spalled areas and surface cracks less than 1/16 inch noted in the baseline inspections and subsequent inspections. These conditions were deemed acceptable and pose no structural concerns.
- Turbine Building elevation 565 has active water in-leakage, sections of expansion joint missing in Room 253, and degraded vertical expansion joints in Room 330 that needed re-work. The work order system was used to address these conditions. Minor spalled areas and surface cracks less than 1/16 inch noted in the baseline inspections and subsequent inspections. These conditions were deemed acceptable and pose no structural concerns.
- Water Treatment Building has minor spalled areas, surface cracks, and water stains on walls noted in the baseline inspections and subsequent inspections. These conditions were deemed acceptable and pose no structural concerns.

The Structures Monitoring Program provides reasonable assurance that aging effects are being managed for the Davis-Besse structures. This has been demonstrated through inspection reports and the Corrective Action Program.

The Corrective Action Program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Structures Monitoring Program, with enhancement, will be capable of detecting and managing aging effects for structures within the scope of license renewal. The continued implementation of the Structures Monitoring Program, with enhancement, provides reasonable assurance that the effects of aging will be managed so that components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.40 WATER CONTROL STRUCTURES INSPECTION

Program Description

The Water Control Structures Inspection is implemented as part of the Structures Monitoring Program, conducted for the Maintenance Rule.

The Water Control Structures Inspection is an existing condition monitoring program for detecting age-related degradation of the Intake Structure, Forebay, Service Water Discharge Structure, and those structural components within the structures.

Davis-Besse is not committed to RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." However, enhancements pertaining to water control structure inspection elements from RG 1.127 Revision 1 will be incorporated into the Water Control Structures Inspection, implemented as part of the Structures Monitoring Program, consistent with NUREG-1801, Section XI.S7.

NUREG-1801 Consistency

The Water Control Structures Inspection is an existing Davis-Besse program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," with the following exceptions.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope, Parameters Monitored or Inspected, and Detection of Aging Effects**

  Dams, spillway structures, outlet works, reservoirs, and water-control structure safety and performance instrumentation are not installed at Davis-Besse. Therefore, the associated portions of the NUREG-1801, XI.S7 program are not applicable to the Water Control Structures Inspection for Davis-Besse.

- **Acceptance Criteria**

  Earthen structures falling within the regulatory jurisdiction of the Federal Energy Regulatory Commission or the U. S. Army Corps of Engineers are not installed at Davis-Besse. Therefore, the associated portions of the NUREG-1801, XI.S7 program are not applicable to the Water Control Structures Inspection for Davis-Besse.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- **Scope**

  The Water Control Structures Inspection, included in the existing Structures Monitoring Program, will include the Service Water Discharge Structure which is within the scope of license renewal.

- **Parameters Monitored or Inspected**

  The Water Control Structures Inspection, included in the existing Structures Monitoring Program, will include parameters monitored and inspected for water control structures, including the Service Water Discharge Structure, in accordance with applicable inspection elements listed in Section C.2 of RG 1.127 Revision 1. Descriptions of concrete conditions will conform with the appendix to the American Concrete Institute (ACI) publication, ACI 201, "Guide for Making a Condition Survey of Concrete in Service." The use of photographs for comparison of previous and present conditions will be included as a part of the inspection program.

- **Detection of Aging Effects**

  The Water Control Structures Inspection, included in the existing Structures Monitoring Program, will specify that water control structure periodic inspections are to be performed at least once every five years.

- **Monitoring and Trending**

  The Water Control Structures Inspection, included in the existing Structures Monitoring Program, will include requirements to follow the documentation requirement of 10 CFR 54.37, including submittal of records of structural evaluations to records management.

- **Acceptance Criteria**

  The Water Control Structures Inspection, included in the existing Structures Monitoring Program, will list ACI 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," as a reference and will indicate that it will be considered in developing acceptance criteria for inspection of water control structures.

Operating Experience

The Water Control Structures Inspection has been effective in managing age-related degradation. Visual inspections conducted by the Water Control Structures Inspection have found some age-related problems. Age-related issues have been processed through the Corrective Action Program and repaired.

Monitoring for degradation of the ultimate heat sink embankments has historically been performed by system engineer walkdown looking for obvious signs of erosion and possible displacement. The only degradation that had been found prior to 2007 was erosion of the earthen embankment during 1999 in the nonsafety-related portion of the canal, which was promptly repaired. During a routine inspection in 2007 of the intake canal under the Preventive Maintenance program, the north side of the embankment in the safety-related portion of the intake canal (Forebay) was found to have settled for a length of approximately 200 feet, which greatly reduced the slope of the embankment. Evaluation of this area found that it is stable. The slope stability study performed as a corrective action found the degradation in the north sidewall of the Forebay between stations 500-1000 feet occurred as a result of the presence of low compressive strength Lacustrine till (brown clay). Diver inspection of this area revealed the toe of the embankment does not appear to have moved, suggesting the degradation is limited to the embankment above the water surface. The degradation found during 2007 is believed to have occurred slowly over a period of time so that it was not distinguishable until gross slope degradation was observed. Based on this finding and to identify any future degradation of the embankments, preventive maintenance was established that will measure the slope, width, elevation, and length of the intake canal to preserve the volume of water available. The frequency of the preventive maintenance task is every three years. The results of the inspections are documented in the work order system used to perform the preventive maintenance, in the Corrective Action Program (as needed), and in the system chronological log. An engineering modification has been planned to repair the degraded area of the north wall of the Intake Canal.

In September 2008, the NRC conducted a triennial inspection of Davis-Besse's ultimate heat sink performance. No findings of significance were identified. The NRC inspectors verified that FENOC's inspection of the ultimate heat sink was thorough and of significant depth to identify degradation of the shoreline protection or loss of structural integrity. The inspectors verified vegetation present along the slopes was trimmed, maintained, and was not adversely impacting the embankment. The inspectors verified that FENOC ensured sufficient reservoir capacity by trending and removing debris or sediment buildup in the ultimate heat sink. The inspectors performed a system walkdown of the service water Intake Structure and verified FENOC's assessment of structural integrity and component functionality. This inspection included the verification that FENOC ensured proper functioning of traveling screens and strainers, and structural integrity of component mounts. In addition, the inspectors verified that service water pump bay silt accumulation is monitored, trended, and maintained at an acceptable level. The Corrective Action Program documentation related to the heat sink performance issues was reviewed to verify that FENOC had an appropriate threshold for identifying issues and to evaluate the effectiveness of the corrective actions.

Review of completed Maintenance Rule inspection results indicated that age-related degradation was identified and documented through the Corrective Action Program. Water control structures were found to be in good condition below and above the water level. Normal silt sedimentation and biological growth were dredged and cleaned. Underwater inspections were documented via written report and video. Examples of conditions found were:

- Intake Structure concrete is in good condition above and below water level.
- Steel sheet piling at Forebay area by the Intake Structure had surface rust but material thickness was acceptable.
- Degraded earthen dikes were identified and repaired.
- Vegetation on earthen dikes was identified and cleared.
- Isolated small holes due to burrowing animals were identified, but no structural stability concerns were noted.

Review of program health reports has concluded that water control structures within license renewal scope are in good working condition with the exception of the erosion of the earthen embankment discussed above.

The Corrective Action Program and ongoing review of industry operating experience will be used to ensure that the program continues to be effective in managing the identified aging effects.

Conclusion

The Water Control Structures Inspection, with enhancement, will be capable of detecting and managing aging effects for structures within the scope of license renewal. The continued implementation of the Water Control Structures Inspection, with enhancements, provides reasonable assurance that the effects of aging will be managed so that components within the scope of this inspection will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

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APPENDIX C

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APPENDIX D

TECHNICAL SPECIFICATION CHANGES

10 CFR 54.22 requires that an application for license renewal include any Technical Specification changes or additions necessary to manage the effects of aging during the period of extended operation.

No changes to the Davis-Besse Technical Specifications are required to support the License Renewal Application.

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Appendix E

Applicant's Environmental Report
Operating License Renewal Stage

Davis-Besse Nuclear Power Station

August 2010

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Acronyms and Abbreviations

Acronym	Definition
AADT	annual average daily traffic
AEC	Atomic Energy Commission
BSBO	Black Swamp Bird Observatory
BVPS	Beaver Valley Power Station
Btu	British thermal unit
°C	degrees Celsius
CDF	core damage frequency
CEQ	Council on Environmental Quality
CET	containment event tree
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
CWS	Circulating Water System
Davis-Besse	Davis-Besse Nuclear Power Station
DSM	demand-side management
EFH	Essential Fish Habitat
EIA	Energy Information Administration
EPRI	Electric Power Research Institute
ER	environmental report
ESA	Endangered Species Act
°F	degrees Fahrenheit
FBC	Fluidized-bed-combustion
FE	FirstEnergy Corporation
FENGenCo	FirstEnergy Nuclear Generation Corp.
FENOC	FirstEnergy Nuclear Operating Company
FERC	Federal Energy Regulatory Commission

Acronyms and Abbreviations
(continued)

Acronym	Definition
FES	Final Environmental Statement
fps	feet per second
ft^3	cubic feet
gal	gallon
GEIS	Generic Environmental Impact Statement
gpd	gallons per day
gpm	gallons per minute
IGCC	integrated gasification combined cycle
IPA	Integrated Plant Assessment
kWh	kilowatt-hour
kV	kilovolt
lb	pound
lb/MMBtu	pounds per million British thermal units
LOS	level of service
m^3	cubic meters
mA	milliampere
MAAP	Modular Accident Analysis Program
MACCS2	MELCOR Accident Consequence Code System
MDC	Minimum Detection Concentration
mg/l	milligrams per liter
mgd	million gallons per day
MM	million
MSW	municipal solid waste
MW	megawatt
MWd/MTU	megawatt-days per metric ton uranium
MMBtu	million British thermal unit
MWe	megawatts-electric
MWh	megawatt-hour

Acronyms and Abbreviations
(continued)

Acronym	Definition
MWt	megawatts-thermal
NAAQS	National Ambient Air Quality Standards
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NMFS	National Marine Fisheries Service
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NRR	Office of Nuclear Reactor Regulation
OAC	Ohio Administrative Code
OCMP	Ohio Coastal Management Program
ODCM	Off-site Dose Calculation Manual
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OHPO	Ohio Historic Preservation Office
ONWR	Ottawa National Wildlife Refuge
OPSB	Ohio Power Siting Board
pCi/L	picoCuries per liter
PDS	plant damage state
PEIS	programmatic environment impact statement
PCBs	polychlorinated byphenyls
PM	particulate matter
PM_{10}	particulates with diameters less than 10 microns
$PM_{2.5}$	particulates with diameters less than 2.5 microns
ppb	parts per billion

Acronyms and Abbreviations
(continued)

Acronym	Definition
ppm	parts per million
ppt	parts per thousand
PRA	probabilistic risk assessment
psig	pounds per square inch gauge
rms	root mean square
RC	release category
RCS	Reactor Coolant System
ROW	Right of Way
SAMA	Severe Accident Mitigation Alternatives
scf	standard cubic feet
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SO_x	sulfur oxides
SU	standard units
SWS	Service Water System
USACE	U.S. Army Corps of Engineers
USAR	Updated Safety Analysis Report
USCB	U.S. Census Bureau
USDOD	U.S. Department of Defense
USDOE	U.S. Department of Energy
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USOSHA	U.S. Occupational Safety and Health Administration
wt%	percent by weight
yr	year

1.0 INTRODUCTION

1.1 PURPOSE OF AND NEED FOR ACTION

FirstEnergy Nuclear Operating Company (FENOC) prepared this Environmental Report (ER) to support renewal of the Class 103 facility operating license for Davis-Besse Nuclear Power Station, Unit 1 (Davis-Besse) (facility operating license NPF-3) for a period of 20 years beyond the expiration of the current license term. License renewal would extend the facility operating license from midnight on April 22, 2017, to midnight on April 22, 2037. Davis-Besse Operating License NPF-3 was issued on April 22, 1977, and the plant began commercial operation on July 31, 1978 (**FENOC 2010**, Section 1.1). Per 10 CFR 50.51, the license allows the plant to operate up to 40 years, and may be renewed for a period of up to an additional 20 years (10 CFR 54.31).

For license renewal, the U.S. Nuclear Regulatory Commission (NRC) has defined (**NRC 1996a**, Page 28,472) the purpose and need for the proposed action as follows:

> *The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decision makers.*

The proposed action would provide FENOC the option to operate Davis-Besse for an additional 20 years beyond the current licensed operating period.

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1.2 ENVIRONMENTAL REPORT SCOPE AND METHODOLOGY

NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled *Applicant's Environmental Report - Operating License Renewal Stage*. This report fulfills that requirement and is an appendix to the Davis-Besse license renewal application.

The requirements regarding information to be included in the environmental report (ER) are codified in 10 CFR 51.45 and 51.53(c). Table 1.2-1 lists the regulatory requirements and identifies the ER sections that respond to the requirements. In addition, affected ER sections are prefaced by a boxed quote of the relevant regulatory language.

The ER has been developed to meet the format and content of Supplement 1 to Regulatory Guide 4.2 (**NRC 2000**). Additional insight regarding content was garnered from the NRC's Generic Environmental Impact Statement (GEIS) for license renewal (**NRC 1996b**) and standard review plans for environmental reviews (**NRC 1999**), and supplements to the GEIS.

Table 1.2-1: Environmental Report Responses to License Renewal Environmental Regulatory Requirements

Regulatory Requirement	Description	ER Section(s)
10 CFR 51.53(c)(1)	Operating license renewal stage ER.	Entire Document
10 CFR 51.53(c)(2)	Proposed action description.	3.0
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(3)	Environmental impacts and comparison of alternatives.	7.3, 8.0
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(1)	Proposed action impact on the environment.	4.0
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(2)	Unavoidable adverse environmental impacts.	6.3
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(4)	Local short-term uses vs. long-term productivity of the environment.	6.5
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(5)	Irreversible and irretrievable commitments of resources.	6.4
10 CFR 51.53(c)(2) and 10 CFR 51.45(c)	Environmental analysis of the proposed action and mitigating actions,	4.0, 6.2
	environmental impacts of alternatives, and	7.3
	alternatives available for reducing or avoiding adverse environmental effects.	8.0
10 CFR 51.53(c)(2) and 10 CFR 51.45(d)	Status of compliance.	9.0
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(2) and (e)	Proposed action impact on the environment and unavoidable adverse impacts.	4.0, 6.3
10 CFR 51.53(c)(3)(ii)(A)	Water use conflicts (plants using cooling towers or ponds and withdrawing from a small river).	4.1, 4.6
10 CFR 51.53(c)(3)(ii)(B)	Entrainment, impingement, and heat shock assessment (plants using once-through cooling or cooling ponds).	4.2, 4.3, 4.4
10 CFR 51.53(c)(3)(ii)(C)	Groundwater use conflicts (plants using Ranney wells or >100 gpm groundwater).	4.5, 4.7

Table 1.2-1: Environmental Report Responses to License Renewal Environmental Regulatory Requirements
(continued)

Regulatory Requirement	Description	ER Section(s)
10 CFR 51.53(c)(3)(ii)(D)	Groundwater quality degradation.	4.8
10 CFR 51.53(c)(3)(ii)(E)	Impact of refurbishment on terrestrial resources, and	4.9
	threatened or endangered species.	4.10
10 CFR 51.53(c)(3)(ii)(F)	Assessment of air quality during refurbishment (nonattainment areas).	4.11
10 CFR 51.53(c)(3)(ii)(G)	Impact on public health from thermophilic organisms.	4.12
10 CFR 51.53(c)(3)(ii)(H)	Potential shock hazard from transmission lines.	4.13
10 CFR 51.53(c)(3)(ii)(I)	Assessment of refurbishment on housing,	4.14
	public water supply,	4.15
	public schools, and	4.16
	land use.	4.17
10 CFR 51.53(c)(3)(ii)(J)	Assessment of local highway traffic during refurbishment.	4.18
10 CFR 51.53(c)(3)(ii)(K)	Assessment of historic or archaeological properties.	4.19
10 CFR 51.53(c)(3)(ii)(L)	Alternatives to mitigate severe accidents.	4.20
10 CFR 51.53(c)(3)(iii)	Reducing adverse impacts.	6.2
10 CFR 51.53(c)(3)(iv)	New and significant information.	5.0
10 CFR Part 51, Appendix B, Table B-1, Footnote 6	Environmental Justice.	2.6.2, 4.21

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1.3 DAVIS-BESSE NUCLEAR POWER STATION LICENSEE AND OWNERSHIP

Davis-Besse is owned by FirstEnergy Nuclear Generation Corp. (FENGenCo). Both FENGenCo and FENOC are the licensees. FENOC is the applicant and, acting on behalf of FENGenCo, is also the operator with exclusive responsibility and control over the operation and maintenance of Davis-Besse. (**FENOC 2010**, Section 1.4.1)

FENOC is a wholly owned direct subsidiary of FirstEnergy Corp., a public utility holding company.

FirstEnergy Nuclear Generation Corp. is a wholly owned direct subsidiary of FirstEnergy Solutions Corp., and a wholly owned second-tier subsidiary of FirstEnergy Corp (FE).

FirstEnergy Solutions Corp. is a wholly owned direct subsidiary of FirstEnergy Corp.

References to a previous owner, the Toledo Edison Company, have been retained, where appropriate, for historical purposes. (**FENOC 2010**, Section 1.4.1)

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1.4 REFERENCES

FENOC 2010. Updated Safety Analysis Report (USAR) Davis-Besse Nuclear Power Station No. 1 Docket No: 50-346 License No: NPF-3, FirstEnergy Nuclear Operating Company (FENOC), Revision 27, June 2010.

NRC 1996a. Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, Federal Register, Vol. 61, No. 109, June 5, 1996.

NRC 1996b. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants (GEIS), NUREG-1437, Volumes 1 and 2, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, May 1996.

NRC 1999. Standard Review Plans for Environmental Reviews for Nuclear Power Plants, NUREG-1555, Supplement 1, Operating License Renewal, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, October 1999.

NRC 2000. Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses; Supplement 1 to Regulatory Guide 4.2, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, September 2000.

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2.0 SITE AND ENVIRONMENTAL INTERFACES

This chapter describes the overall character of the Davis-Besse site and local environment. Its purpose is to portray the plant's setting and the environment affected, with particular attention to information required to address the environmental issues designated by the GEIS (**NRC 1996**) as Category 2.

2.1 LOCATION AND FEATURES

Davis-Besse is located on the southwestern shore of Lake Erie in Ottawa County, Ohio, in Section 12 of Township 8 North, Range 15 East. Nearby communities include Oak Harbor approximately 8 miles southeast, Fremont 16 miles south, and Toledo 25 miles west northwest. Prominent features of the surrounding area out to 50 miles are shown in Figure 2.1-1. The area within six miles is shown on Figure 2.1-2.

The station structures are located approximately in the center of the site 3,000 feet from the shoreline, which provides a minimum exclusion distance of 2,400 feet from any point on the site boundary. The reactor is located at 41° 35' 49" north Latitude and 83° 05' 16" west Longitude. The approximate Universal Transverse Mercator coordinates are 4,607,000 meters north and 326,100 meters east (**FENOC 2010**, Section 2.1.1).

The low population zone is an area outside the site boundary within a radius of two miles from the center of the containment structures (**FENOC 2010**, Section 2.1.3.3). Figure 2.1-3 shows the site boundaries and exclusion area. Section 3.1 describes key features of Davis-Besse, including reactor and containment systems, cooling water system, and transmission system.

The site consists of 954 acres, of which approximately 733 acres are marshland that is leased to the U.S. Government as a national wildlife refuge (**FENOC 2010**, Section 2.1.2). To the west is the main unit of the Ottawa National Wildlife Refuge and the state of Ohio Magee Marsh Wildlife Area. On the southern boundary is the Toussaint River, which empties into Lake Erie 700 feet from the lake shoreline site boundary (Figure 2.1-3). The land area surrounding the site is generally agricultural with no major industry in the vicinity.

The topography of the site and vicinity is flat with marsh areas bordering the lake and the upland area rising to only 10 to 15 feet above the lake low water datum level in the general surrounding area. The site itself varies in elevation from marsh bottom, below lake level, to approximately six feet above lake level (**FENOC 2010**, Section 1.2.1.1).

Motor vehicle access to the site is by a two-lane road off State Highway 2, which is a two-lane artery located west of the station (**FENOC 2010**, Section 2.2.2.1). U.S. Highway 80 is about 14 miles south of the site (Figure 2.1-1). The nearest scheduled passenger air service is located 38 miles west, in Toledo (**FENOC 2010**, Section 2.2.2.3). Section 2.9.5 describes local and regional transportation in more detail.

2.1.1 References

FENOC 2010. Updated Safety Analysis Report (USAR) Davis-Besse Nuclear Power Station No. 1 Docket No: 50-346 License No: NPF-3, FirstEnergy Nuclear Operating Company (FENOC), Revision 27, June 2010.

NRC 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants (GEIS), NUREG-1437, Volumes 1 and 2, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, May 1996.

Figure 2.1-1: Project Area Map, 50-Mile Radius

Figure 2.1-2: Project Area Map, 6-Mile Radius

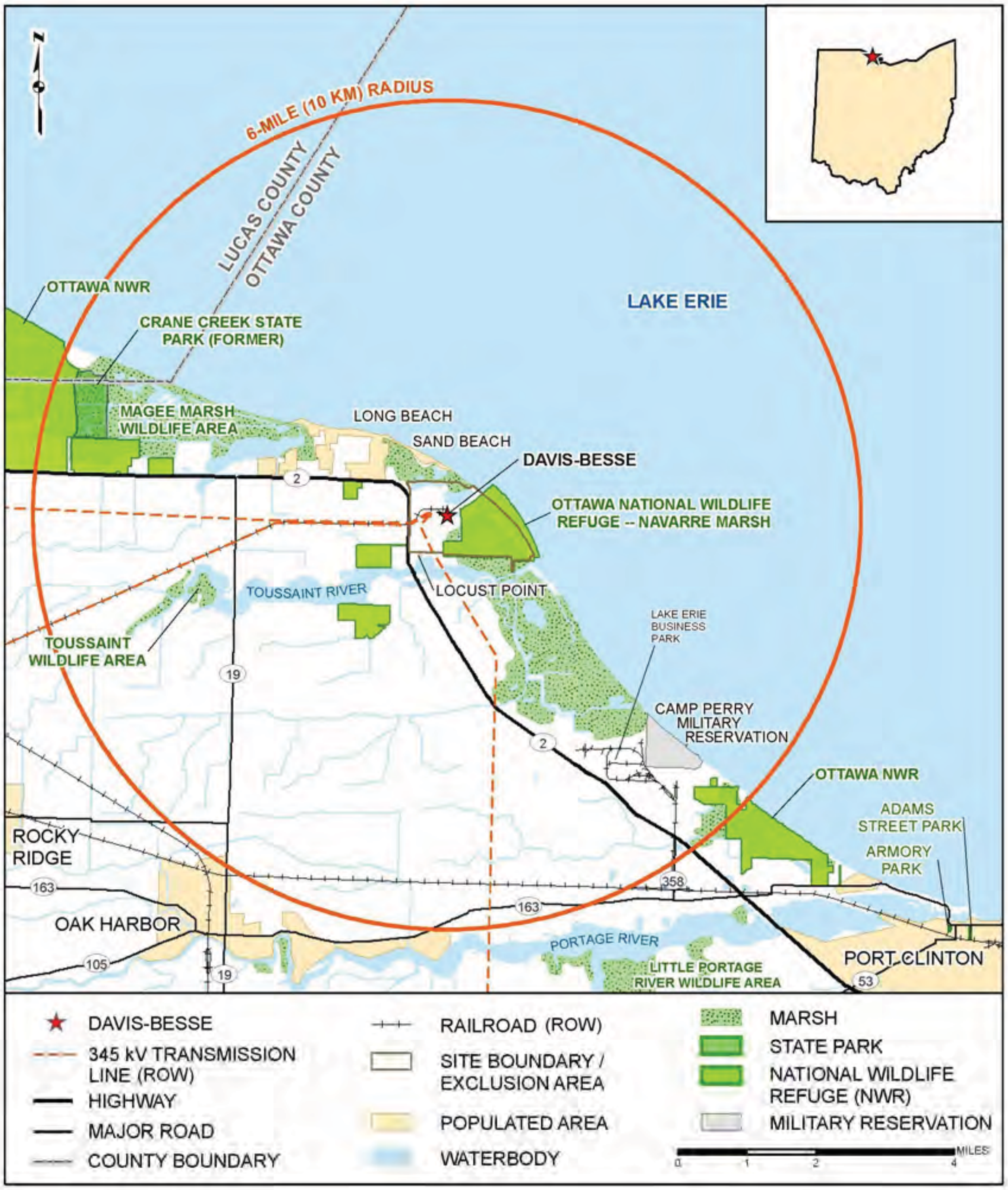
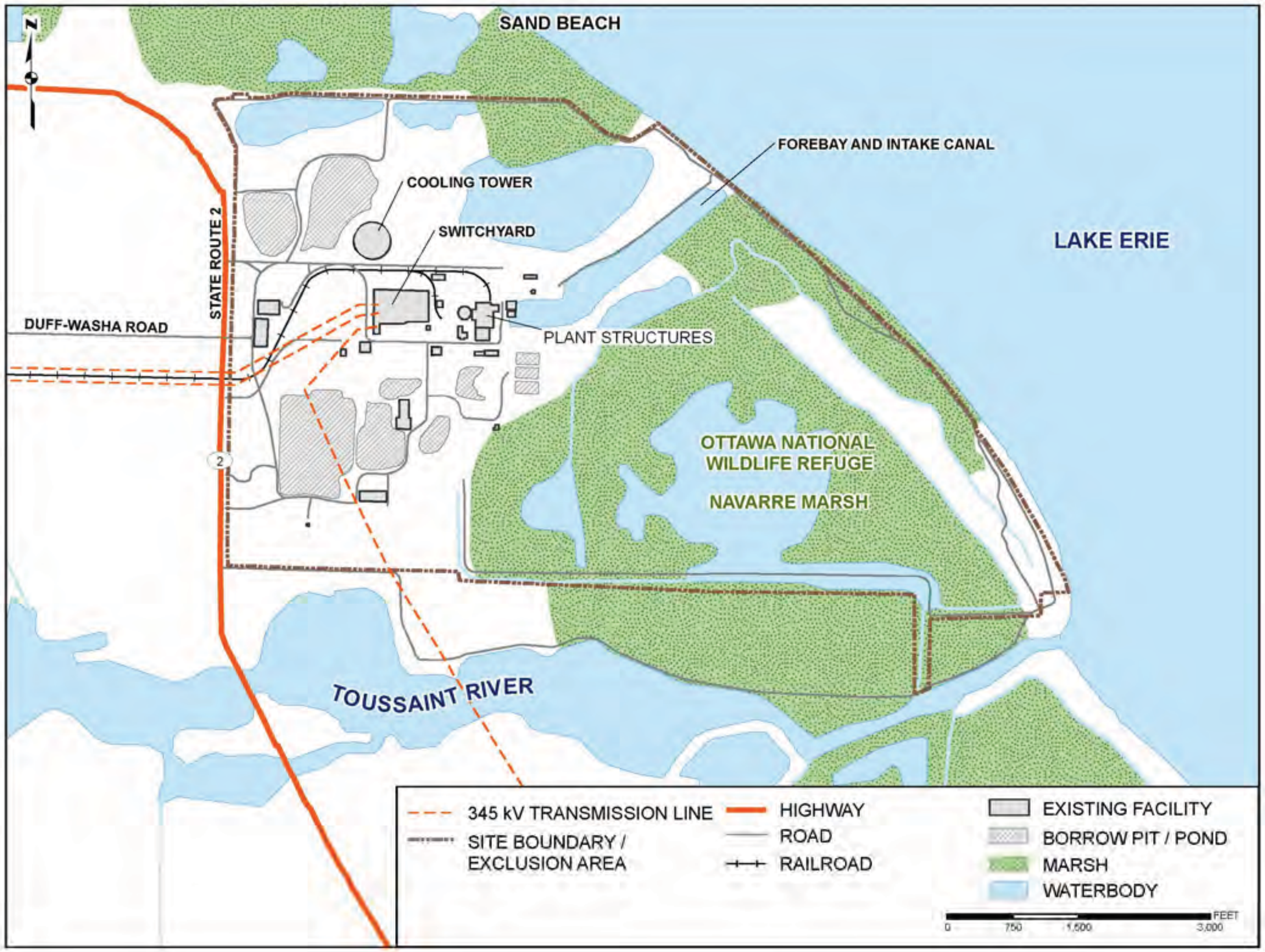


Figure 2.1-3: Site Area Map



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2.2 AQUATIC AND RIPARIAN ECOLOGICAL COMMUNITIES

Davis-Besse is located on the south shore of western Lake Erie. Hydrologic features of the site include Lake Erie surface waters, 733 acres of associated site wetlands, and the nearby Toussaint River and the Cedar-Portage Watershed (**NRC 1975** Section 2.5.1; **ODNR 2007**, Chapter 3; **LELamp 2008**, Section 6.1). Lake Erie and its associated watersheds, like that of the Great Lakes System, represent a vitally important economic and natural resource that supports recreation, fisheries, agriculture, transportation, and industrial processes. The lake also represents an important source of potable water. However, rapid industrial and population growth surrounding the lake have contributed to water quality degradation and eutrophication. As a result, numerous state, federal, and international partnerships have been established to develop resource management goals and to perform long-term ecological monitoring (**GLFC 2007**; **LELamp 2008**; **USEPA 2004**; **OHLEC 2008**; **NRCS 2005**; **IJC 2005**). Together, these partnerships provide critical information to assess ecosystem health. This environmental report section summarizes aquatic resources associated with western Lake Erie and the Davis-Besse site.

2.2.1 HYDROLOGY AND WATER QUALITY

2.2.1.1 Hydrology

Lake Erie is the smallest of the Great Lakes by volume and second smallest by surface area. The southernmost and most-shallow of the Great Lakes, Lake Erie extends west to east approximately 240 miles and averages about 57 miles wide. Water surface area is approximately 9,906 square miles and its volume is about 116 cubic miles. Average depth is about 60 feet. The lake's surface area represents about 44% of the total land-water area of the Lake Erie Basin which includes 22,720 square miles and parts of New York, Pennsylvania, Ohio, Michigan and Ontario (**Downhower 1988**, Chapter 4; **USEPA 1984**, Pages 3-10; **LELamp 2008**, Section 2.1; **Bolsenga and Herdendorf 1993**, Pages 11-26).

Lake Erie is divided into three distinct topographic basins: the western basin bounded on the east by a series of islands near Port Clinton; the central basin extending approximately 124 miles to the east; and the eastern basin bounded on the west by a shallow sand and gravel bar near Erie, PA (**Herdendorf and Monaco 1988**, Page 30). Average depths in the basins are 24 feet, 60 feet, and 80 feet for the western, central and eastern basins, respectively. Maximum water depth in the western basin is 62 feet (**Bolsenga and Herdendorf 1993**, Pages 11-19).

The hydrologic budget in Lake Erie is determined largely by inflow from the Detroit River, and to a lesser extent by direct precipitation and basin drainage (runoff). The estimated contributions are about 80% from the Detroit River inflow, about 11% from precipitation, and about 9% from basin runoff (**Bolsenga and Herdendorf 1993**, Pages 173-180; **LELamp 2008**, Section 2.1; **Herdendorf and Monaco 1988**, Pages 30-38). Annual precipitation in the Lake Erie region is approximately 34 inches. Within the western basin, the Maumee River is the largest contributor of runoff; approximately 25% of the runoff to the lake is attributed to this river. The Toussaint River enters Lake Erie about 1.75 miles southeast of the station. Outflow from the lake is primarily through the Niagara River.

Current patterns in Lake Erie are influenced by the inflow of water from the Detroit River and gyres created by prevailing winds. In the western basin, flows from the Detroit River predominate and pass along the north shore through the Pelee Passage with some recirculation along the south shore attributed to the islands extending northward from Port Clinton toward Pelee Point in Ontario, Canada. Currents in the central and eastern basins generally occur as gyres circulating either clockwise or counterclockwise depending on the prevailing wind direction. Water levels fluctuate due to seasonal changes in inflow but also due to the prevailing winds that run along the axis of the lake. The average annual water level fluctuation is about 1.2 feet. Changes in lake level have been recorded to increase up to 9.8 feet at Toledo due to northeasterly storms and decrease up to 6.6 feet due to southwesterly winds. Differences in water level between Toledo and Buffalo have been recorded as high as 14 feet due to extreme wind driven seiches (**Bolsenga and Herdendorf 1993**, Page 188-194 and **LELamp 2008**, Section 2.1). At the same time, Lake Erie can experience large wind driven waves. Herdendorf and Monaco suggest that, based on U.S. Army Corps of Engineers (USACE) estimates, waves as high as 12 feet can be obtained in the area of Marblehead Peninsula, reaching up to 3.6 feet along the shoreline (**Herdendorf and Monaco 1988**, Page 38).

2.2.1.2 Water Quality

Water quality in Lake Erie and its western basin reflects the demographics of the surrounding watersheds. About one-third of the total population of the Great Lakes Basin, about 11.6 million people, resides within the Lake Erie watershed. As a result, Lake Erie has been disproportionately affected by urbanization, industrialization, and agriculture (**LELamp 2008**, Section 2.1; **OHLEC 2008**, Introduction). Eutrophication of the lake was first identified as an emerging ecological and human health concern in the 1950s, with the occurrence of noxious algal blooms and oxygen depletion. The increasing discharge of phosphorous and its recycling in sediments were considered to be the main contributors. The accumulation of persistent toxic chemicals, attributed to increased industrialization, was also being observed in water, sediment, fish and wildlife. Subsequent ecological concerns have focused on invasive species such as the zebra mussel that have altered food web dynamics.

Addressing these ecological and human health issues in the Great Lakes led to the formation of an international partnership and the development of a long term strategy expressed in the Great Lakes Water Quality Agreement of 1978 (**IJC 2005**; **LELamp 2008**). Lakewide Management Plans, envisioned for each of the Great Lakes, include a set of performance measures tied to beneficial use criteria. Complementary plans were established by the Ohio Lake Erie Commission and the U.S. Department of Agriculture. Various research institutions and scientific forums were also developed to carry out the required water quality and ecological monitoring and to provide data analyses that allow for continued management oversight and refinement of lake management goals. The current status of the Lake Erie Management Plan (Plan) is found in the Lake Erie Lake Management Report for 2008 (**LELamp 2008**).

While results of these international efforts have demonstrated some progress, water quality impairments still exist for most of the performance criteria established in the Plan. Areas of continued concern include the occurrence of chemical contaminants in biota and sediments, elevated levels of bacteria, invasive species (and impact on biodiversity), habitat loss, degradation of fish populations (and supporting food web) and continued eutrophication. Similar trends have been observed in the terrestrial environment associated with Lake Erie and its basins (**LELamp 2008**).

Despite the legacy issues and ongoing concerns with respect to water quality and ecosystem health, drinking water taken from the lake following treatment meets the primary maximum contaminant levels for finished drinking water (**OHLEC 2004**, Page 14).

Lake Erie monthly average water temperatures recorded at Cleveland between 1961 and 1990 varied between 33º F in February to 74ºF in July and August (**NOAA 2009**). At Hatchery Bay, near South Bass Island, water temperatures were reported for various years between 1984 and 1995. Minimum winter water temperature reached 32ºF in January and February and 80.6ºF in late July and early August (**Beeton et al. 1996**). Comparable water temperature ranges were also reported for long time series recorded at Put-in-Bay and Sandusky Bay (**McCormick 1996a, b**).

Lake Erie water quality data spanning the period 1974 to 2001 were collected in the vicinity of Davis-Besse by various investigators. Following is a summary of the results, demonstrating the seasonal and temporal range of values for the different parameters.

Water quality data were collected in the vicinity of Davis-Besse between 1974 and 1979 as part of a preoperational and operational study (**Reutter et al. 1980**, Pages 49 and 72). Parameters were measured monthly at three stations during ice-out periods.

Parameters were reported as averages for the intake and discharge station for the preoperational and operational periods. Annual average water temperature over the study period varied between 60.8 and 61.5ºF. Average dissolved oxygen ranged between 9.1 and 10.0 parts per million (ppm), although variations between 3.0 ppm and 14.1 ppm were reported. Water pH averaged 8.3 standard units (SU) across all stations and varied seasonally between 7.2 and 8.9 SU. Alkalinity ranged between 94 ppm and 96.2 ppm. Transparency (clarity) was low and varied between 1.6 and 1.8 feet. Phosphorus concentrations were relatively high but decreased over time from an average of about 70 parts per billion (ppb) to 40 ppb between the preoperational and operational periods, respectively.

Additional water quality data are found in U.S. Environmental Protection Agency (USEPA) (**USEPA 1984**), Herdendorf and Monaco (**Herdendorf and Monaco 1988**), Bolsenga and Herdendorf (**Bolsenga and Herdendorf 1993**) and OHLEC (**OHLEC 2004**). Bolsenga and Herdendorf (**Bolsenga and Herdendorf 1993**, Pages 251-270) report selected parameters for the period 1967-1982 drawing on data provided by USEPA (Table 2.2-1). Similar to the results reported by Reutter (**Reutter et al. 1980**), Bolsenga and Herdendorf indicate that Lake Erie tends to be alkaline with an average alkalinity of 95 milligrams per liter (mg/l) as $CaCO_3$, ranging from 82.3 ppm in the western basin to 103.9 ppm in the eastern basin (**Reutter et al. 1980**; **Bolsenga and Herdendorf 1993**). Average pH ranged from 8.23 to 8.42 SU across the three basins. Average annual water temperatures in the three basins varied from 63 ºF to 58.5 ºF. Secchi depth readings showed that water clarity was greater in the central and eastern basins and averaged only 2.6 feet in the western basin which was the most turbid of the three basins, this attributed to the Maumee River inflow. Annual average dissolved oxygen varied between 9.4 and 9.9 ppm in the basins.

Average annual total phosphorous concentrations were 29.1 and 20.7 ppb for the central and eastern basins. No value was reported for the western basin although the concentration of dissolved phosphorus was between two to three times higher than that of the central and eastern basins. Total phosphorus loadings during this study period showed a dramatic decrease of up to 50% due to improvements in sanitary sewage treatment. Despite these improvements, periods of anoxia in the central basin continued to exist. Average chlorophyll a concentrations were greatest (13.5 ppb) in the western basin, reflecting the inputs from the Maumee River, and lowest in the eastern basin (3.1 ppb) (**Bolsenga and Herdendorf 1993**).

OHLEC provides corresponding data for the period 1983-2001 (**OHLEC 2004,** Pages 4-8). During this study period, the concentration of total phosphorus in the western basin ranged between just over 25 ppb to just over 10 ppb and showed a general decrease over time. The 5-year average concentration as of 2001 was 16.2 ppb, just above the 15 ppb target for the western basin. During this same period, average phosphorus concentration in the central basin was 6 ppb. Despite these past improvements, phosphorus loadings have been increasing since the early 1990s attributed largely to agricultural practices (**LELamp 2008**; **OHLEC 2004**). Corresponding increases in loadings have been observed for nitrate-nitrite.

Water clarity improved during the period 1970 through 1996 in the western basin increasing from approximately two to three feet to between 6 and 7 feet. The improvement resulted in part from the infestation of zebra mussels in 1988. A comparison of water clarity and phytoplankton diatom densities pre- and post-zebra mussel occurrence showed a 100% increase in water clarity, and a corresponding decrease of 86% in diatoms (**Holland 1993**). However, water clarity decreased through 2001 due to increased sediment loads and algal concentrations, and continues to be impaired in certain parts of the lake (**LELamp 2008**, Section 4.2). Increasing sediment loads contributing to this trend appear to be linked to increased drainage basin flows in the major tributaries and the corresponding increases in nutrient loadings.

Bathymetry of western Lake Erie and sediment composition near Davis-Besse were reported by Herdendorf in anticipation of station construction near Locust Point (**Herdendorf 1972 a**, **b**, **c**). Depth profiles taken from the shoreline out to about 4,000 feet show the depth increasing gradually to approximately 11 feet at 3,000 feet from shore, the location of the intake crib (**AEC 1973**, Section 3.3.2). Sediment composition was variable but generally had a higher percentage of sand near shore, and tending toward gravel further offshore.

2.2.2 AQUATIC COMMUNITIES

Information describing the ecological characteristics of western Lake Erie in the vicinity of Davis-Besse is available from preoperational and operational studies (**Reutter et al. 1980**) and from research conducted subsequently by various state, federal and international organizations, some for the purpose of monitoring and assessing ecological conditions relative to lake management plans (**Herdendorf and Monaco 1985**; **Bolsenga and Herdendorf 1993**; **LELamp 2008**; **OHLEC 2008**; **NRCS 2005**; and **GLFC 2007**).

2.2.2.1 General

Lake Erie aquatic community data dating from as early as 1930 were collected in the general vicinity of Davis-Besse by various investigators. Following is a summary of the results, demonstrating the abundance and diversity of the aquatic communities.

The abundance and diversity of aquatic organisms in Lake Erie has been influenced historically by altered habitat conditions. As discussed above, key factors that have impacted the lake's ecological balance include eutrophication, hypoxia, toxics, habitat loss and invasive species. Phytoplankton, as an example, respond to excess concentrations of phosphorus and other nutrients in Lake Erie and form algal blooms. The algae die, settle to the bottom and decompose consuming oxygen in the process. The effect is exacerbated when a hypolimnion occurs separating oxygen rich surface waters from anoxic bottom waters. This problem was most acute in the 1960s and provided the impetus for coordinated efforts to improve water quality and protect ecosystem health (**LELamp 2008**, Section 2.1).

Phytoplankton species composition and abundance were studied from 1974 through 1979 as part of the Davis-Besse preoperational and operational monitoring programs (**Reutter et al. 1980,** Page 31, 57). Among the three groups of phytoplankton, diatoms were most numerous and typically peaked in spring. Mean densities during the preoperational and operational periods were 127,669 cells/gallon (gal) and 521,415 cells/gal, respectively. Monthly densities ranged from 346 cells/gal in June to 1,572,684 cells/gal in May. The dominant species typically included *Melosira, Fragillaria, Asterionella, Stephanodiscus and Synedra* (**Herdendorf and Monaco 1985**, Page 17; **Reutter et al. 1980**).

Green algae were least abundant. Mean densities ranged between 16,758 cells/gal and 58,665 cells/gal during the preoperational and operational study periods. Mean monthly densities varied between 392 cells/gal in April and 452,177 cells/gal in November. The dominant species were *Mugeotia, Pediastrum and Scenedesmus*. Blue-green algae mean densities ranged from 62,919 cells/gal to 223,180 cells/gal in the two study periods and were most abundant in summer (**Reutter et al.1980**). Blue-green algal blooms observed during the mid 1960s, consisting of *Microcystis, Aphanizomenon and Anabena*, were less common in the 1970s (**Herdendorf and Monaco 1985**).

Algae that adhere to substrates, periphyton, are also common in Lake Erie and are most abundant in the littoral zone. A discussion of these algal species is provided by Herdendorf and Monaco (**Herdendorf and Monaco 1985**) who studied the limnology of the island region near Port Clinton. The benthic alga, *Cladophora glomerata*, is known for its formation of massive algal mats in late spring and summer that create noxious odors and foul submerged structures. Excess growth of this species has been linked to increased phosphorus concentrations and hypoxia (**Lorenz and Monaco 1988**, Page 65). Benthic algal species also include diatoms, and green and blue-green algae.

Zooplankton in the western basin of Lake Erie include both herbivores and carnivores from three basic groups: protozoans, rotifers and microcrustaceans (cladocerans and copepods) (**Herdendorf and Monaco 1985**, Page 18; **Reutter et al. 1980**, Pages 36 and 57). Mean densities of rotifers reported by Reutter (**Reutter et al. 1980**) ranged between 858/gal and 442/gal during the Davis-Besse preoperational and operational study periods. Monthly mean densities ranged between 58/gal in November (operational) and 2,619/gal in October (preoperational). The dominant species included *Brachionus, Keratella, Polyarthra and Synchaeta*. Copepods were most abundant in spring and fall during this same study. Mean densities during the preoperational and operational periods ranged between 515/gal and 550/gal, respectively. Mean monthly densities ranged between 92/gal in April and 3,273/gal in May. Calanoid and cyclopoid forms were most common, including their nauplii. Cladoceran mean densities ranged between 254/gal and 296/gal during the two study periods. Mean monthly densities were comparable to those reported by Herdendorf and Monaco (**Herdendorf and Monaco 1985**).

A composite description of the Lake Erie benthic community in the vicinity of Davis-Besse is also provided by Herdendorf and Monaco, (**Herdendorf and Monaco 1985,** Page 25), and Reutter (**Reutter et al. 1980**, Page 64). Typical of benthic macroinvertebrate communities, species composition was determined by the substrate type and included attached and borrowing forms: coelenterates, annelids, arthropods, mollusks and crustaceans were all represented. The burrowing forms were dominated by oligochaetes and chironomid midge larvae. Gastropod snails were found mostly on submerged vegetation. Among the mollusks, the freshwater mussels and fingernail clams were the dominant forms. Crustaceans included the amphipod, *Gammarus fasciatus,* and various forms of water fleas, isopods, ostracods (seed shrimp) and decapods (crayfish). Insects typically included dipterans (true flies) and mayflies. Densities of the four major groups were provided by Reutter (**Reutter et al. 1980**) as part of the Davis-Besse monitoring programs.

A historical perspective on the benthic fauna of western Lake Erie including the invasion by zebra mussels was provided by Manny and Schloesser and Austen (**Manny and Schloesser 1999**; **Austen et al. 2002**). From 1930 to 1961, the average densities of most benthic macroinvertebrates increased dramatically while the mayflies decreased. However, from 1961 through 1982, there were large decreases in gastropods, fingernail clams, and chironomids (midge larvae) and the disappearance of mayflies. As of 1982, the benthic infauna was dominated by oligochaete and polychaete worms, suggesting continued water quality impairment. In 1993, burrowing mayflies began to recover, yet the native unionid freshwater mussel died throughout most of western Lake Erie as a result of competition from the zebra mussel. Recent evidence suggests, however, that the abundance of mayflies in the western basin is increasing (**GLFC 2003**). Information on historical changes in benthic communities of the nearby island region is provided by Fink and Wood (**Fink and Wood 1988**). Similar to the findings of Manny and Schloesser, Fink and Wood report the demise of the mayfly, decreasing numbers of caddisfly species and the dominance of *Gammarus* in the littoral zone (**Manny and Schloesser 1999**; **Fink and Wood 1988**). Monitoring of zebra and quagga mussel densities continues as part of the Lake Erie Management Plan activities (**LELamp 2008**, Section 10.2). Results during 2004 suggest that while the density and mass of zebra mussels has changed little from 1992 to the present, they are now distributed mostly within the western basin. In general, quagga mussels were more abundant than zebra mussels. Mean density of quagga mussels was 235 individuals/square foot compared to 22.4 individuals/square foot for zebra mussels. A detailed discussion of the affects of invasive mussels on energy flow and biodiversity within the Lake Erie benthic community is provided by Austen (**Austen et al. 2002**).

Because most benthic infauna are relatively immobile, they have been used as bioindicators of toxic contaminants in sediments and related impairments. Of particular concern are metals and organic chemicals. Based on the USEPA Lamp study programs, portions of western Lake Erie remain impaired based on sediment contaminant concentrations and indicator species abundance. While concentrations of key contaminants such as polychlorinated byphenyls (PCBs), dioxin, chlordane, mercury and poly aromatic hydrocarbons (PAHs) have been steadily declining over the past two decades, most remain above their probable effect concentrations near industrial-urban areas (**LELamp 2008**, Section 5.0).

2.2.2.2 Fisheries

Changes in the species composition and abundance of Lake Erie fishes over the last century have been attributed to a number of stresses, including exploitation, habitat deterioration, contaminants and invasive species (**LELamp 2008**; **GLFC 2003**; **Reutter and Hartman 1988**, Page 163). The perturbation of trophic structure led to corresponding impacts on standing fish stocks. Several native species such as the lake trout, lake sturgeon, lake herring and whitefish have been nearly extirpated. The abundance of key recreational and commercial species such as walleye and yellow perch had declined significantly. Despite these historical impacts, Lake Erie maintains a substantial fishery, and long-term management goals have been established by the Great Lakes Fishery Commission to restore and maintain stability of the standing fish stocks (**GLFC 2003**).

The Lake Erie basin supports an estimated 143 fish species; 95 species are present in the lake. Thirty-four species (24%) of fish in Lake Erie proper are nonindigenous (**Austen et al. 2002**). Thirty-five species have been harvested and 19 are considered commercially significant (**Reutter and Hartman 1988**; **Van Meter and Trautman 1970**). Key commercial and recreational species include yellow perch, walleye, smallmouth bass, steelhead trout, lake whitefish and white bass. The abundance of these and other species is monitored by the Ohio Department of Natural Resources (**ODNR 2008**). Trawl surveys have been conducted in the western basin during summer and fall since 1990. Up to 38 locations are sampled at four depths. Gill nets were also deployed at seven historic sites. Corresponding samples were collected in the central basin.

Information on growth and diet are also collected. Hydroacoustic surveys are conducted to assess forage fish abundance.

Walleye abundance (mean catch/acre of age-1 and older fish in the western basin) in summer trawls ranged between 0.04 in 1996 and 2007 and 7.5 in 2004. Except for 2004, catches in the last 5 years were below the long-term average of 1.6 fish/acre. Walleye catches in fall trawls ranged between 0.0 in 2007 and 4.1 in 2004. The long term mean was 0.85 fish/acre. Yellow perch abundance ranged between 1.6 fish/acre in 2003 and 85.3 fish/acre in 2004. The long-term average catch was 22.2 fish/acre. Catches during 2005-2007 were well below the long term average. Similar trends were found in Fall catches of yellow perch. The long term catch of white bass in summer trawls was 33.8 fish/acre and was lowest in 2007 at 3.3 fish/acre. Fall abundance of white bass averaged 2.2 fish/acre and was highly variable in recent years. The abundance of freshwater drum was comparatively high and averaged 53.3 fish/acre over the study period, and was consistently higher between 2000 and 2004. The fall average abundance of drum was 32.5 fish/acre (**ODNR 2008**, Section 6).

Monitoring performed as part of the Davis-Besse monitoring programs through 1979 yielded a total of fifty-one fish species in the Locust Point area (**Reutter et al. 1980**, Page 44, 66). Gillnet, trawl and seine samples were typically dominated by seven species: alewife, emerald shiner, freshwater drum, gizzard shad, spottail shiner, white bass and yellow perch. Together these species contributed over 90% of the catch. Walleye were not commonly found. Yellow perch, gizzard shad, white perch, carp and spottail shiner were the most common fish species caught in gill nets set at Locust Point. Yellow perch were consistently the most abundant. A total of 20 species of fish were captured in trawls and included several benthic species such as bullheads and channel catfish. Species composition in seines was similar to that found in gill net catches.

Records of sport catch in Ohio waters by private and charter boats are available for the period 1975-2007 (Table 2.2-2). Some of the earlier catches represent averages over two or more years but are generally recorded as annual catches between 1995 and 2007. Total annual catch (x1000) of walleye during this period ranged between 374 in 2005 and 1,790 fish in 1998. Catches in 2006 and 2007 were 1,195 and 1,414, respectively. Catch rates in 2006 and 2007 averaged 0.68 fish per angler hour and were the highest harvest rates for the period of record (**ODNR 2008**, Section 4).

Lake-wide commercial and sport harvest of walleye during 1975 through 2007 is shown in Figure 2.2-1. Total lake-wide harvest of walleye peaked during the late 1980s at about 10,000,000 individuals and declined thereafter, although increases were observed in 2005-2007. The total estimated lake-wide harvest was 4.67 million fish in 2007. Harvest per-unit effort also increased during these later years to levels last seen during the 1980s. The lake-wide population estimates of walleye in Lake Erie show similar trends over the period 1978-2008 (Figure 2.2-2).

Yellow perch sport catch in Ohio waters varied between 248 (x1000) fish average per year in 1990 - 1994 and 4,174 (x1000) fish in 2003 (Table 2.2-2). Catches in recent years appeared to be consistent with the long-term average. Long-term trends in western Lake Erie yellow perch population size are shown in Figure 2.2-3. Trends across the various basins of the lake show similar results with decreasing population size during the early 1990s and increases in recent years, but not surpassing levels seen historically. Sport catch of smallmouth bass appears to have declined in recent years. Total private and charter boat catch varied between 2.7 (x1000) fish in 2007 to a high of 77.4 (x1000) fish in 1995. Catches between 2004 and 2007 were less than 7.6 (x1000) fish. Corresponding harvest rates were also low. (**LEC 2008b**)

Commercial harvests of fish taken from Lake Erie are available through the National Marine Fisheries Service (**NMFS 2009**). Over the period 1971 through 2005, annual walleye catches varied between a low of 33 fish in 2002 and a high of 153,595 fish in 1973 (Table 2.2-3). Harvests of yellow perch taken in Lake Erie varied from a peak 3,157,417 fish in 1980 to 235,078 fish in 1984. Catches were greatest during the 1970s, declined during the 1980s and more recently have increased reaching 1,586,154 fish in 2005. White bass commercial harvests for Lake Erie varied from 3,249,763 fish in 1980 and 95,466 fish in 1995. Catches were highest during the 1970s and have been consistently lower since, although harvests in Ohio consistently exceeded 300,000 fish from 2004 through 2007. Freshwater drum harvests were also higher during the 1970s and have consistently decreased since. Only 253,086 fish were harvested in 2002 compared to a peak of 1,332,971 in 1979. Similar trends were observed in other commercial catches of fish landed in Ohio, as listed in Table 2.2-4.

Affecting the quality of the sport and commercial fisheries are consumption health advisories attributed to toxic contaminants. Studies of toxic chemical concentrations in sport fish from the Canadian waters of Lake Erie from 1976-2000 continue to show elevated levels of mercury, PCBs and other contaminants although concentrations continue to decline. Mean mercury concentrations in 12 in. white bass decreased from 0.22 ppm in 1976-80 to 0.13 ppm in 1996-2000. Similarly, mean mercury concentrations in 18 in. walleye have decreased from 0.30 ppm to 0.12 ppm over the same time period. Only fish larger than 16 in. exceeded the 0.45 ppm consumption advisory. PCB concentrations in channel catfish have also decreased over the same study periods. PCB concentrations (3,225 ppb) in 1981-1985 had decreased to 1143 ppb in 1996-2000. However, PCB concentrations in benthic feeding species such as carp and catfish continue to exceed the consumption guideline of 500 ppb (**LELamp 2008**, Section 10.4).

Another factor affecting fish species composition and abundance in Lake Erie has been the invasion of nonindigenous fish species. As stated above, it is estimated that the resident fish community now includes approximately thirty-four nonindigenous species. Approximately 40% of the commercial catches in Ontario in the late 1990s were nonindigenous fish species (**Austen et al. 2002**). Changes have occurred within the various trophic levels. Historically, lake herring, sculpins and shiners dominated the forage fish community. Many of the sculpin species are no longer found. Alewife, rainbow smelt, gizzard shad and round gobies now dominate.

A review of the U.S. Fish and Wildlife Service Critical Habitat portal indicated that the Locust Point area of Lake Erie near Davis-Besse does not contain critical habitat for any threatened or endangered fish species (**USFWS 2009a**). Notwithstanding the historical impacts to Lake Erie and its fisheries described above, none are related to Davis-Besse operation and the lake continues to maintain a substantial fishery, both in the species composition and abundance.

2.2.2.3 Entrainment and Impingement.

Year class strength of most fish species is determined within the egg and larval stage. As a result, the abundance and distribution of ichthyoplankton relative to the location and amount of water withdrawal by cooling water intakes can influence the potential impact of entrainment on fish populations. Studies of entrainment and the abundance of ichthyoplankton relative to the Davis-Besse Station and other steam-electric stations located on Lake Erie were performed by the Ohio State University Center for Lake Erie Area Research from 1974 through the first few years of Davis-Besse operation , as requested by the Ohio Department of Natural Resources (**Reutter et al. 1980**) by the U.S. Environmental Protection Agency (**Cooper et al. 1981**), and by the Toledo Edison Company (**Reutter 1981a**).

In general, emerald shiner, common shiner, freshwater drum, gizzard shad, white bass and yellow perch were the majority of the larval fish species collected in the Davis-Besse intake area, although gizzard shad were clearly the most abundant. Larval densities were highest in late May and June. The relative abundance of yellow perch and walleye was highly variable from year to year. During the period 1976-1980, the percent composition of larval yellow perch ranged between 2% in 1978 to 70% in 1975. Walleye percent composition varied from 0.2% in 1976 and 1979 to 22% in 1980. In 1980, mean densities (number/3531 cubic feet (ft^3)) of the abundant species, freshwater drum, gizzard shad, white bass and yellow perch, were 130.67, 189.18, 23.8 and 91.0, respectively. Peak density estimates in 1979 based on a composite of stations off Locust Point were as follows: gizzard shad, 200.4/3531 ft^3; yellow perch, 66.1/3531 ft^3; emerald shiner, 7.6/3531 ft^3. Estimates of equivalent female adult losses due to entrainment in 1980, based on mean adult fecundity, were very low, i.e., 71 gizzard shad, one (1) walleye, and 153 yellow perch (**Reutter 1981a**). Reutter concluded that there was no indication that the Davis-Besse intake location was a significant spawning area that could be detrimentally impacted by the operation of the facility, and there was no indication that the activities of the plant, including the thermal discharge, have significantly altered the populations of the local larval fish species (**Reutter et al. 1980**, Page 72). Reutter also states that the research and other research performed by the authors has indicated that the design features at Davis-Besse, i.e., cooling tower, off-shore intake, closed intake canal, bottom intake, and a high velocity discharge nozzle, may be the optimal design features to minimize aquatic environmental impacts due to cooling water intakes and thermal discharges (**Reutter et al. 1980**, Page 79).

An assessment of entrainment impacts from power plants distributed throughout Lake Erie was performed by Cooper (**Cooper et al. 1981**). Data included samples collected in 1975-1977 in the western basin and 1978 in the central basin. A total of 22 larval fish taxa was collected in the western basin. Dominant species included gizzard shad (87% of the catch) followed by rainbow smelt, whitefish, carp, white bass, yellow perch, sauger, walleye and freshwater drum. The data shows that the percentage of fish entrained by the Davis-Besse cooling water intake as compared to three other Lake Erie western basis generating stations is a small fraction (i.e., 6% or less by fish type) of total fish entrainment (**Cooper et al. 1981**, Page 108).

More recently, McKenna (**McKenna et al. 2008**) studied the relationship between larval fish assemblages in West-Central Lake Erie and habitat type. Ichthyoplankton species composition, abundance and distribution were examined in the vicinity of the major river mouths. Samples were collected in 2000-2002 from April through September. A total of 26 fish species was recorded. Fourteen were found in each year of the study. Species composition and seasonal occurrence were similar to that found in earlier studies. White bass larvae were most common in April, percids in May and June, and cyprinids (shiners) in summer.

Each of the studies discussed here demonstrates that the occurrence of fish larvae and their vulnerability to entrainment is limited to a very short period. While walleye are known to spawn over the offshore reefs near Locust Point (**ODNR 2007**, Page 131), the relative abundance of larval walleye in entrainment samples was low (**Cooper et al. 1981**).

Samples of fish impinged on the Davis-Besse traveling screens were collected at the request of Toledo Edison during 1980 (**Reutter 1981b**). Estimates of total impingement were extrapolated from periodic sampling by normalizing impingement counts to fish impinged/hour. Total 1980 estimated impingement was 9,056 fish. Goldfish and gizzard shad dominated the impingement samples and were most commonly impinged during winter. Over half (51%) of the annual impingement occurred during January, and this January total (4,626) was composed primarily of goldfish (53.5%) and gizzard shad (37.0%). Other species that occurred but at much lower numbers included yellow perch, shiners and freshwater drum. The number of yellow perch estimated to have been impinged was 750 fish, compared to the yellow perch sport and commercial harvest from Ohio waters of 22,248,000 fish. During this same period, 45 white bass were impinged compared to the white bass sport and commercial harvest of 3,909,000 fish. When compared to the sport and commercial harvest of the key species from Ohio waters during the study period, impingement of fish in the Davis-Besse cooling water intake was judged to be insignificant.

Low entrainment and impingement at Davis-Besse are attributable to the use of closed cycle cooling (average intake flow of 21,000 gallons per minute (gpm)) and low intake velocities (< 0.25 fps) (**AEC 1973**, Pages 3-6).

2.2.2.4 Riparian zone

The Lake Erie riparian zone at the Davis-Besse site is one of transition from shoreline beach, to a beach ridge community, a hardwood swamp zone, extensive wetlands and then to upland. The shoreline beach consists of a sand-shell mixture and is considered to be stable "non-critical erosion area, not protected" (**AEC 1973**, Section 2.5.1). The beach ridge plant community consists of several grass species, willow, and sumac. Dominant plants of the hardwood swamp include cottonwood, black willow, hackberry, sycamore, sumac and river-bank grape. The largest freshwater marsh on site (about 733 acres) is the Navarre Marsh which is part of the larger Ottawa National Wildlife Refuge. A series of dikes and pumps are employed to maintain adequate water levels and to manage vegetation and species composition. The marsh is typical of palustrine systems that are flooded seasonally. Vegetation consists mostly of rooted herbaceous hydrophytes (**USFWS 2009b**). The Navarre marsh vegetation includes cattail, soft-stem bulrush, white water lily, milfoil, sago pondweed and curly-leafed pondweed (**AEC 1973**, Pages 2-6, 2-28, 2-40, 4-6).

2.2.3 References

Note to reader: This list of references identifies web pages and associated URLs where reference data were obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. FENOC has maintained hard copies of the information and data obtained from the referenced web pages.

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Table 2.2-1: Mean Chemical Composition of Lake Erie and Connecting Waterways (1967-1982)

Parameter Units		St. Clair River	Lake St. Clair	Detroit River	Western Lake Erie	Central Lake Erie	Eastern Lake Erie	Niagara River
Water Temperature	°F	53.2	65.9	58.2	63.1	58.7	58.5	59.7
Secchi depth	ft	1.3	4.9	3.3	2.6	9.8	14.1	---
Dissolved oxygen (D.O.) ppm		10.4	9.5	9.3	9.8	9.4	9.9	9.7
D.O. percent saturation	%	97.4	102.0	91.9	98.1	90.6	96.6	98.4
Conductivity @ 25 °C	µmhos/cm	329	224	256	282	298	304	330
Dissolved solids	ppm	142.7	134.6	140.3	193.7	211.2	197.6	169.4
Suspended solids	ppm	21.62	12.14	15.42	19.86	6.63	5.32	17.92
Alkalinity, total	ppm	91.6	81.6	83.4	82.3	89.8	103.9	95.9
Alkalinity, phenolphthalein pH	ppm	---	---	---	4.2	3.7	---	7.3
pH SU		8.09	8.27	8.03	8.42	8.23	8.26	7.83
Calcium, total	ppm	51.2	29.1	29.8	34.4	39.7	31.3	43.6
Magnesium, total	ppm	18.2	7.6	7.5	7.6	9.5	8.8	9.9
Potassium, total	ppm	3.2	1.0	1.0	1.2	1.4	1.3	1.7
Sodium, total	ppm	47.4	4.9	6.1	8.9	10.1	9.2	13.3
Chlorides, total	ppm	20.1	8.1	17.2	---	24.4	21.6	27.7
Sulfates, total	ppm	16.6	16.7	16.1	32.7	25.7	25.5	30.1
Fluoride, total	ppm	0.12	0.12	0.11	0.24	0.16	0.20	0.25
Silica, dissolved	ppb	1.11	0.72	0.83	---	---	0.32	0.19
Ammonia, dissolved	ppb	0.018	---	0.047	0.061	0.023	0.017	---
Nitrate + nitrite, dissolved	ppb	0.290	---	0.300	0.325	0.165	0.263	---
Phosphorus, total	ppb	---	44.5	---	---	29.1	20.7	---
Phosphorus, dissolved	ppb	11.9	8.1	33.8	29.3	11.8	8.1	---
Phosphorus, ortho	ppb	12.2	---	12.1	9.2	5.8	3.4	---
Chlorophyll a ppb		11.9	4.7	3.4	13.5	5.6	3.1	---

Source: **Bolsenga and Herdendorf 1993**, Pages 251-270

Table 2.2-2: Sport Harvest of Selected Fish Species in Western Lake Erie, 1975-2007 (thousands of fish)

Year	Species			
	Walleye	White Bass	Yellow Perch	Smallmouth Bass
1975-77	937	173	6,567	21.2
1978-79	2,424	--	--	--
1980-84	2,520	312	7,982	33.8
1985-89	3,496	166	4,906	20.5
1990-94	1,378	28	1,242	25.6
1995	1,161	19	2,838	77.4
1996	1,442	31	4,020	30.7
1997	929	36	3,464	32.8
1998	1,790	49	3,708	55.7
1999	812	45	3,262	67.8
2000	674	71	3,062	28.0
2001	941	83	2,642	25.1
2002	516	72	3,290	22.4
2003	715	23	4,174	35.0
2004	515	26	2,603	5.9
2005	374	79	2,593	5.2
2006	1,195	93	3,173	7.6
2007	1,414	89	2,817	2.7

Source: **ODNR 2008**

Table 2.2-3: Commercial Harvest, in Numbers of Fish, for Selected Fish Species Taken from Lake Erie during 1971 through 2005

Year	Species					
	Walleye	Yellow Perch	Whitefish	White Bass	White Perch	Freshwater Drum
1971	55,525	2,641,392	114	996,333	--	838,863
1972	91,215	1,917,615	554	770,503	--	917,371
1973	153,595	1,887,321	2,390	2,424,667	--	999,754
1974	113,136	2,376,685	758	2,912,884	--	694,038
1975	127,053	1,914,326	681	1,691,852	--	853,832
1976	69,032	1,885,272	28	1,523,579	25	1,034,677
1977	72,487	2,868,959	28	1,121,201	--	833,458
1978	69,493	2,580,025	1,077	1,732,218	2	1,214,939
1979	101,873	3,147,031	99	1,968,538	53	1,332,971
1980	80,505	3,157,417	2,396	3,249,763	186	1,063,793
1981	66,158	2,422,699	2,274	1,134,536	3,882	1,281,724
1982	68,072	57,314	347	726,804	28,404	1,064,553
1983	79,380	387,748	2,617	864,901	120,682	1,006,962
1984	84,851	235,078	481	980,896	206,367	735,968
1985	131,322	349,963	953	1,350,486	300,358	669,290
1986	14,617	270,390	2,252	729,930	346,724	798,790
1987	14,618	588,442	16,274	474,523	422,039	976,647
1988	12,223	996,187	15,424	144,706	593,992	710,775
1989	9,542	1,926,620	42,013	558,100	607,863	508,929
1990	10,190	1,765,886	123,707	398,226	851,228	658,225
1991	10,532	858,049	336,049	446,122	1,021,149	514,470
1992	9,779	396,635	228,405	383,002	865,402	621,922
1993	29,567	381,441	373,185	227,080	354,901	809,934
1994	28,163	670,282	404,844	366,698	419,395	761,460
1995	41,145	473,245	225,233	95,466	412,702	750,996
1996	81	632,641	51,416	103,603	188,029	600,211
1997	193	774,729	29,028	358,196	259,511	714,839
1998	417	586,754	45,459	236,230	119,647	578,764
1999	229	700,936	48,292	221,562	131,519	359,659
2000	186	959,368	41,475	319,455	182,583	429,227
2001	73	1,042,006	47,639	227,199	155,982	288,199
2002	33	1,413,030	6,564	165,496	270,422	253,086
2003	129	1,501,939	13,337	318,413	312,638	262,004
2004	300	1,588,901	10,620	360,635	387,617	297,708
2005	830	1,586,154	5,176	349,152	432,647	441,975

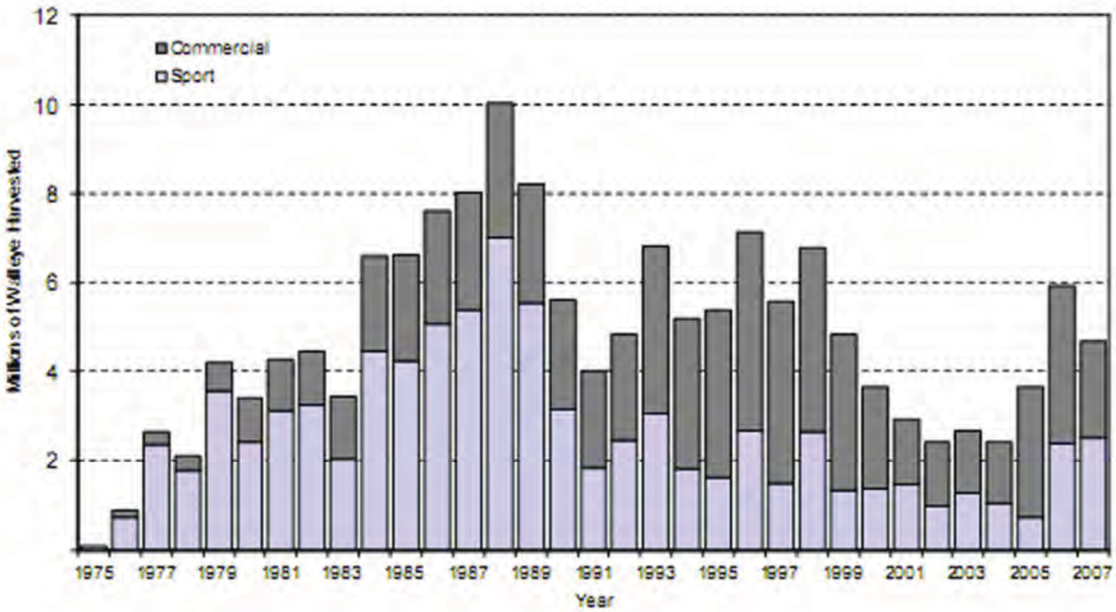
Source: **NMFS 2009**

Table 2.2-4: Annual Commercial Harvest (pounds) from Ohio Waters of Lake Erie, by species, 1998 - 2007

Year	Buffalo	Bullhead	Burbot	Carp	Channel Catfish	Freshwater Drum	Gizzard Shad	Goldfish	Quillback	Suckers	White Bass	White Perch	Whitefish	Yellow Perch
1998	295,904	17,897	1,458	1,336,450	302,056	553,659	172,425	7,992	226,603	50,785	234,791	118,946	41,990	580,151
1999	258,160	24,502	1,145	1,111,504	317,642	358,714	105,068	20,726	170,988	32,415	221,443	131,308	47,622	697,332
2000	162,477	41,695	78	956,218	260,512	428,660	2,809	19,473	140,183	30,195	317,336	182,254	41,472	962,841
2001	257,621	24,106	47	857,694	322,488	284,883	1,970	18,837	149,549	41,040	226,664	155,555	47,639	1,089,247
2002	281,955	23,409	59	523,539	311,824	248,567	545,151	10,625	170,096	32,641	161,664	269,512	6,539	1,438,215
2003	278,544	21,815	192	582,035	319,378	261,068	45	31,406	227,195	15,469	318,327	312,240	13,244	1,505,840
2004	234,673	11,005	857	469,059	271,627	298,336	85,540	23,834	195,931	30,836	358,810	386,800	10,529	1,577,113
2005	230,426	17,012	363	340,399	310,115	438,589	219,800	35,396	363,818	41,763	347,657	428,822	4,613	1,563,200
2006	263,396	25,118	305	271,190	385,134	411,840	195	58,812	250,052	33,233	483,314	655,551	29,795	1,050,614
2007	268,884	25,790	47	322,323	341,843	320,747	55,259	29,148	211,208	17,165	334,721	573,996	41,554	1,950,661
Mean	253,204	23,235	455	677,041	314,262	360,506	118,826	25,625	200,562	32,554	300,473	321,498	28,500	1,241,521

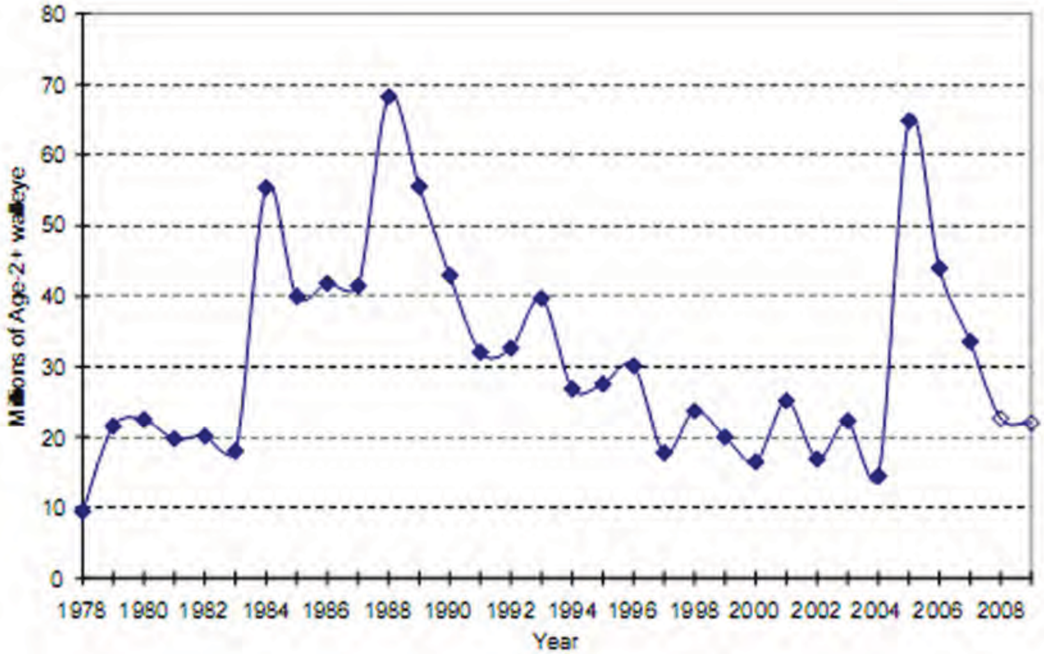
Source: ODNR 2008

Figure 2.2-1: Lake-wide Harvest of Lake Erie Walleye by Sport and Commercial Fisheries, 1975-2007



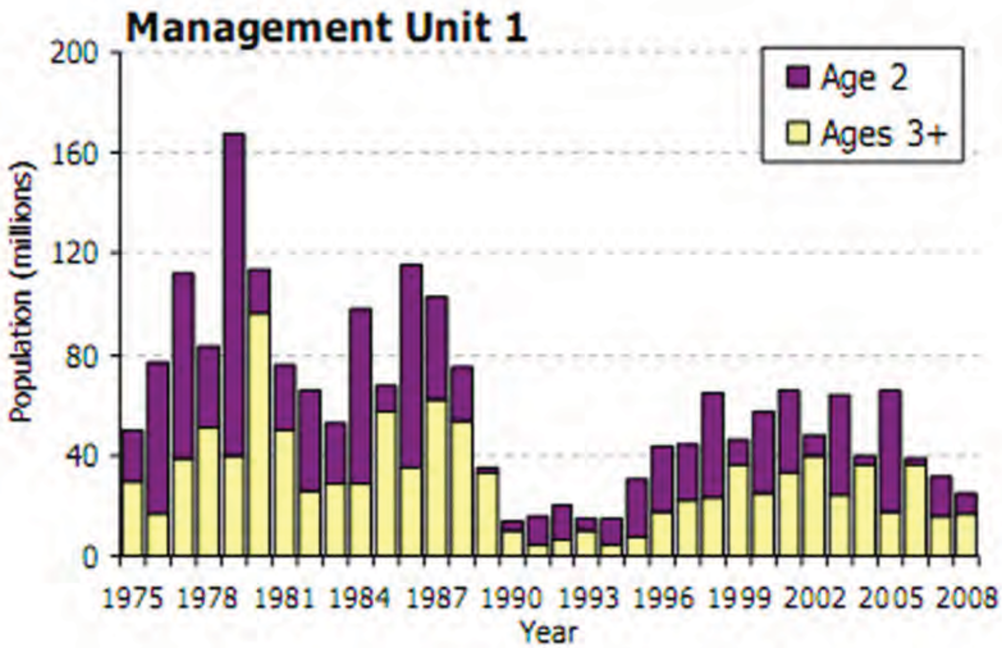
Source: LEC 2008a

Figure 2.2-2: Abundance of Lake Erie Walleye from 1978-2007 (Two Additional Years are Forecasted)



Source: **LEC 2008a**

Figure 2.2-3: Western Lake Erie (Great Lakes Fishery Commission Management Unit 1) Yellow Perch Population Estimates, 1975-2007 The Estimate for 2008 is Projected



Source: LEC 2008b

2.3 GROUNDWATER RESOURCES

The Davis-Besse site is underlain by glaciolacustrine and glacial till deposits, which overlie sedimentary bedrock. The surficial deposits, which are dominantly silty clay, have very low permeability. Site bedrock consists of the Tymochtee formation underlain by the Greenfield formation. These formations consist of nearly horizontal beds of argillaceous dolomite with interbeds of shale, gypsum and anhydrite to a depth of at least 200 feet below ground surface. (**FENOC 2010**, Section 2.4.1.2.3)

The presence of the low permeability surficial deposits has produced an artesian groundwater condition in the site vicinity bedrock. This effect is the result of the surficial deposits acting as an aquiclude to the underlying water-bearing carbonate bedrock, and the influence of Lake Erie's water table producing a potentiometric surface above the water-bearing zone. The potentiometric surface of the confined water-bearing zone is generally a few feet above the level of Lake Erie, indicating that groundwater flow at the site is generally east to northeast, towards the lake and adjacent marshes, with a gradient of approximately 2 feet per mile, which is similar to the surface water gradient in the area. Groundwater elevation fluctuations historically correlate to lake level fluctuations. (**FENOC 2010**, Section 2.4.13.2.3) Assuming heterogeneous hydraulic conductivity of 1×10^{-2} centimeters per second for the bedrock, the maximum value obtained in field tests, the groundwater flow in the Davis-Besse site vicinity is calculated to be approximately 83 feet/year (**FENOC 2010**, Section 2.4.13.3). The groundwater at the site discharges primarily into Lake Erie and the adjacent marshes to the east/northeast (**ERM 2008**, Section 5.0).

Davis-Besse does not use groundwater at the site for plant operations (**FENOC 2010** Section 2.4.13.1.5). Groundwater use in the site vicinity is limited due to the naturally poor water quality exhibited by the carbonate water-bearing zones. There are no identified drinking water wells within 5 miles of the site (**ERM 2007**, Section 3.4). Local residents obtain drinking water from the Carroll Township Water Treatment Plant, which uses surface waters from Lake Erie (**ERM 2007**, Section 3.4). The intake for this water treatment facility is located approximately three miles northwest of the Davis-Besse site. Privately owned wells within 2 to 3 miles of the site are used for farm irrigation and sanitary purposes, and not used as drinking water sources (**ERM 2007** Section 3.4).

The groundwater at the plant site is characterized by strong hydrogen sulfide odors resulting from naturally occurring interaction with local deposits of gypsum and anhydrite. Naturally high levels of carbonate and total dissolved solids cause this aquifer to be unsuitable for use as drinking water (**ERM 2007**, Section 3.4). The Ohio Environmental Protection Agency (OEPA) indicated the absence of any sole-source aquifer in the plant region (**OEPA 2005**).

The historic groundwater monitoring network at the Davis-Besse site consisted of 78 monitoring wells, of which 54 (27 couplets) remain functional (**ERM 2008**, Section 5.0).

The couplets are nested wells screened in bedrock units designated for the site as the upper dolomite and the lower dolomite. These wells were installed during plant construction to monitor groundwater conditions.

In June 2007, Davis-Besse implemented a plan to conform with the voluntary policy of the Nuclear Energy Institute (NEI) Groundwater Protection Initiative (**NEI 2007**). Selected existing monitoring wells were sampled to determine the necessity and location of additional monitoring wells as needed to characterize and monitor the groundwater conditions at the site. In August 2007, 16 new monitoring wells were installed in six distinct locations (**ERM 2008**, Section 3.3). Five of the locations provide nested monitoring wells screened in three distinct zones: the base of the glacial till, the upper dolomite, and the lower dolomite. One of these nested locations is located as a background well up-gradient of the plant power block on the southwest side of the site. The other four nested locations are in the northeast portion of the site, down-gradient from plant structures. Three of these down-gradient wells are located near the extreme northeast corner of the site, allowing for determination of down-gradient offsite contaminant migration. The sixth location is a monitoring well screened only in the glaciolacustrine/glacial till and is located to the northeast and down-gradient from the power block. Historical and 2007-installed well locations are shown in Figure 2.3-1.

Concentrations of gamma-producing radionuclides were below the minimum detection concentration (MDC) in all groundwater samples analyzed between 2007 and 2009. In early 2010, five of seven historic wells showed tritium levels slightly greater than the plant action level of 2,000 pCi/l. Another well, MW-105A, which has been on a slow increasing trend since the spring of 2009, had a tritium level of 4,158 pCi/l. As a result, FENOC is pursuing a root cause approach to identify the source of the tritium in the wells. No tritium concentrations have been detected at or above the USEPA drinking water limit of 20,000 pCi/l (40 CFR 141.66).

Analysis results from three periods of groundwater sampling performed in 2007 revealed the following (**ERM 2008**, Section 5.0). July tritium concentrations above the plant action level of 2,000 picoCuries per liter (pCi/l) occurred in three historical down-gradient wells screened in the upper dolomite. The highest concentration from this sampling period was 7,535 pCi/l in the upper dolomite at a down-gradient well. September groundwater samples from the wells screened in the soil had a range from below the MDC, under about 200 pCi/l to 1,832 pCi/l, with three wells displaying tritium concentrations above background levels. Background tritium levels have been statistically determined by up-gradient groundwater sampling and sampling of Lake Erie waters to be between 178 and 348 pCi/l. Samples in the upper dolomite had a range from the MDC to 3,149 pCi/l, with none of the new monitoring wells having tritium concentrations outside the range of background levels. Samples from the lower dolomite included three wells with tritium concentrations above background levels, but none of these were the new down-gradient monitoring wells. September sampling showed a decrease in tritium concentrations from the June and July samplings.

Sampling in 2008 showed no wells with tritium concentrations above the plant action level. Sampling in 2009 resulted in one well above the plant action level with a tritium concentration of 2,352 pCi/l. During the same 2009 sampling period, six well locations had tritium values below the MDC, with the remainder showing tritium levels below the plant action level.

Concentrations of gamma-producing radionuclides were below the MDC in all groundwater samples analyzed between 2007 and 2009. No tritium concentrations have been detected at or above the USEPA drinking water limit of 20,000 pCi/l (40 CFR 141.66).

2.3.1 References

Note to reader: This list of references identifies a web page and associated URL where reference data were obtained. This web page may likely no longer be available or its URL address may have changed. FENOC has maintained hard copies of the information and data obtained from the referenced web page.

FENOC 2010. Updated Safety Analysis Report (USAR) Davis-Besse Nuclear Power Station No. 1, Docket No: 50-346, License No: NPF-3, FirstEnergy Nuclear Operating Company (FENOC), Revision 27, June 2010.

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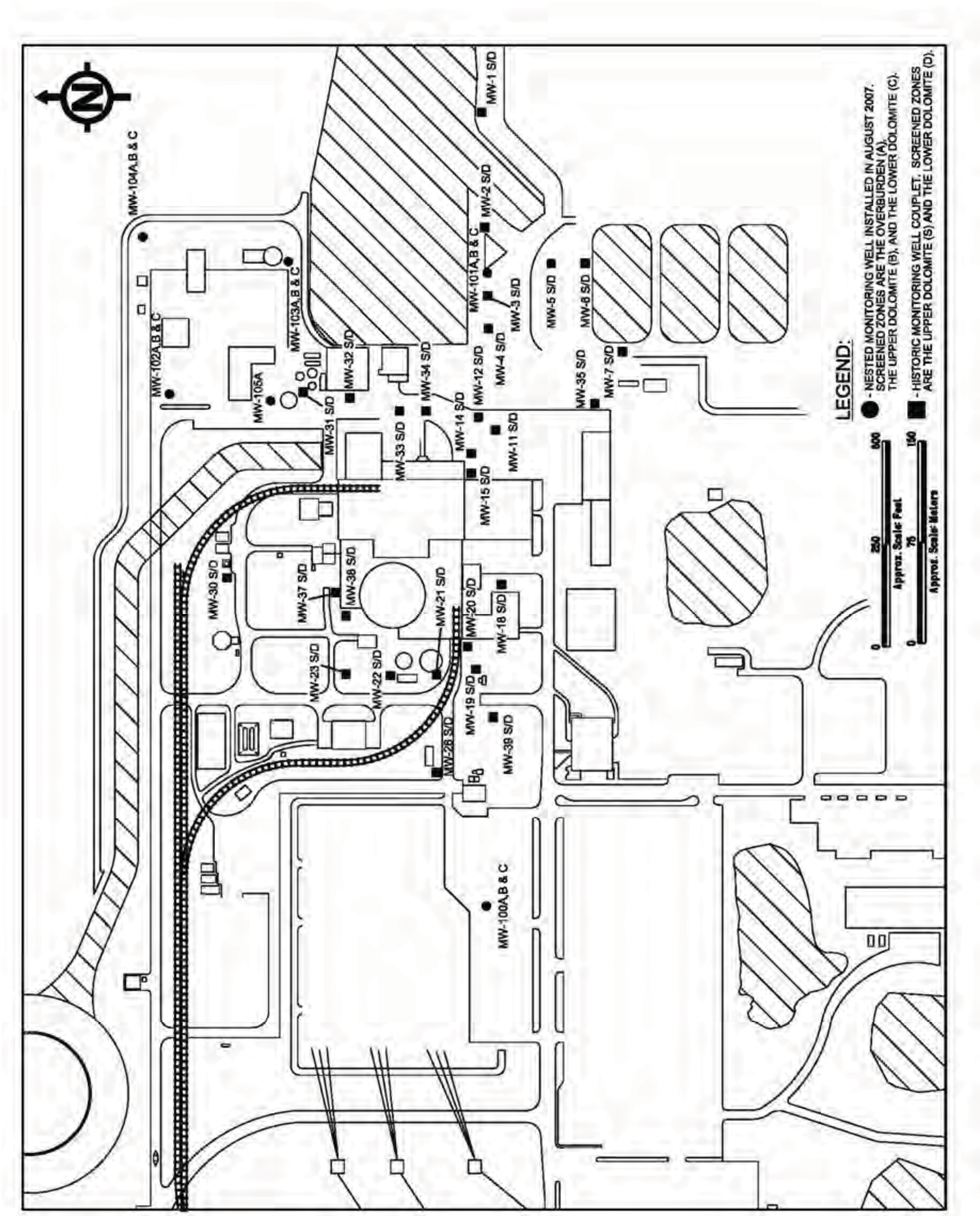
Figure 2.3-1: Groundwater Well Monitoring Locations



Source: **ERM 2007**

2.4 CRITICAL AND IMPORTANT TERRESTRIAL HABITAT

Various state and federal conservation agencies, along with the Nature Conservancy have adopted ecoregions for landscape-level planning. Ecoregions provide an ecological basis for portioning the state into coherent units with common habitat types, wildlife species, and landforms. The Ohio Department of Natural Resources (ODNR) has developed a comprehensive conservation program for the state including detailed accountings of plant and animal species of concern within various ecoregions (**ODNAP 2009a**).

2.4.1 ECOREGIONS

The Davis-Besse Nuclear Plant lies in the Huron/Erie Lake Plains (HELP) Ecoregion. This area, in northwestern Ohio, northeastern Indiana and southwestern Michigan, is bounded by Lake Erie and glacial moraines. Approximately one sixth of Ohio is within this ecoregion. The Environmental Protection Agency and the Indiana Biological Survey describe this ecoregion as follows (**BSC 2009**; **IBS 2009**; **USEPA 2009**):

> *This ecoregion is a discontinuous, broad, fertile, nearly flat plain punctuated by relict sand dunes, beach ridges, and end moraines. Originally, soil drainage was typically poor and black swamp elm-ash swamp and beech forests were dominant. Many wetlands are still present, but many have been drained and cleared for agriculture. Streams within the moraine hills and valleys are often intermittent becoming perennial when they reach the valley floor. The majority of streams drain less than 100 square miles. Precipitation is evenly distributed throughout the year and region and averages from 31 – 35 inches annually. The ecoregion has few lakes and reservoirs with those present usually being less than a quarter mile square.*

Oak savanna, and more specifically mesic oak savanna, was characteristic in this region. Mesic oak savanna typically occurs on bluffs and ridges or morainal deposits. Dominant species are white oak, bur oak, northern red oak, and black oak. This Biome was typically restricted to sandy, well-drained dunes and beach ridges. Nearly all savannas on mesic sites have been destroyed by land-use changes or altered by successional change and invasion of exotic species (**USEPA 1993**). Today, the natural climax vegetation of the area includes American elm, red maple, and black ash. Most of the area has been cleared and artificially drained and contains highly productive farms producing corn, winter wheat, soybeans, livestock, and vegetables; urban and industrial areas are also extensive. Stream habitat and quality have been degraded by channelization, ditching, and agricultural activities.

Within the HELP ecoregion, the Davis-Besse Nuclear Power Station is more specifically located in the Marblehead Drift/Limestone Plain ecoregion, which has been described by the USEPA as follows (**USEPA 2009**):

> *This ecoregion has areas of thin glacial drift and limestone-dolomite ridges and islands. Streams often flow on carbonate bedrock; originally, beech forests and, especially, elm-ash swamp forests were common. Scattered carbonate ridges supported distinctive mixed oak forests and prairies, marl plains had prairies, and the Lake Erie and Sandusky Bay shoreline often supported fens. Many geographically isolated plant species occurred in this ecoregion. Today, corn, small grains, soybeans, and hay are grown on artificially drained land. Vegetable and fruit farming is well adapted to the relatively mild climate near the shoreline.*

Since the designation of ecoregions, states have made efforts to divide ecoregions into subecoregions by using information with greater resolution, specifically concentrating on differences in patterns of environmental characteristics of particular ecoregions. The regional subdivision is based on the vegetative differences of an ecoregion along with climate, physiography, land use, soils, and surface-water quality (**ACWI 1995**). Ohio recognizes five distinct physiographic regions within the state. The Davis-Besse site can be found within the Lake Plains physiographic region (Figure 2.4-1). The ODNR describes this region as being at one time, the bottom of a much larger ancient lake known as Lake Maumee. This region is an extremely flat plain that consists of a narrow strip of land along the Lake Erie coast in northeastern Ohio that widens significantly west of Cleveland. Historically, as water levels rose and fell, sandy beach ridges and dunes formed along the shore. The northwestern area of the physiographic region, where the Davis-Besse site is more specifically located, was called the Great Black Swamp that was distinguished by rich, black soils and poor drainage (**ODNAP 2009c**).

Remnants of this habitat are preserved in the Ottawa National Wildlife Refuge (ONWR) which consists of three refuges, Ottawa, Cedar Point, and West Sister Island and two divisions, the Navarre and Darby Marshes. In total, the ONWR network of marshes encompasses more than 9,000 acres along the western shore of Lake Erie (**ONWRA 2009**). The Ohio Department of Natural Resources Division of Natural Areas and Preserves has identified several areas within and around the ONWR complex that are of importance for some threatened or endangered species as well as locations worth noting as they are deserving of priority for conservation efforts. These locations deserve priority due to their identification as being a rare or outstanding example of a particular community. Examples in and around the complex area include a bank swallow colony, a breeding amphibian site, a great blue heron rookery, a mussel bed, Piping Plover critical habitat and a waterfowl rest area. These areas are likely to harbor rare, threatened or endangered species (**ODNAP 2009a**).

2.4.2 DAVIS-BESSE SITE

The Davis-Besse site is typical of the HELP ecoregion. It is generally flat, with predominantly hydric or wetland soils. Approximately 700 acres (**FirstEnergy 2008**) of the site is marshland, with the remaining areas being classified as woodlands, low grasslands and poorly drained marginal agricultural lands (**AEC 1973**, Section 3.3.2). The Davis-Besse site contains some of the best and arguably least disturbed examples of a marsh habitat in northwest Ohio (**Campbell 1995**, Page 138). The on-site Navarre Marsh is a small remnant of what was once the Great Black Swamp. The original area and location of the Swamp lie completely within this ecoregion. Since settlement, much of the region has been converted into farms and urban centers. The protected status of the Navarre Marsh on the Davis-Besse site has resulted in its becoming a refuge for native plants, animals and biological communities that were once more common in the surrounding landscape.

National Wetland Inventory Maps indicate that 15 different classifications of wetlands exist on or near the Davis-Besse property. Southeast of the intake channel there is a prominent area identified as being a Palustrine, emergent, persistant, semipermanently flooded area otherwise known as the Navarre Marsh. The Navarre Marsh is located on the southeast end of the Davis-Besse Site, on the southern edge of Lake Erie. It is owned by Davis-Besse, and leased to the U. S. Fish and Wildlife Service (USFWS) which operates it as a division of the Ottawa National Wildlife Refuge (ONWR) located about five miles east of the Davis-Besse plant. The ONWR network has been recognized as an area of high biodiversity by the Ohio Department of Natural Resources, Natural Heritage Department, as well as an outstanding example of a waterfowl rest area. Due to its ecological importance, the Navarre Marsh is protected habitat that is managed cooperatively by the utility environmental personnel and ONWR staff (**FirstEnergy 2008**). Navarre Marsh wetland characteristics can be viewed on the USFWS National Wetlands Inventory, Wetlands Mapper portal (**USFWS 2009a**).

The majority of the area at Navarre is covered by freshwater marsh and contains nearly all the habitats associated with a marsh complex including freshwater marsh, swamp forest, wet meadow, and patches of buttonbush and deciduous forest which serve as a shelter and important refuge for migrating birds (**FirstEnergy 2008**; **Campbell 1995**, Page 138). There have been more than 325 species of birds recorded in or around units of the ONWR complex. The refuge complex is especially important to certain groups of birds, including waterfowl, neotropical migrant song birds, raptors, bald eagles, shorebirds and colonial-nesting wading birds such as herons (**USFWS 2009c**). Approximately nine miles off shore is the 77-acre West Sister Island NWR. It is home to the largest colonial nesting bird rookery in the Great Lakes chain with approximately 3,500 nests. West Sister Island is the only designated national wilderness area in Ohio (**GORP 2009**). Additionally, during normal migration, waterfowl use of the ONWR

Complex averages 3 million duck-use days and 800,000 individuals. Mallards, black ducks, American wigeon, pintail, lesser scaup, redhead and canvasback are the predominant duck species during migration and surveys indicate that approximately 70 percent of the black ducks in the Mississippi flyway use these wetlands during the fall migration (**USFWS 2009c**).

The Black Swamp Bird Observatory (BSBO), an independent, non-profit organization has worked in the Navarre Marsh and surrounding areas for the past 20 years collecting daily bird data throughout the spring and fall migrations. Due to the observatory's efforts, they provide the most up-to-date data for this area. The 10 most common passerine bird species banded by the BSBO during the spring 2008 migration on the Navarre Marsh alone were Myrtle warbler (1082), White-throated sparrow (758), Gray catbird (460), Yellow warbler (393), Traill's flycatcher (339), Magnolia warbler (414), Nashville warbler (299), Western palm warbler (296), Red-winged blackbird (211) and the American redstart (250). In total, 140 different bird species had been banded, totaling 7,805 individuals. During the same 2008 spring time period, raptors were also surveyed throughout the entire ONWR wetland complex. The survey lists 18 different raptor species totaling 8,760 individuals (**BSBO 2009a, b**).

The marshes along the southwestern shore of Lake Erie provide much of the feeding areas for both migratory and nesting birds that utilize this region of Lake Erie. The variety of insect prey available in the marshes permits these birds to refuel for their continued migration. The nesting birds of West Sister Island, such as Herons and egrets, have been documented as flying several times a day to the mainland refuges for food (**GORP 2009**). Ensuring that a variety of high quality food as well as cover are available to the high diversity of species utilizing the marsh, the Navarre Marsh is heavily managed through the use of earthen dikes, which surround and transect the marsh, to control water levels to promote plant succession to meet seasonal wildlife's food and habitat needs (**FirstEnergy 2008**; **AEC 1973**).

About 35 species of mammals can be found within or around the ONWR wetland complex due to the abundance and variety of food and cover available in these habitats. Common species include deer, coyotes, fox, rabbits, squirrels, muskrats, mink, skunks, shrews, mice and weasels (**USFWS 2009c**; **Herdendorf 1987**, Page 12).

Reptiles and amphibians are also present on the ONWR complex. Sixteen different species of turtles and snakes can be found in the area. Common reptiles and amphibians include garter snakes, fox snakes, northern watersnakes, Blanding's turtles, Midland painted turtles, snapping turtles, bullfrogs and leopard frogs. The Five-lined skink is the only lizard species found in the region and is common in the Navarre Marsh (**Campbell 1995**, Page 184; **Herdendorf 1987**, Pages. 102-104; **USFWS 2009c**).

Over 370 terrestrial vertebrates have been reported on or near the Navarre Marsh area, including 325 bird species (174 of these bird species were identified in the Navarre Marsh), 35 species of mammals, 5 species of amphibians and 11 species of reptiles (**BSBO 2009a, b** and **USFWS 2009c**).

Approximately 800 species of vascular plants are found in the low-lying marsh communities of the Lake Erie Region, of which, less than 100 species are trees and shrubs (**Bolsenga and Herdendorf 1993**, Page 372). Throughout this lowland area, common wetland species include cattail, bur reed, grasses, spatterdock, water lily and smartweed. A stable beach ridge separates the Navarre Marsh from Lake Erie. Common plants growing on the beach ridge include sandbar willow, staghorn sumac and elderberry. Behind the beach ridge there is a hardwood swamp zone. Here, cottonwood, hackberry, sycamore, river-bank grape, black willow and staghorn sumac are commonly found. The plant communities that grow on the earthen dikes that surround the marsh likely change as the marsh is managed and dikes are repaired. Common species found on earthen dikes are similar to those found in wet meadows and include common greenbrier, swamp thistle, cone flower, common milkweed, asters, river-bank grape and common burdock (**AEC 1973**;Section 2.7.2; **Campbell 1995**, Pages 189-192; **Bolsenga and Herdendorf 1993**, Pages 372, 380).

2.4.3 Habitat Management

The USFWS completed the Ottawa National Wildlife Refuge Comprehensive Conservation Plan in 2000. The plan was created to outline how the Refuge will fulfill its legal purpose and contribute to the National Wildlife Refuge System's wildlife, habitat and public use goals. The Conservation Plan is intended to be updated every 5 to 10 years based on information gathered through monitoring the site (**USFWS 2009c**).

Within the Navarre Marsh, habitat is managed through the use of electric pumps. The pumps are used to lower marsh pools during spring migrations, exposing knolls thereby creating nesting habitat as well as promoting vegetation growth throughout the summer. In early fall, the water levels are increased to accommodate southward migrations (**FirstEnergy 2008**; **AEC 1973**).

The biodiversity of this ecoregion is being challenged by invasive species. These species are of focus for study and control by the ODNR, USFWS and ONWR staffs. Invasive species that are of concern and are considered a priority for management include purple loosestrife, reed canary grass, phragmites and flowering rush (**USFWS 2009c**).

Purple loosestrife, reed canary grass and phragmites all grow in a variety of wetland habitats, primarily in northern Ohio. All three species invade both natural and disturbed wetlands, replacing native vegetation with nearly homogeneous stands of each. These three species are classified as "targeted species" by the ODNR as they are the most invasive and difficult to control. Management techniques used to eradicate loosestrife include hand-pulling or digging up small stands. Currently, biological controls using insects are being researched. Reed canary grass management techniques include burning and mowing and phragmites is best controlled by cutting. In all three species herbicides are used to treat larger stands (**ODNAP 2009d**; **TNC 2009**).

Flowering rush is not considered to be a targeted species by the ODNR, but is a species that is on the state's "well-established invasive species" list. Species put on this list have a distribution that is state-wide or regional in Ohio and pose moderate to serious threats to natural areas. Flowering rush can grow as an emergent plant along shorelines and as a submersed plant in lakes and rivers. This species is best managed by cutting the stalk of the plant below the water or digging it up taking care to remove all root fragments. Mechanical methods of harvesting are not recommended as root fragments of the plant are able to form new plants. Herbicides are effective, but not selective and can spread easily to native plants through the water (**MIPN 2009**; **TNC 2009**).

Within the marsh, there is a large lacustrine area which contains both permanently flooded and semipermanently flooded sections; the latter of the two contains some aquatic beds. There are sections of the marsh that are seasonally flooded, comprised of broad-leaved deciduous species as well as containing aquatic beds. The section of the Navarre Marsh that adjoins the intake channel is classified as being a mix between a broad-leaf deciduous scrub – shrub marsh and an emergent marsh, both of which are semipermanently flooded. To the northeast of and adjoining the intake channel there is a marsh area classified as having sections that are forested, containing broad-leaved deciduous species as well as sections that contain emergent species and that are persistent. Both areas are classified as being seasonally flooded. Notably, nearly all wetlands and lake-like areas located on the Davis-Besse site are classified as Palustrine aquatic bed, semipermanently flooded diked/impounded (PABFh) or Palustrine forested broad-leaf deciduous, seasonally flooded (PFO1C) (**USFWS 2009a**).

2.4.4 References

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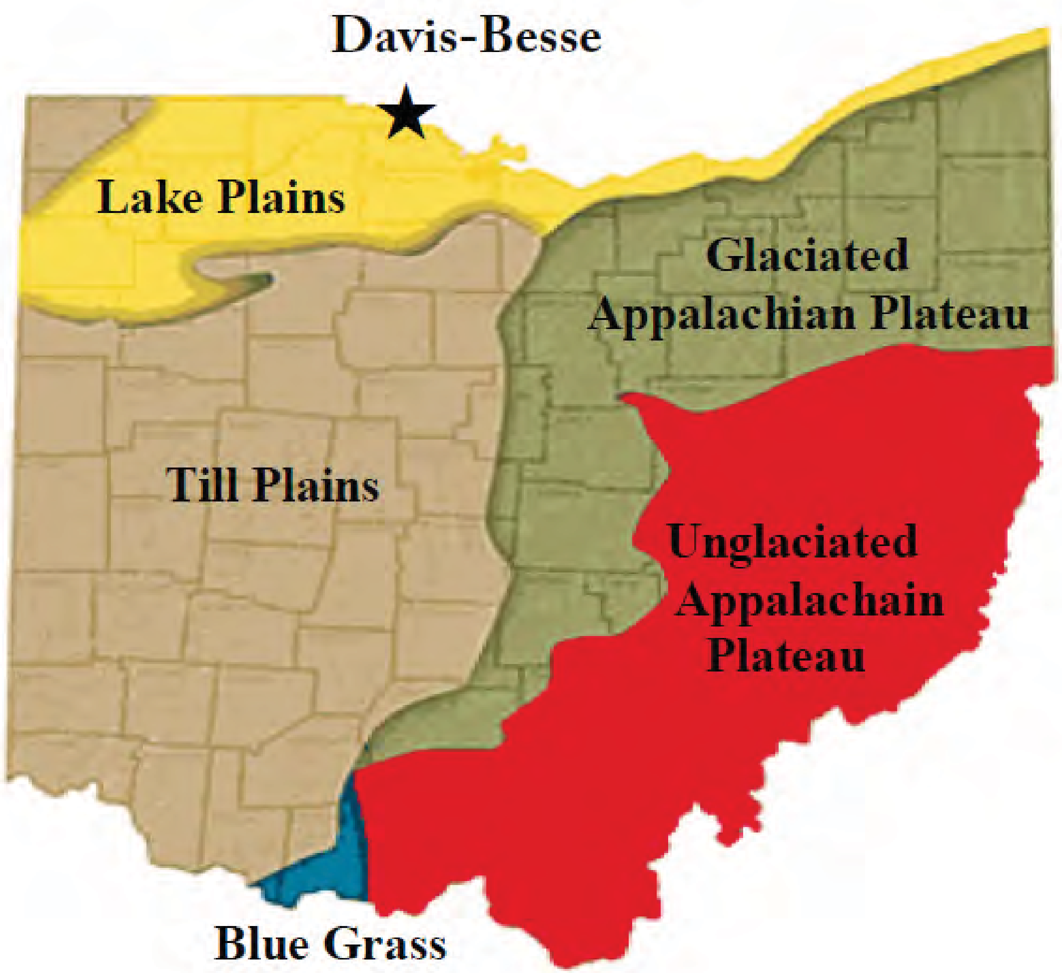
Figure 2.4-1: Ohio's Five Physiographic Regions



Source: ODNAP 2009c

2.5 THREATENED OR ENDANGERED SPECIES

2.5.1 OVERVIEW

The USFWS has listed several species with ranges that include the Navarre Marsh area as threatened or endangered at the federal level or candidates for such listing. Similarly, threatened, endangered and candidate species have been designated at the state level under programs administered by the Ohio Department of Natural Resources, Division of Wildlife and Division of Natural Areas and Preserves. The state resource agencies also use several additional classifications to guide conservation and management of wildlife resources. The total number of species according to taxa that are classified as endangered, threatened, species of concern, special interest, extirpated, or extinct for the state of Ohio is provided in Table 2.5-1. Table 2.5-2 lists those federally listed and candidate species that have been identified as being in, around or potentially occurring on the Davis-Besse site. Table 2.5-2 also lists state-listed, candidate and additional status given species that are considered to have a potential for occurring on or near the Davis-Besse site.

Federal and state-listed terrestrial species closely associated with the habitats found in the HELP ecoregion include the, star-nosed mole, Indiana bat, piping plover, Karner Blue butterfly, Virginia rail, sora, yellow-bellied sapsucker, least flycatcher, loggerhead shrike, Golden-winged warbler, magnolia warbler, Kirtland warbler, mourning warbler, Canada warbler, hermit thrush, sharp-shinned hawk, peregrine falcon, bald eagle, osprey, northern harrier, sandhill crane, American bittern, least bittern, king rail and black tern. Species and state and federal classification can be found in Table 2.5-2.

Federal and state-listed reptiles and amphibians that can be found in this ecoregion include the Lake Erie water snake, eastern massasauga rattlesnake, copperbelly water snake, spotted turtle, Blanding's turtle, box turtle and Kirtland's water snake (**USFWS 2009c**, **d**, **e**, **f**, **g**; **ODNAP 2009a, b, c, d**; **ODNR 2009**). The Lake Erie water snake is a federally-listed threatened species. They live on the cliffs and rocky shorelines of limestone islands and feed on fish and amphibians. Some of the Lake Erie water snakes are protected under the Endangered Species Act and some are not. The distinction is made on the basis of where the snakes are found. The snakes that live on a group of limestone islands in western Lake Erie that are located more than one mile from the Ohio and Canada mainlands are protected under the Endangered Species Act. Water snakes on the Ohio mainland, Mouse Island, and Johnson's Island are not protected under the Endangered Species Act. The primary reason for the snakes decline is habitat destruction (**USFWS 2008**).

Aquatic species that have been given a state or federal status that can be found in the HELP ecoregion include lake sturgeon, spotted gar, cisco, lake whitefish, burbot, eastern sand darter, channel darter, purple wartyback, snuffbox, wavy-rayed lampmussel, eastern pondmussel, black sandshell, threehorn wartyback, fawnsfoot, deertoe, and rayed bean (**USFWS 2009c**, **d**, **e**, **f**, **g**; **ODNAP 2009a, b, c, d**; **ODNR 2009**).

2.5.2 Davis-Besse Site

As discussed in Sections 2.2 and 2.4, the Davis-Besse site and associated wetlands provide habitat for numerous wildlife and plant species. Included are remnant habitats for terrestrial and aquatic organisms that were wide-spread before much of the region was converted to agricultural and urban lands. For example, Navarre marsh and similar surrounding wetlands were once part of a much larger wetland complex known as the Great Black Swamp that covered 300,000 acres. Today, only about 10% of this original wetland habitat remains (**USFWS 2009c**).

Federal and state-listed species occurring onsite or in the immediate vicinity of Davis-Besse are described by the USFWS and the ODNR. Several state, federal and independent agencies have reported listed species which include 1 mammal, 22 bird, 6 reptile, 7 fish, 9 mussel and 11 invertebrate species that are or potentially could be on the Davis-Besse site (**USFWS 2009c**, **d**, **e**, **f**, **g**; **ODNAP 2009a, b, c, d**; **ODNR 2009**; **BSBO 2010a**, **b**). Plant data is not as complete as animal data, so the rare plant list from Ottawa County, prepared by the Ohio Division of Natural Areas and Preserves, has been used to determine which species are associated with habitats similar to those found on the Davis-Besse site. Of the 69 state-listed rare plant species that occur in Ottawa County, 36 species grow in habitats that can be found within the Davis-Besse site and therefore could potentially be present. Of these, two species, the eastern prairie fringed orchid and the lakeside daisy are federally threatened (**ODNAP 2009b**).

In 2008, the BSBO banded several designated state-listed birds within the Navarre Marsh. These include Virginia rail, sora, yellow-bellied sapsucker, least flycatcher, loggerhead shrike, golden-winged warbler, magnolia warbler, Kirtland warbler, mourning warbler, Canada warbler, hermit thrush, sharp-shinned hawk, peregrine falcon, bald eagle, osprey, northern harrier, sandhill crane. Additional species not banded by the BSBO, but that could potentially utilize the Navarre Marsh include the American bittern, least bittern, king rail, and black tern. Of these species, only Kirtland's warbler is listed as federally endangered (**ODNR 2009**). Table 2.5-3 lists the passerine species for the spring and fall migrations for 2007 and 2008 along with total number of each species banded during each migration on the Navarre Marsh. Table 2.5-3 also lists the raptor species surveyed during spring of 2008 throughout the Navarre Marsh and ONWR complex as well as total number for each species sighted during that time period.

Review of the USFWS website revealed that the only designated critical habitat in the area was for the piping plover. Although the piping plover is not listed as being found on or potentially near the Davis-Besse site, it has a federal and state listing as endangered. The USFWS has designated two sites as piping plover critical habitat in northwest Ohio. The first site is located in Erie County around the Sheldon MarshState Nature Preserve, and the other site is in Lake County near the Headlands Dunes State Nature Preserve, approximately 30 miles and 115 miles east of the Navarre Marsh, respectively (**USFWS 2009h**,**i**).

All of the nine listed species of mussels were found in the western Lake Erie region by the Ohio State University Center for Lake Erie Area Research (**Herdendorf 1983**, Pages 121-122). Current data provided by the ODNR Natural Heritage Program indicates that these same species can still be found in this region of the lake, and therefore have the potential for occurring on or near the Davis-Besse Site (**ODNAP 2009a**). The only mussel given a federal status is the rayed bean, which is listed as a species of concern. There are seven fish species that can be found in this region of western Lake Erie that are also variously state-designated as being endangered, threatened, a species of concern or candidate species, none of which have been given a federal status (**ODNR 2009**, **USFWS 2009d**).

2.5.3 References

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Table 2.5-1: Number of Species in Major Taxa Classified as Endangered, Threatened, Species of Concern, Special Interest, Extirpated, or Extinct in Ohio, January 2009

Taxon	Endangered	Threatened	Concern	Special Interest	Extirpated	Extinct
Mammals	5	0	8	0	9	0
Birds	16	11	13	31	4	2
Reptiles	5	2	13	0	0	0
Amphibians	5	1	2	0	0	0
Fishes	23	13	11	0	5	2
Mollusks	24	4	9	0	13	5
Crayfishes	0	2	3	0	0	0
Isopods	0	0	2	0	0	0
Pseudo-scorpions	0	0	1	0	0	0
Dragonflies	13	6	1	0	0	0
Damselflies	3	0	0	0	0	0
Caddisflies	3	6	3	00	0	0
Mayflies	2	0	1	0	0	0
Midges	1	3	1	0	0	0
Crickets	0	0	1	0	0	0
Butterflies	8	1	2	1	1	0
Moths	14	4	22	10	0	0
Beetles	3	2	6	0	0	0
Total	125	55	99	42	32	9

Source: **ODNR 2009**

Table 2.5-2: Federal and State Listed Species of Known Occurrences or Potentially Occurring on the Davis-Besse Site

Common Name	Scientific Name	State Status	Federal Status
Plants			
alpine rush	*Juncus alpinus*	P	
American beach grass	*Ammophila breviligulata*	T	
American sweet flag	*Acorus americanus*	P	
American water milfoil	*Myriophyllum sibiricum*	T	
balsam poplar	*Populus balsamifera*	E	
baltic rush	*Juncus balticus*	P	
bearded wheat grass	*Elymus trachycaulus*	T	
Bebb's sedge	*Carex bebbii*	P	
bullhead-lily	*Nuphar variegata*	E	
bushy cinquefoil	*Potentilla paradoxa*	T	
Canada milk-vetch	*Astragalus canadensis*	T	
Caribbean spike-rush	*Eleocharis geniculata*	E	
deer's-tongue arrowhead	*Sagittaria rigida*	P	
Drummond's rock cress	*Arabis drummondii*	E	
prairie fringed orchid	*Platanthera leucophaea*	T	T
flat-stemmed pondweed	*Potamogeton zosteriformis*	P	
floating pondweed	*Potamogeton natans*	P	
Garber's sedge	*Carex garberi*	E	
golden fruited sedge	*Carex aurea*	T	
lakeside daisy	*Tetraneuris herbacea*	E	T
little green sedge	*Carex viridula*	P	
low umbrella sedge	*Cyperus diandrus*	P	
narrow-leaved blue-eyed grass	*Sisyrinchium mucronatum*	E	
ovate spike-rush	*Eleocharis ovata*	E	
Philadelphia panic grass	*Panicum philadelphicum*	E	
Pursh's bulrush	*Schoenoplectus purshianus*	P	
Richardson's pondweed	*Potamogeton richardsonii*	P	
rock elm	*Ulmus thomasii*	P	
Smith's bulrush	*Schoenoplectus smithii*	E	

Table 2.5-2: Federal and State Listed Species of Known Occurrences or Potentially Occurring on the Davis-Besse Site
(continued)

Common Name	Scientific Name	State Status	Federal Status
Smith's bulrush	*Scirpus smithii*	E	
southern wapato	*Lophotocarpus (=Sagittaria) calycinus*	P	
Sprengel's sedge	*Carex sprengelii*	T	
variegated scouring-rush	*Equisetum variegatum*	E	
wapato	*Sagittaria cuneata*	T	
wheat sedge	*Carex atherodes*	P	
wild rice	*Zizania aquatica*	T	
Invertebrates			
Insects			
Canada darner	*Aeshna canadensis*	E	
elfin skimmer	*Nannothemis bella*	E	
frosted elfin	*Incisalia irus*	E	
Karner blue	*Lycaeides melissa samuelis*	E	E
marsh bluet	*Enallagma ebrium*	T	
persius dusky wing	*Erynnis persius*	E	
plains clubtail	*Gomphus externus*	E	
purplish copper	*Lycaena helloides*	E	
silver-bordered fritillary	*Boloria selene*	T	
tiger beetle	*Cicindela hirticollis*	T	
unexpected cycnia	*Cycnia inopinatus*	E	
Mussels			
black sandshell	*Ligumia recta*	T	
deertoe	*Truncilla truncata*	SC	
eastern pondmussel	*Ligumia nasuta*	E	
fawnsfoot	*Truncilla donaciformis*	T	
purple wartyback	*Cyclonaias tuberculata*	SC	
rayed bean	*Villosa fabalis*	E	C
snuffbox	*Epioblasma triquetra*	E	
threehorn wartyback	*Obliquaria reflexa*	T	
wavy-rayed lampmussel	*Lampsilis fasciola*	SC	

Table 2.5-2: Federal and State Listed Species of Known Occurrences or Potentially Occurring on the Davis-Besse Site
(continued)

Common Name	Scientific Name	State Status	Federal Status
Fish			
burbot	*Lota lota*	SC	
channel darter	*Percina copelandi*	T	
cisco	*Coregonus artedii*	E	
eastern sand darter	*Ammocrypta pellucida*	SC	
lake sturgeon	*Acipensar fulvescens*	E	
lake whitefish	*Coregonus clupeaformis*	SC	
spotted gar	*Lepisosteus oculatus*	E	
Reptiles			
Blanding's turtle	*Emydoidea blandingi*	SC	
box turtle	*Terrapene Carolina*	SC	
eastern massasauga swamp rattler	*Sistrurus catenatus catenatus*	E	C
Kirtland's water snake	*Natrix kirtlandii*	T	
Lake Erie water snake	*Natrix sipedon insularium*	E	T
spotted turtle	*Clemmys guttata*	T	
Birds			
American bittern	*Botaurus lentiginosus*	E	
bald eagle	*Haliaeetus leucocephalus*	T	
black tern	*Chlidonias niger*	E	
Canada warbler	*Wilsonia canadensis*	SI	
golden-winged warbler	*Vermivora chrysoptera*	E	
hermit thrush	*Catharus guttatus*	T	
king rail	*Rallus elegans*	E	
Kirtland's warbler	*Dendroica kirtlandii*	E	E
least bittern	*Ixobrychus exilis*	T	
least flycatcher	*Empidonax minimus*	T	
loggerhead shrike	*Lanius ludovicianus*	E	
magnolia warbler	*Dendroica magnolia*	SI	
mourning warbler	*Oporornis philadelphia*	SI	
northern harrier	*Circus cyaneus*	E	

Table 2.5-2: Federal and State Listed Species of Known Occurrences or Potentially Occurring on the Davis-Besse Site
(continued)

Common Name	Scientific Name	State Status	Federal Status
osprey	*Pandion haliaetus*	T	
peregrine falcon	*Falco peregrinus*	T	
sandhill crane	*Grus canadensis*	E	
sharp-shinned hawk	*Accipiter striatus*	SC	
sora rail	*Porzana carolina*	SC	
Virginia rail	*Rallus limicola*	SC	
yellow-bellied sapsucker	*Sphyrapicus varius*	E	
Mammals			
star-nosed mole	*Condylura cristata*	SC	

Sources: **BSBO 2010a**, **b**; **ODNR 2009**; **USFWS 2009c**, **d**, **e**; **CFR 2008a**, **b**

Table Captions:

State Status

E: ENDANGERED - A native species or subspecies threatened with extirpation from the state.

T: THREATENED - A species or subspecies whose survival in Ohio is not in immediate jeopardy, but to which a threat exists.

SC: SPECIES OF CONCERN - A species or subspecies which might become threatened in Ohio under continued or increased stress. Also, a species or subspecies for which there is some concern but for which information is insufficient to permit an adequate status evaluation.

SI: SPECIAL INTEREST - A species that occurs periodically and is capable of breeding in Ohio. It is at the edge of a larger, contiguous range with viable population(s) within the core of its range. These species have no federal endangered or threatened status, are at low breeding densities in the state, and have not been recently released to enhance Ohio's wildlife diversity.

P: POTENTIALLY THREATENED - A native Ohio plant species may be designated potentially threatened if one or more of the following criteria apply:

1. The species is extant in Ohio and does not qualify as a state endangered or threatened species, but it is a proposed federal endangered or threatened species or a species listed in the Federal Register as under review for such proposal.

Table 2.5-2: Federal and State Listed Species of Known Occurrences or Potentially Occurring on the Davis-Besse Site
(continued)

2. The natural populations of the species are imperiled to the extent that the species could conceivably become a threatened species in Ohio within the foreseeable future.

3. The natural populations of the species, even though they are not threatened in Ohio at the time of designation, are believed to be declining in abundance or vitality at a significant rate throughout all or large portions of the state.

Federal Status

E: ENDANGERED - An animal or plant species in danger of extinction throughout all or a significant part of its range.

T: THREATENED - Likely to become endangered within the foreseeable future throughout all or a significant part of its range.

C: CANDIDATE - Sufficient information exists to support listing as endangered or threatened.

Table 2.5-3: Species and Total Numbers of Birds Banded and or Sighted at the Navarre Marsh or Throughout the ONWR Complex during Spring and Fall Migrations, 2007- 2008

Number of Birds Banded at the Navarre Marsh					
Passerine					
Common Name	**Scientific Name**	**2008**		**2007**	
		Spring	**Fall**	**Spring**	**Fall**
Canada warbler	*Oporornis philadelphia*	105	9	182	8
golden-winged warbler	*Lanius ludovicianus*	1	0	2	1
hermit thrush	*Wilsonia canadensis*	95	183	98	262
Kirtland warbler	*Dendroica magnolia*	0	N/A	0	N/A
least flycatcher	*Sphyrapicus varius*	56	1	96	6
loggerhead shrike	*Empidonax minimus*	0	N/A	1	N/A
magnolia warbler	*Vermivora chrysoptera*	414	101	1,282	113
mourning warbler	*Dendroica kirtlandii*	88	6	134	20
sharp-shinned hawk	*Accipiter striatus*	12	0	4	1
sora	*Porzana Carolina*	0	N/A	0	N/A
Virginia rail	*Rallus limicola*	0	N/A	0	N/A
yellow-bellied sapsucker	*Botaurus lentiginosus*	2	5	3	5

Raptors*			
Common Name	**Scientific Name**	**2008 Total Count**	**2007**
bald eagle	*Haliaeetus leucocephalus*	371	181
northern harrier	*Circus cyaneus*	167	122
osprey	*Pandion haliaetus*	29	14
peregrine falcon	*Falco peregrinus*	3	8
sandhill crane	*Grus canadensis*	13	43
sharp-shinned hawk	*Accipiter striatus*	389	492

Source: **BSBO 2009; BSBO 2010a, b**

* Raptors are only surveyed in the spring.

2.6 DEMOGRAPHY

2.6.1 GENERAL DEMOGRAPHIC CHARACTERISTICS

The study area is defined by a 50-mile radius around Davis-Besse and includes all or parts of 15 counties in Ohio, four counties in Michigan, and 10 Canadian census subdivisions in Ontario. Toledo, Ohio, is the nearest major city to Davis-Besse; its center is approximately 30 miles to the west-northwest of Davis-Besse. The 2000 U.S. Census Bureau decennial census indicated that the urban area of Toledo has a population of 502,146. A portion of Detroit, Michigan, lies to the north of Davis-Besse. This urban area's 2000 population is 3,900,539. To the north, most of the Canadian City of Windsor lies approximately 50 miles from Davis-Besse. The 2001 Canada Census estimated the population at 208,402. The urbanized area of Lorain-Elyria, Ohio, is approximately 50 miles east of Davis-Besse. The 2000 census population estimate for this urbanized area is 188,818. Cleveland, Ohio, is another major city in the vicinity; its center is approximately 70 miles (113 km) east of Davis-Besse. The urbanized population figure for the 2000 census for Cleveland is 1,785,038 (**ESRI 2007**). The study area is shown in Figure 2.6-1.

Table 2.6-1 through Table 2.6-7 present general demographic information for the jurisdictions around Davis-Besse. These include the population of U.S. Census Bureau (USCB) block-groups within a 50 mile radius of the plant. The Ohio counties of Lucas, Ottawa, Sandusky, and Wood are included in the general demographic information because most of the Davis-Besse work force resides within these areas (Section 3.4). Background data presented includes the total population of the 19 U.S. counties and 10 Canadian census subdivisions that fall entirely or partly within 50 miles of the plant. Population projections are included for the states of Michigan and Ohio, as well as the Canadian province of Ontario.

2.6.1.1 Current Demographic Characteristics

The population of persons residing within 20 and 50 miles of the Davis-Besse site was determined from the 2000 census block group data. Census block group population data were included if the block fell partly or entirely within an area. Most of the census blocks that fell partly within a zone were low density and, as a result, were not thought to significantly bias population size upward if included. Population density of the two zones was calculated using the total area circumscribed by their respective radii. This calculation provides a conservatively higher estimate of density than using an area defined by census blocks including those that may fall partly outside the 20 or 50 mile radii.

Using the methodology described above, an estimated 2,375,624 people lived within 50 miles of Davis-Besse in 2000, with a population density of 316 people per square mile (Table 2.6-1). This density is higher than the density for the state of Ohio (253 people per square mile), Michigan (103 people per square mile), and Ontario (27 people per square mile). Within the 20 mile area there were an estimated 129,411 persons, at a density of 169 persons per square mile (**ESRI 2007**).

Applying the GEIS population sparseness criterion to Table 2.6-1, Davis-Besse is sparseness Category 4, "least sparse" (≥ 120 persons per square mile within 20 miles), as shown in Table 2.6-1. Applying the GEIS proximity criterion using Table 2.6-1 again, Davis-Besse falls into Category 4, "in close proximity" (>190 persons per square mile within 50 miles). Per the GEIS sparseness-proximity matrix, Davis-Besse is located in a high population area (**NRC 1996**, Section C.1.4).

2.6.1.2 Population Projections

As shown in Table 2.6-1, a population increase of 3.1% for 2000 - 2005 was expected for the combined U.S. block groups and Canadian census subdivisions within a 50 mile radius of Davis-Besse (**ESRI 2006, ESRI 2007, StatCan 2006b**). A slight decline (-0.4%) from the present population of 129,411 was expected for U.S. block groups within 20 miles of Davis-Besse (**ESRI 2006, ESRI 2007**). The expected change in population (2000 – 2005) for Ohio and Michigan are similar, 1.0% and 1.6%, respectively (**USCB 2006**). Counties near Davis-Besse expected to have a declining population were Lucas, Ottawa, and Sandusky. Lucas County's population was expected to increase by 2.4% in the time period 2000 – 2005 (**MHAL 1996**; **ODD 2004**).

Population projections by county to 2040 indicate that five Ohio counties will experience a population decline: Crawford, Lucas, Ottawa, Sandusky, and Seneca. One Michigan county, Wayne, will also have a population decline over the same time period (Table 2.6-2 and Table 2.6-4). Canadian population projections were derived from estimates of the entire Province of Ontario's growth over the time period of 2006 – 2040 (**StatCan 2006a, b**). The growth rate for this area is higher for the period 2006 – 2010, but declines thereafter (Table 2.6-3 and Table 2.6-5).

2.6.2 MINORITY AND LOW INCOME POPULATIONS

Minority and low-income populations in the 50-mile geographic area were analyzed based on 2000 decennial census block data. The results were compiled and maps were produced showing the geographic location of minority and low-income populations in relation to the site. Information for both groups was then reviewed with respect to the NRC Office of Nuclear Reactor Regulation guidance (**NRC 2004**).

2.6.2.1 Minority Populations

Minority populations are defined as American Indian or Alaskan Native, Asian, Black, Native Hawaiian or Pacific Islander, Multi-Racial, and Hispanic ethnicity. Other races are analyzed as one group (Other). The relative sizes of minority populations in jurisdictions surrounding Davis-Besse are included in Table 2.6-6 and Table 2.6-7.

The NRC determined that a minority population exists in a specific census block if either of two criteria is met:

- The minority population percentage of the census block exceeds 50%.
- The minority population percentage of the census block is significantly greater (more than 20%) than the minority population percentage in the geographic region chosen for comparison.

The comparison area selected for this analysis consists of the 19 counties surrounding Davis-Besse that are entirely or partly within 50 miles of the station. This area contains 4,002 census block-groups. The study area is defined as a 50 mile radius around Davis-Besse and is a subset of the comparison area, consisting of all or parts of the counties that fall within the 50 mile radius; 1,747 census block groups are within 50 miles of Davis-Besse (Figure 2.6-1). Figure 2.6-2 through Figure 2.6-7 locate the minority block groups with the 50-mile radius.

Within the Canadian census subdivisions, minority groups make up less than 14% of the population. Windsor has the most diversity with a white population of 79%, Asian population of 11%, and 5% other ethnic groups. Pelee’s population of 256, has a relatively large Latin American population (13%) (Table 2.6-5 and Table 2.6-7).

2.6.2.2 Low Income Populations

Low-income populations are defined by assessing household income according to a poverty income threshold determined by the U.S. Census Bureau (USCB). The Canadian census provides the percentage of persons in low income after tax for census subdivisions. Figure 2.6-8 shows the low-income population block groups within a 50-Mile radius of the Davis-Besse site.

The NRC determined that a low-income population exists in a specific census block if either of two criteria is met:

- The low income population percentage of the census block group exceeds 50%.

- The low income population percentage of the census block group is significantly greater (more than 20%) than the low income population percentage in the geographic region chosen for comparison.

The number of census block groups within a 50 mile radius of Davis-Besse meeting the above criteria for low-income households are included in Table 2.6-8 (50% criterion) and Table 2.6-9 (20% criterion). Thirteen block groups met the 50% criterion: eight are in Lucas County, two are in Wood County, and three are in Wayne County. One hundred twenty block groups met the 20% criterion, including block groups in Erie, Huron, Lorain, Lucas, Wood, Monroe, and Wayne counties. Lucas County, which contains Toledo, has 62 low income block groups. Wayne County, Michigan, which contains a portion of Detroit, has 36 low income block groups.

2.6.2.3 Migrant Populations

Migrant population totals by state, county, farms, and workers are summarized in Table 2.6-10. Data on migrant populations for the 19 counties in Ohio and Michigan within the 50 miles of Davis-Besse were obtained from the US Department of Agriculture 2002 Census of Agriculture.

Migrant laborers were defined as any worker whose employment required travel that prevented the migrant worker from returning to his/her permanent place of residence the same day and worked on a farm less than 150 days. The 2007 Census of Agriculture-County Data (**USDA 2007a, b**) estimates that there were 1,827 farms in the 15 Ohio counties surrounding Davis-Besse, with a total of 8,166 farm workers that worked less than 150 days. The four counties in Michigan surrounding Davis-Besse had 669 farms with a total of 3,379 farm workers that worked less than 150 days.

2.6.2.4 Seasonal and Transient Populations

As described in Section 2.9.6, the area in the vicinity of Davis-Besse comprises a significant percentage of all recreation in the four-county area. Ottawa County, in particular, has the most facilities and acreage devoted to state parks, forests, natural preserves, and wildlife. Its location along Lake Erie and its islands provide a wide variety of opportunities for water-based recreational activities.

As a result, there are significant seasonal and transient population groups within a 10-mile radius of Davis-Besse. Table 2.6-11 lists the estimated population of these groups, along with the permanent population within the 10-mile area. The seasonal population group comprises those people who reside in the area during warmer months, principally May through October. The transient population group comprises those people who enter the area for a specific purpose (e.g., recreation) and who leave on the same day or stay overnight at motels and hotels.

As shown in Table 2.6-11, the total combined seasonal and transient population is equivalent to the total permanent population.

2.6.3 References

Note to reader: This list of references identifies web pages and associated URLs where reference data were obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. FENOC has maintained hard copies of the information and data obtained from the referenced web pages.

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Table 2.6-1: Population Density and Recent Change in Major Jurisdictions Near Davis-Besse

Location	2000	2005	Percent Change	2000 Density (people/ sq. mi)	2005 Density (people/ sq. mi)
Ohio	11,353,140	11,470,685	1.0%	277	280
Michigan	9,938,444	10,100,833	1.6%	175	178
Ontario, Canada (1)	11,410,046	12,541,400	9.9%	33	36
Lucas County, OH	455,050	449,290	-1.3%	1337	1320
Ottawa County, OH	40,990	40,850	-0.3%	161	160
Sandusky County, OH	61,790	61,060	-1.2%	151	149
Wood County, OH	121,070	123,960	2.4%	196	201
Within 50 Miles of Davis-Besse	2,375,624	2,448,608	3.1%	316	326
Within 20 Miles of Davis-Besse	129,411	128,878	-0.4%	169	168

Sources: **ESRI 2007**; **StatCan 2001**; **StatCan 2006a**; **USCB 2000a**; **MHAL 1996**(1); **ODD 2004**

Note:

(1) Population Figure for Ontario is from the 2001 Canadian census

Table 2.6-2: Population Projections for Counties Surrounding Davis-Besse

State	County	2000 Census	2005 Estimate	Projections						
				2010	2015	2020	2025	2030	2035	2040
Ohio	Ashland	52,520	54,300	56,160	57,540	59,010	60,010	61,050	62063	63083
Ohio	Crawford	46,970	46,250	45,450	44,800	44,250	43,850	43,390	42970	42540
Ohio	Erie	79,550	81,020	81,420	82,260	82,400	83,180	83,060	83540	83870
Ohio	Fulton	42,080	43,270	44,610	45,830	47,210	48,190	49,110	50070	51020
Ohio	Hancock	71,300	73,030	74,180	75,740	76,910	78,250	79,040	80197	81262
Ohio	Henry	29,210	29,440	29,540	29,850	29,990	30,200	30,110	30220	30280
Ohio	Huron	59,490	60,830	62,040	62,610	63,430	63,690	64,020	64303	64598
Ohio	Lorain	284,660	288,400	290,840	295,660	299,630	306,720	312,540	319207	325662
Ohio	Lucas	455,050	449,290	444,870	439,370	434,650	426,860	417,870	409680	401290
Ohio	Ottawa	40,990	40,850	40,790	40,450	40,270	39,400	38,520	37647	36772
Ohio	Richland	128,850	128,190	128,900	128,770	130,050	130,460	132,180	133027	134092
Ohio	Sandusky	61,790	61,060	59,940	58,910	57,900	57,130	56,420	55670	54930
Ohio	Seneca	58,680	57,560	56,750	55,420	54,260	52,620	50,920	49260	47590
Ohio	Wood	121,070	123,960	127,020	129,500	133,330	136,480	141,880	145780	150055
Ohio	Wyandot	22,910	22,870	23,090	23,180	23,400	23,360	23,240	23173	23093
Michigan	Lenawee	98,890	100939	100286	102299	104025	105502	106704	107620	108242
Michigan	Monroe	145,945	152234	153140	154592	155525	155845	155566	154690	153224
Michigan	Washtenaw	322,895	343858	350008	361477	372946	384050	394823	405217	415186
Michigan	Wayne	2,061,162	2025145	1914940	1864929	1822219	1785118	1753609	1727407	1706277

Sources: USCB 2000a; MHAL 1996[(1)]; ODD 2004

Note: (1) Michigan county projections report estimated 2000 population; this table presents 2000 census.

Table 2.6-3: Population Projections for Canadian Census Subdivisions near Davis-Besse

Location	2001 Census	2005 Estimate	Projections						
			2010	2015	2020	2025	2030	2035	2040
Amherstburg	20,339	21,466	22,537	23,322	24,048	24,732	25,335	25,822	26,187
Chatham-Kent	107,341	108,010	112,099	116,008	119,616	123,021	126,018	128,443	130,259
Essex	20,085	20,043	20,758	21,482	22,150	22,781	23,336	23,785	24,121
Kingsville	19,619	20,650	21,666	22,421	23,119	23,777	24,356	24,825	25,176
Lakeshore	28,746	32,345	34,450	35,651	36,761	37,807	38,728	39,473	40,031
Lasalle	25,285	27,179	28,655	29,654	30,576	31,446	32,213	32,832	33,297
Leamington	27,138	28,494	29,878	30,920	31,882	32,789	33,588	34,235	34,719
Pelee	256	281	297	308	317	326	334	341	346
Tecumseh	25,105	24,237	25,102	25,977	26,786	27,548	28,219	28,762	29,169
Windsor	208,402	215,022	224,322	232,143	239,365	246,176	252,176	257,028	260,661

Sources: **StatCan 2001**; **StatCan 2006b**

Notes:

(1) Estimates and projections based on growth rates for the entire Province of Ontario under scenario 1 (StatCan 2006b, Page 72).

Table 2.6-4: Annual Projected Population Percentage Change for Counties Surrounding Davis-Besse

State	County	2000 Census	2005 Estimate	Projections						
				2010	2015	2020	2025	2030	2035	2040
Ohio	Ashland	52,520	3.4%	3.4%	2.5%	2.6%	1.7%	1.7%	1.7%	1.6%
Ohio	Crawford	46,970	-1.5%	-1.7%	-1.4%	-1.2%	-0.9%	-1.0%	-1.0%	-1.0%
Ohio	Erie	79,550	1.8%	0.5%	1.0%	0.2%	0.9%	-0.1%	0.6%	0.4%
Ohio	Fulton	42,080	2.8%	3.1%	2.7%	3.0%	2.1%	1.9%	2.0%	1.9%
Ohio	Hancock	71,300	2.4%	1.6%	2.1%	1.5%	1.7%	1.0%	1.5%	1.3%
Ohio	Henry	29,210	0.8%	0.3%	1.0%	0.5%	0.7%	-0.3%	0.4%	0.2%
Ohio	Huron	59,490	2.3%	2.0%	0.9%	1.3%	0.4%	0.5%	0.4%	0.5%
Ohio	Lorain	284,660	1.3%	0.8%	1.7%	1.3%	2.4%	1.9%	2.1%	2.0%
Ohio	Lucas	455,050	-1.3%	-1.0%	-1.2%	-1.1%	-1.8%	-2.1%	-2.0%	-2.0%
Ohio	Ottawa	40,990	-0.3%	-0.1%	-0.8%	-0.4%	-2.2%	-2.2%	-2.3%	-2.3%
Ohio	Richland	128,850	-0.5%	0.6%	-0.1%	1.0%	0.3%	1.3%	0.6%	0.8%
Ohio	Sandusky	61,790	-1.2%	-1.8%	-1.7%	-1.7%	-1.3%	-1.2%	-1.3%	-1.3%
Ohio	Seneca	58,680	-1.9%	-1.4%	-2.3%	-2.1%	-3.0%	-3.2%	-3.3%	-3.4%
Ohio	Wood	121,070	2.4%	2.5%	2.0%	3.0%	2.4%	4.0%	2.7%	2.9%
Ohio	Wyandot	22,910	-0.2%	1.0%	0.4%	0.9%	-0.2%	-0.5%	-0.3%	-0.3%
Michigan	Lenawee	98,890	2.1%	-0.6%	2.0%	1.7%	1.4%	1.1%	0.9%	0.6%
Michigan	Monroe	145,945	4.3%	0.6%	0.9%	0.6%	0.2%	-0.2%	-0.6%	-0.9%
Michigan	Washtenaw	322,895	6.5%	1.8%	3.3%	3.2%	3.0%	2.8%	2.6%	2.5%
Michigan	Wayne	2,061,162	-1.7%	-5.4%	-2.6%	-2.3%	-2.0%	-1.8%	-1.5%	-1.2%

Sources: **ESRI 2007**; **MHAL 1996**; **ODD 2004**; **USCB 2000a**

Note: (1) 2005 estimate and 2010-2040 projections indicate percentage increase from prior interval; i.e., population in 2010 is 3.9% higher than estimated population in 2005.

Table 2.6-5: Projected Population Change for Canadian Census Subdivisions Near Davis-Besse

Location	2006 Census	2010 Projection (4 year)	Projection					
			2015	2020	2025	2030	2035	2040
Amherstburg	21,748	3.6%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%
Chatham-Kent	108,177	3.6%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%
Essex	20,032	3.6%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%
Kingsville	20,908	3.6%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%
Lakeshore	33,245	3.6%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%
Lasalle	27,652	3.6%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%
Leamington	28,833	3.6%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%
Pelee	287	3.5%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%
Tecumseh	24,224	3.6%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%
Windsor	216,473	3.6%	3.5%	3.2%	2.9%	2.4%	1.9%	1.4%

Source: **StatCan 2006b**

Notes:

(1) Estimates and projections based on growth rates for the entire Province of Ontario under scenario 1 (StatCan 2006b, Page 72).
(2) 2005 estimate and 2010-2020 projections indicate percentage increase from prior interval; i.e., population in 2010 is 3.9% higher than estimated population in 2005.

Table 2.6-6: General Demography for American Jurisdictions Near Davis-Besse

Location	Sex	Age				Racial/Ethnic Makeup							
	Female	Median age	Under 5	18+	65+	White	Black	American or Alaska Native	Asian	Native Hawaiian or Pacific Islander	Other	Multi-Racial	Hispanic
U.S.Block groups within 50 miles of Davis-Besse	51%	36.4	7%	74%	13%	85%	10%	0.4%	1%	< 1%	2%	2%	5%
Surrounding U.S. Counties	51%	36.6	7%	74%	13%	88%	8%	0.3%	1%	< 1%	2%	2%	4%
Lucas County, OH	52%	35.2	7%	74%	13%	78%	17%	< 1%	1%	< 1%	2%	2%	5%
Ottawa County, OH	51%	41.0	5%	77%	16%	97%	1%	< 1%	< 1%	< 1%	1%	1%	4%
Sandusky County, OH	51%	37.3	6%	74%	14%	92%	3%	< 1%	< 1%	< 1%	3%	2%	7%
Wood County, OH	52%	32.6	6%	76%	11%	95%	1%	0.2%	1%	< 1%	1%	1%	3%

Sources: **ESRI 2007**; **USCB 2000a**

Table 2.6-7: General Demography in the Major Canadian Jurisdictions Near Davis-Besse

Location	Sex	Age				Racial / Ethnic Makeup					
	Female	Median age	Under 5	20+	65+	White	Black	Asian	Other	Multi-Racial	Latin American
Amherstburg	51%	38.6	6%	73%	12%	97%	2%	1%	< 1%	< 1%	< 1%
Chatham-Kent	51%	41.2	5%	75%	16%	96%	2%	2%	< 1%	< 1%	< 1%
Essex	50%	40.8	5%	74%	14%	98%	1%	< 1%	< 1%	< 1%	< 1%
Kingsville	50%	39.9	5%	75%	15%	96%	1%	< 1%	< 1%	< 1%	2%
Lakeshore	49%	37.5	6%	71%	10%	95%	1%	3%	< 1%	< 1%	< 1%
Lasalle	51%	37.3	6%	71%	10%	91%	1%	5%	2%	1%	< 1%
Leamington	49%	37.1	7%	72%	15%	90%	1%	2%	2%	< 1%	5%
Pelee	42%	45.1	2%	86%	16%	87%	< 1%	< 1%	< 1%	< 1%	13%
Tecumseh	51%	39.9	5%	73%	10%	94%	< 1%	4%	1%	< 1%	< 1%
Windsor	51%	37.5	6%	75%	14%	79%	4%	11%	5%	< 1%	1%

Source: **StatCan 2007**

Table 2.6-8: Minority and Low-Income Population Census Block Groups (50% Criteria)

Location		Total Block Groups within 50 Miles	Minority								Low-Income
State	County		Black	American or Alaska Native	Asian	Native Hawaiian or Pacific Islander	Other	Multi-Racial	Aggregate	Hispanic	
Ohio	Ashland	1	0	0	0	0	0	0	0	0	0
	Crawford	9	0	0	0	0	0	0	0	0	0
	Erie	73	2	0	0	0	0	0	2	0	0
	Fulton	16	0	0	0	0	0	0	0	0	0
	Hancock	56	0	0	0	0	0	0	0	0	0
	Henry	11	0	0	0	0	0	0	0	0	0
	Huron	48	0	0	0	0	0	0	0	0	0
	Lorain	87	0	0	0	0	0	0	10	3	0
	Lucas	431	67	0	0	0	0	0	79	0	8
	Ottawa	39	0	0	0	0	0	0	0	0	0
	Richland	4	0	0	0	0	0	0	0	0	0
	Sandusky	61	0	0	0	0	0	0	0	0	0
	Seneca	57	0	0	0	0	0	0	0	0	0
	Wood	86	0	0	0	0	0	0	0	0	2
	Wyandot	10	0	0	0	0	0	0	0	0	0
Michigan	Lenawee	18	0	0	0	0	0	0	0	0	0
	Monroe	127	0	0	0	0	0	0	1	0	0
	Washtenaw	29	4	0	0	0	0	0	4	0	0
	Wayne	584	56	0	0	0	0	0	73	28	3
Totals:		**1747**	**129**	**0**	**0**	**0**	**0**	**0**	**169**	**31**	**13**

Sources: **ESRI 2007**; **USCB 2000a, b**

Table 2.6-9: Minority and Low-Income Population Census Block Groups (20% Criteria)

Location		Total Block Groups within 50 Miles	Minority								Low-Income
State	County		Black	American or Alaska Native	Asian	Native Hawaiian or Pacific Islander	Other	Multi-Racial	Aggregate	Hispanic	
Ohio	Ashland	1	0	0	0	0	0	0	0	0	0
	Crawford	9	0	0	0	0	0	0	0	0	0
	Erie	73	7	0	0	0	0	0	7	0	2
	Fulton	16	0	0	0	0	0	0	0	0	0
	Hancock	56	0	0	0	0	0	0	0	0	0
	Henry	11	0	0	0	0	0	0	0	0	0
	Huron	48	0	0	0	0	0	0	0	0	1
	Lorain	87	16	0	0	0	3	0	20	11	8
	Lucas	431	103	0	0	0	0	0	107	3	62
	Ottowa	39	0	0	0	0	0	0	0	0	0
	Richland	4	0	0	0	0	0	0	0	0	0
	Sandusky	61	0	0	0	0	0	0	1	2	1
	Seneca	57	0	0	0	0	0	0	0	0	0
	Wood	86	0	0	0	0	0	0	0	0	9
	Wyandot	10	0	0	0	0	0	0	0	0	0
Michigan	Lenawee	18	0	0	0	0	0	0	0	0	0
	Monroe	127	1	0	0	0	0	0	1	0	1
	Washtenaw	29	9	0	0	0	0	0	9	0	0
	Wayne	584	72	0	2	0	34	2	113	41	36
Totals:		**1747**	**208**	**0**	**2**	**0**	**37**	**2**	**258**	**57**	**120**

Sources: ESRI 2007; USCB 2000a, b

**2. 10 S A C
S**

S	**C**	**2007 C A F S 150**	**2007 C A S 150**
Ohio	Ashland	184	421
	Crawford	107	313
	Erie	68	383
	Fulton	148	686
	Hancock	130	324
	Henry	119	487
	Huron	122	1,595
	Lorain	156	651
	Lucas	78	519
	Ottawa	78	406
	Richland	113	385
	Sandusky	140	699
	Seneca	154	347
	Wood	148	600
	Wyandot	82	350
O C		**1 827**	**8 1**
Michigan	Lenawee	214	908
	Monroe	193	1,035
	Washtenaw	196	835
	Wayne	66	601
M C			**3 37**

Sources: **S A 2007**

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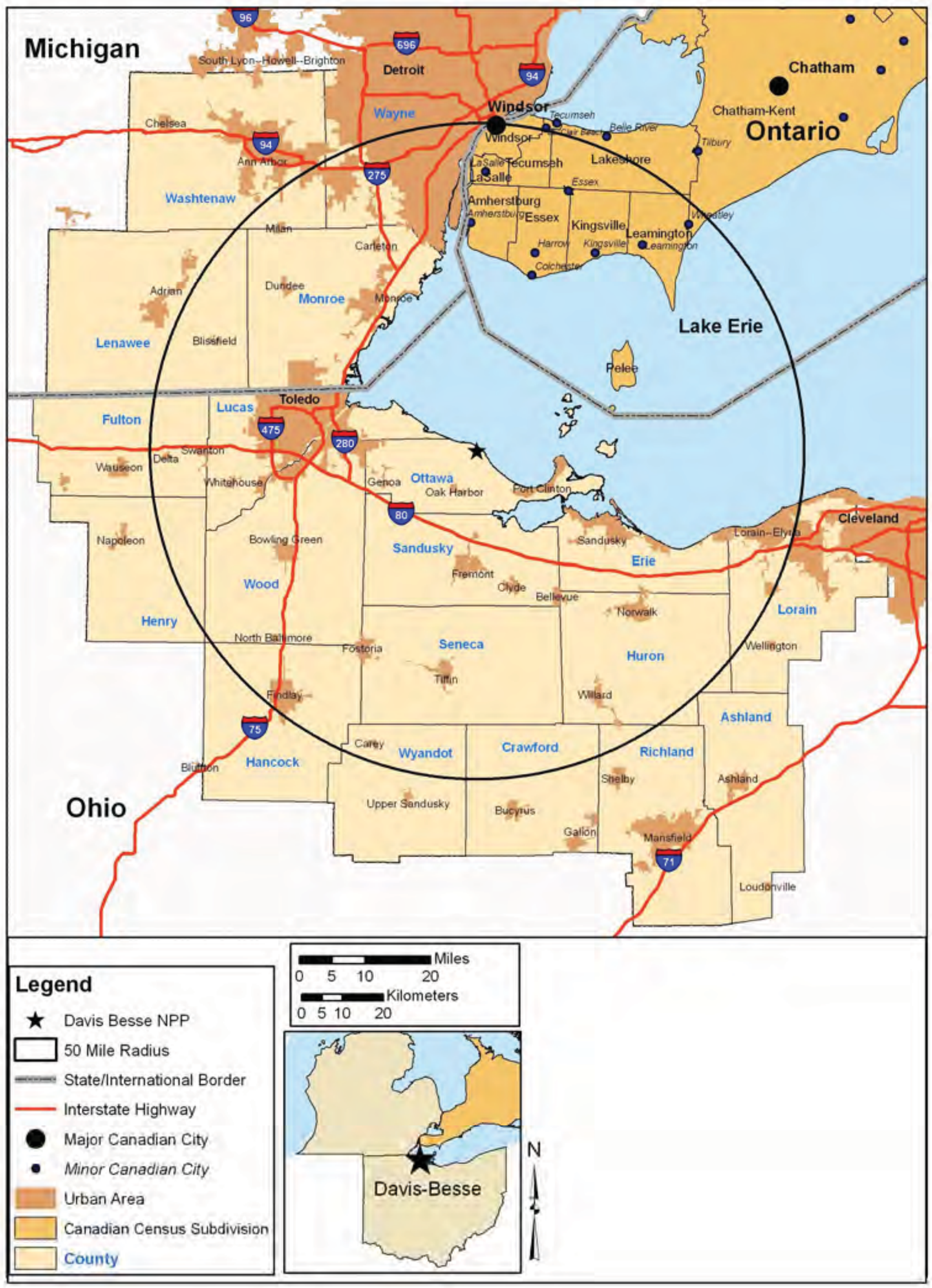
10 M

M	E P		
	P	S	
0-2	715	0	0
2-5	1,357	1,863	9,454
5-10	12,998	963	3,237
	15 070	**2 82**	**12 1**

F 2. 1 S A S C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Amherstburg
Tecumseh
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Legend
Davis Besse NPP
50 Mile Radius
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Interstate Highway
Major Canadian City
Minor Canadian City
Urban Area
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Miles
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Davis-Besse

F 2. 2 P
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Chelsea
Washtenaw
Ann Arbor
94
Wayne
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Windsor
Tecumseh
Belle River
Chatham-Kent
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Windsor
LaSalle
Tecumseh
Lakeshore
LaSalle
Essex
Michigan
Amherstburg
Amherstburg
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Wheatley
Milan
Kingsville
Leamington
Carleton
Harrow
Kingsville
Leamington
Colchester
Adrian
Dundee
Monroe
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Lake Erie
Blissfield
Lenawee
Pelee
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Lucas
Fulton
475
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Delta
Swanton
Whitehouse
Genoa
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Oak Harbor
Port Clinton
80
Bowling Green
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Lorain--Elyria
Sandusky
Erie
Fremont
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Norwalk
Lorain
Henry
North Baltimore
Fostoria
Seneca
Huron
Wellington
Tiffin
Ohio
Findlay
Willard
Ashland
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Carey
Wyandot
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Bluffton
Hancock
Shelby
Ashland
Legend
Davis Besse NPP
50 Mile Radius
Black Population
State/International Border
Interstate Highway
Major Canadian City
Minor Canadian City
Urban Area
Canadian Census Subdivision
County
Miles
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Kilometers
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Davis-Besse
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F 2. 3. A P
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Michigan
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Richland
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Chatham-Kent
Windsor
Tecumseh
LaSalle
Amherstburg
Essex
Kingsville
Leamington
Lakeshore
Pelee
Toledo
Legend
Davis Besse NPP
50 Mile Radius
Asian Population
State/International Border
Interstate Highway
Major Canadian City
Minor Canadian City
Urban Area
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Chelsea
Washtenaw
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Ann Arbor
Wayne
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Michigan
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Amherstburg
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Leamington
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Harrow
Kingsville
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Colchester
Lake Erie
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Whitehouse
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Oak Harbor
Port Clinton
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Fremont
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50 Mile Radius
Other Minority Population
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**F 2. 5 M P
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Chelsea
Washtenaw
Ann Arbor
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Tecumseh
Belle River
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Tecumseh
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Lakeshore
Essex
Michigan
Amherstburg
Amherstburg
Essex
Kingsville
Leamington
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Colchester
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Lake Erie
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Lenawee
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Lucas
Fulton
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Whitehouse
Genoa
Ottawa
Oak Harbor
Port Clinton
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Bowling Green
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Fremont
Clyde
Bellevue
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Davis Besse NPP
50 Mile Radius
Multi-racial Population
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Interstate Highway
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Minor Canadian City
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Canadian Census Subdivision
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Chelsea
Washtenaw
Ann Arbor
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Wayne
Windsor
Tecumseh
Belle River
St Clair Beach
Chatham-Kent
Tilbury
Ontario
Windsor
LaSalle
Tecumseh
LaSalle
Lakeshore
Essex
Amherstburg
Amherstburg
Essex
Kingsville
Leamington
Wheatley
Harrow
Kingsville
Leamington
Colchester
Michigan
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Carleton
Adrian
Dundee
Monroe
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Lake Erie
Blissfield
Lenawee
Pelee
Toledo
Lucas
Fulton
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Whitehouse
Genoa
Ottawa
Oak Harbor
Port Clinton
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Bellevue
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Lorain
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North Baltimore
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Davis Besse NPP
50 Mile Radius
Hispanic Population
State/International Border
Interstate Highway
Major Canadian City
Minor Canadian City
Urban Area
Canadian Census Subdivision
County
Miles
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Kilometers
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Davis-Besse
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F 2. 7: A M P
50 M R S

F 2. 8 I P
50 M R S


Chatham-Kent
Ontario
Windsor
Tecumseh
Belle River
Tilbury
Lakeshore
LaSalle
Essex
Amherstburg
Kingsville
Leamington
Wheatley
Harrow
Colchester
Lake Erie
Pelee
Wayne
Chelsea
Washtenaw
Ann Arbor
Michigan
Milan
Carleton
Adrian
Dundee
Monroe
Blissfield
Lenawee
Toledo
Lucas
Fulton
Swanton
Delta
Whitehouse
Genoa
Ottawa
Oak Harbor
Port Clinton
Sandusky
Erie
Lorain--Elyria
Bowling Green
Wood
Fremont
Clyde
Bellevue
Norwalk
Lorain
Henry
North Baltimore
Fostoria
Seneca
Huron
Wellington
Tiffin
Ohio
Findlay
Willard
Ashland
Carey
Wyandot
Crawford
Richland
Hancock
Bluffton
Shelby
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Legend
Davis Besse NPP
50 Mile Radius
Low Income Population
State/International Border
Interstate Highway
Major Canadian City
Minor Canadian City
Urban Area
Canadian Census Subdivision
County
Miles
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Kilometers
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Davis-Besse
N

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2.7 TAXES

The Ohio Tax Reform Act (Amended Substitute House Bill 66,126th General Assembly), which went into effect on July 1, 2005, has made significant changes in the structure of almost all major state and local taxes. Major business tax components of the tax reform act consist of the phase-out of both the tangible personal property tax (which excludes electric companies) and the corporate franchise tax and the phase-in of the commercial activity tax. It is a privilege tax measured by gross receipts from activities within the state. The fully phased-in 0.26% commercial activity tax rate took effect on April 1, 2009 (impacting fiscal year 2010 tax revenues). Prior phase-in rates are as follows:

Tax Period	Base Tax Rate	Phase-in Percentage	Effective Rate
July 1, 2005 to December 31, 2005	0.06%	N/A	0.0600%
January 1, 2006 to March 31, 2006	0.26%	23%	0.0598%
April 1, 2006 to March 31, 2007	0.26%	40%	0.1040%
April 1, 2007 to March 31, 2008	0.26%	60%	0.1560%
April 1, 2008 to March 31, 2009	0.26%	80%	0.2080%
After March 31, 2009	0.26%	100%	0.2600%

Table 2.7-1 compares property taxes paid by FENOC for Davis-Besse to the annual total operating budgets for Ottawa County, Carroll Township, the Benton-Carroll-Salem School District, and the Penta County Joint Vocational School for the years 2004 through 2008. During this five-year period, Davis-Besse property taxes contributed less than 10% to the Ottawa County total operating budget. The percentage of Davis-Besse property tax to the operating budget in Carroll Township, where Davis-Besse is located, varied widely from about 11% to nearly 28%. Property taxes paid to the Benton-Carroll-Salem School District and the Penta County Joint Vocational School, on the other hand, were more stable, averaging about 17% for the school district and 1.6% for the vocational school.

The amount of future property tax payments for Davis-Besse and the proportion of those payments are dependent on future market value of the units, future valuations of other properties in these jurisdictions, and other factors. FENOC assumes that the values presented in Table 2.7-1 are substantially representative of conditions that would exist in the license renewal term of the unit.

Table 2.7-1: Davis-Besse Property Tax Distribution and Jurisdictional Operating Budgets, 2004-2008

Year	Property Tax Paid for Davis-Besse	Operating Budget	Percent of Operating Budget
Ottawa County			
2004	$846,190	$13,808,101	6.1%
2005	$1,171,511	$13,909,810	8.4%
2006	$890,177	$15,111,168	5.9%
2007	$949,380	$15,846,381	6.0%
2008	$897,881	$16,053,182	5.6%
Carroll Township			
2004	$485,644	$4,334,322	11.2%
2005	$675,842	$3,510,297	19.3%
2006	$533,277	$1,908,000	27.9%
2007	$551,766	$2,307,692	23.9%
2008	$558,791	$4,829,032	11.6%
Benton-Carroll-Salem Local School District			
2004	$3,211,588	$20,142,955	15.9%
2005	$4,484,582	$21,114,350	21.2%
2006	$3,495,600	$20,953,869	16.7%
2007	$3,607,888	$22,038,419	16.4%
2008	$3,707,221	$23,938,413	15.5%
Penta County Joint Vocational School			
2004	$372,018	$24,832,789	1.5%
2005	$507,832	$25,644,335	2.0%
2006	$397,738	$26,553,076	1.5%
2007	$412,907	$28,015,110	1.5%
2008	$417,247	$29,793,427	1.4%

2.8 LAND USE PLANNING

This section focuses on the four counties of Ottawa, Lucas, Wood, and Sandusky since approximately 88% of the permanent Davis-Besse workforce lives in these counties (see Section 3.4) and, as a result, would more likely influence present and future land use.

2.8.1 EXISTING LAND USE

County government in Ohio was established in 1788 as the administrative arm of the territorial government. Today, it serves the same purpose for the state, although the structure has changed and its range of responsibilities has increased. There are certain state-mandated services that all counties must provide, such as property tax assessment and collection, land records, election administration, public welfare and social services, and certain legal and judicial services that apply throughout the county. State law also permits counties to perform certain functions for their residents if they so choose, e.g., parks and recreation, drainage, and economic development. (**Lucas 2008**)

Table 2.8-1 lists the types of land use in the four-county area. As shown, three of the counties are principally rural. Only one county contains large urban area.

Ottawa County, the smallest of the four counties in land area (255 sq. mi.), is typical of the rural land-use character of the four-county area. Over 90% of the total county area comprises cropland, pasture, forest, open water, and wetlands. Urban areas, on the other hand, account for less than 10% of the total county area. Wood and Sandusky counties have a similar distribution of land area. Ottawa County, although the smallest in land area, has the most open water (7%), as its northeastern boundary abuts Lake Erie and includes a peninsula and several islands. (**Ottawa 2008**)

Lucas County has the largest urban area, accounting for nearly 37% of the total county area. It is also the most populated of the of the four-county area, with Toledo being the county seat and largest city. (**Lucas 2008**)

Wood County is the largest county in land area (617 sq. mi.) and comprises the most land in farms (over 301,000 acres). It also has the most number of farms (1,040) and largest average farm size (289 acres). (**Wood 2008**)

Sandusky County is similar in land category to Wood County, with most land in farms. The county's land area (409.2 sq. mi.), number of farms (780), and average farm size (247 acres) is second only to Wood County. (**Sandusky 2008**)

2.8.2 FUTURE LAND USE

FENOC surveyed the local townships in Ottawa County adjacent to Davis-Besse as to the existence of any growth-control measures that would restrict the development of residential housing. In Carroll Township, where Davis-Besse is located, there is no land use control mechanism such as zoning. Subdivision approval is subject to county rules and regulations, but the actual use of the land is not (**Carroll 1995**, Page 5). Erie Township, which is adjacent and east of Carroll Township, also has no land use control mechanism (**Erie 1995**, Page 6). Instead, both township land use plans encourage development in areas that can be served by existing infrastructure, while preserving open space and environmentally sensitive areas.

The other adjacent townships, Benton to the west and Salem to the south, both have land use zoning to control growth (**Benton 1995**, Page 5; **Salem 2004**, Page 5). Future land use residential growth, however, is limited due to the lack of an extensive public sewer system in each township. As a result, construction of single family residences is more likely than the construction of multi-family/high density housing development.

2.8.3 REFERENCES

Note to reader: This list of references identifies web pages and associated URLs where reference data were obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. FENOC has maintained hard copies of the information and data obtained from the referenced web pages.

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Table 2.8-1: Land Uses in Four-County Area

Land Category	County			
	Ottawa	**Lucas**	**Wood**	**Sandusky**
Land Cover (%)				
- Urban [1]	8.12	36.69	9.42	5.71
- Cropland	60.62	36.56	80.38	71.64
- Pasture	10.90	1.81	3.51	10.46
- Forest	7.47	14.89	4.47	6.55
- Open Water	7.01	3.01	0.90	1.49
- Wetlands [2]	5.18	6.58	1.19	3.77
- Bare Mines	0.72	0.47	0.13	0.42
Land in Farms (acres)	109,000	75,000	301,000	193,000
- Number of Farms	500	390	1,040	780
- Average size (acres)	218	192	289	247
Total County Area (sq. mi.)	255.1	340.4	617.4	409.2

Sources: **Ottawa 2008**; **Lucas 2008**; **Wood 2008**; **Sandusky 2008**

Notes:

(1) Residential, Commercial, Industrial, Transportation, Urban Grasses, Wooded, Herbaceous
(2) Wooded, Herbaceous

2.9 SOCIOECONOMIC CHARACTERISTICS

Table 3.4-1 presents the places of residence of the Davis-Besse operational workforce. The vast majority (88%) of the workforce reside in Ottawa, Lucas, Wood, or Sandusky counties. As stated in Section 3.4, FENOC believes that it can continue to operate the power plant for the 20-year license renewal period with the existing workforce and has no plans to add full-time employees to support plant operations during the period of extended operation. However, FENOC assumes that if any additional staff is required, that they will also reside primarily within the four-county area and in the same proportions as the existing workforce. Thus, the study area to describe the socioeconomic characteristics in the following sections is limited to the four-county area.

2.9.1 ECONOMY, EMPLOYMENT, AND INCOME

2.9.1.1 Economy

The state of Ohio is one of the larger economies in the United States, with an estimated 2007 state gross domestic product of $466.3 billion in nominal dollars, making it the seventh-largest state economy (**Ohio 2008**, Economic Page 4). The four-county area is part of the northwest Ohio economic development region, referred to as Region 2 (**Ohio 2008**, Appendix A). As such, its economy reflects the encompassing county's character and is less dependent on the industrial and technology-based economy of Ohio in general and the "Rust Belt" image of the 1980s in particular. Most of the state's income, for example, is derived from commerce and manufacturing, whereas the four-county area shares the region's industry base with extensive farmland, which produces large amounts of crops and livestock. The subsections following illustrate this diverse economy for the years 2003-2007, before the economic downturn starting in 2008.

2.9.1.2 Employment

Table 2.9-1 lists the civilian labor force during the period 2003-2007. In general, the civilian labor force was stable in Ottawa, Lucas, and Sandusky counties. Wood County, on the other hand, increased its workforce from 2003 through 2006, before declining slightly in 2007. Unemployment rates during the five-year period generally declined in all counties from 2003 through 2006, with an increase occurring in 2007 in each county. Wood County had the lowest unemployment rate, remaining below 6% over the 2003-2007 period.

In 2006, the combined four-county area had a total civilian labor force of over 279,050 people (Table 2.9-2). The combined largest industrial sectors providing employment included trade, transportation and utilities (19.8%); educational and health social services (16.1%); and manufacturing (15.5%). The trade, transportation and utilities sector also was the largest industrial sector in Ottawa, Lucas, and Wood counties, but manufacturing was largest in Sandusky County. A large employer in all counties was combined government, with local government being the largest between federal, state, and local.

Industry growth since 2001, as shown in Table 2.9-3, has occurred in education and health services throughout the four-county area, with increases in financial services in most counties as well. The largest percentage industrial sector decline in all counties has been information services. Although still a significant employer, manufacturing has also seen a large decline in all counties.

2.9.1.3 Income

Table 2.9-4 shows income and poverty levels for the four-county area and state of Ohio, as estimated by the U.S. Census Bureau from the three-year survey during 2005-2007 (**USCB 2009**). Ottawa County had the highest median household income, at $53,183, which is well above the state level of $46,296. Ottawa County also had the lowest poverty rates for both families (6.1%) and individuals (8.0%), which is well below the state levels of 9.7% and 13.2%, respectively. Lucas County had the lowest median household income, at $43,527, below the state level. Lucas County was well above the state poverty levels for both families and individuals at 12.9% and 16.8%, respectively.

2.9.2 HOUSING

Table 2.9-5 presents information about the housing market in the four-county area and the state of Ohio. The estimates are based upon U.S. Census Bureau data from 2005-2007 survey data (**USCB 2009**). The most notable characteristic is the high vacancy rate (32.6%) in Ottawa County. This is likely a result of seasonal properties associated with the county's large number of recreational facilities (see Section 2.9.6). Otherwise, housing vacancy is below the state rate of 10.7% in Wood and Sandusky counties, but above the state rate in the more urban Lucas County, which includes Toledo. The median house values in Ottawa and Wood counties are above the state value of $134,400, but below the state value in Sandusky and Lucas counties.

Residential construction generally increased for the four-county area for the greater part of the five-year period, 2003 through 2007, as shown in Table 2.9-6. The number of total units, for example, increased in all counties through 2005, before starting a decline in 2006 through 2007. The average cost per unit of single and multiple-unit buildings followed a similar trend.

2.9.3 Education

Public education in Ohio is provided through regional school districts, which are funded by a school tax levied as part of the state income tax. Corporations, in general, are exempt from the school tax. (**ODT 2006**) Table 2.9-7 lists information regarding education in the four-county area.

Regionally, Lucas County, as the most populated of the four-county area, has the most schools, including college level. Ottawa County has the least number of students. Ottawa County also has the smallest student-teacher ratio, the highest graduation rate, and expends the most per student. (Table 2.9-7)

Locally, the Benton-Carroll-Salem School district serves the area surrounding Davis-Besse. The school district has four elementary schools, one middle school, and one high school. Enrollment was 1,984 during the 2008 school year and the district employed 102 teachers, with a 19:1 student to teacher ratio. (**PSR 2009**) The Benton-Carroll-Salem School district also works closely with the Penta County Joint Vocational School, which provides certificates in various trades for students in or beyond high school in a five-county area. The public institution is located in Perrysburg, Ohio, southwest of Toledo, in Wood County. Enrollment in 2007 was approximately 195 students (**Penta 2009**).

2.9.4 Public Facilities

Table 2.9-8 provides a summary of the public facilities in the four-county area. Included is information on libraries, health care facilities, and communication services, such television and radio stations, and daily newspapers. Lucas County, which has the most urban area (see Section 2.8, including Toledo, has the greatest number of facilities. Ottawa County, on the other hand, has the least.

Table 2.9-9 provides a summary of the community public water systems in the four-county area from surface water supplies. Information included is the population served, water use, and system capacity. Due to its urban populations, Lucas County has the largest water supply systems. The smallest system (140,000 gallons per day (gpd) capacity) is Put-in-Bay Village located in Ottawa County.

2.9.5 Transportation

The four-county area is served by all modes of transportation, depending on location.

Highway

State and interstate highways, especially U.S. 80/90, which includes the Ohio Turnpike, interconnects each county. State Highway Route 2, located immediately adjacent to the Davis-Besse site, provides local access to the surrounding area. The two-lane highway is used extensively for commercial truck carriers. Approximately six miles east of the site (and continuing east), Route 2 becomes a four-lane, divided and limited-access highway. (**FENOC 2010**, Section 2.2.2.1) Table 2.9-10 lists the annual average daily traffic (AADT) for various points along Route 2 and for Routes 190 and 590 that feed into Route 2 from the south.

As described in Section 2.9.6, there is a significant percentage of recreation in the four-county area and Ottawa County, in particular. The great majority of people using the facilities travel in private vehicles. As a result, there is an increase in the number of seasonal and transient vehicles within a 10-mile radius of Davis-Besse. Table 2.9-14 lists the estimated number of these vehicles, along with the resident vehicles within the 10-mile area. Seasonal vehicles are those that remain in the area during warmer months, principally May through October. Transient vehicles are those that enter the area for a specific purpose (e.g., recreation) and leave on the same day or stay overnight. As shown in Table 2.9-14, the total combined number of seasonal and transient vehicles is equivalent to the total number of resident vehicles within a 10-mile radius of Davis-Besse.

Airports

The closest airport serving commercial airlines is Toledo Express Airport, located 38 miles west of the site. The nearest airport with a paved runway is at Port Clinton, located 13 miles east-southeast from the site. (**FENOC 2010**, Section 2.2.2.3)

Water Transportation

Commercial shipping, both domestic and international, uses Lake Erie extensively. However, the shallowness of the western lake basin, particularly near shore, limits any closer approach than eight miles for ships of any size. The nearest shipping lanes from the site are approximately 20 miles offshore. (**FENOC 2010**, Section 2.2.2.1)

Railroads

Railroad transportation to the four-county area is available for passengers and freight. Amtrak provides passenger rail service from Cleveland to Toledo, with service through Sandusky (**Amtrak 2009**). Mainline rail freight service is provided by the Norfolk Southern Corporation and CSX Transportation, Inc. (**ODOT 2009**).

Locally, the nearest railroad to Davis-Besse is the Norfolk Southern, which runs in an east-west direction from Port Clinton to Oak Harbor, about five miles south of the site. The Norfolk Southern continues to run from Oak Harbor northwest to Toledo. (**ODOT 2009**) A local rail spur line services the site, starting at a point 7.5 miles southwest of the site. This entire spur is owned by Toledo Edison and was built solely for service to Davis-Besse. (**FENOC 2010**, Section 2.2.2.1)

Table 2.9-11 summarizes transportation data in the four-county area.

2.9.6 Recreation

Activities on Lake Erie and the rivers and streams flowing into it comprise a significant percent of all recreation in the four-county area, as listed in Table 2.9-12. Ottawa County, in particular, has the most facilities and acreage devoted to state parks, forests, natural preserves, and wildlife. Its location along Lake Erie and its islands provide a wide variety of opportunities for water-based recreational and tourist activities. As a result, the area has large seasonal and transient populations, which are discussed in Section 2.6.2.4.

Other major regional recreational resources include three of the four U.S. Fish and Wildlife Service National Wildlife Refuges located in Ohio. The three refuges together protect approximately 9,000 acres of habit and some of the last remnants of the "Great Black Swamp" in the heart of the Lake Erie marshes (**USFWS 2009**).

- Ottawa NWR – located adjacent to the Davis-Besse site, management of the refuge focuses on providing resting habitat for migratory birds.
- West Sister Island NWR - located offshore and to the northwest of Davis-Besse, management of the refuge focuses on nesting habitat for the largest heron/egret rookery in the U.S. Great lakes.
- Cedar Point NWR – located northwest of Davis-Besse, the refuge provides a stopover habitat for migratory birds; its marsh land is divided into three large pools, one of which is a public fishing area.

The Ottawa NWR is split between Ottawa and Lucas Counties, with the majority in Ottawa County. The West Sister Island NWR and Cedar Point NWR are entirely in Lucas County.

As noted in Table 2.9-13, utilization of the major park facilities in the Ottawa-Lucas County region is nearly 70% during the summer months.

2.9.7 References

Note to reader: This list of references identifies web pages and associated URLs where reference data were obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. FENOC has maintained hard copies of the information and data obtained from the referenced web pages.

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Table 2.9-1: Civilian Labor Force by County, 2003-2007

County	2003	2004	2005	2006	2007
Ottawa					
Labor Force	21,400	21,600	21,800	21,900	21,800
Employed	19,700	19,900	20,100	20,400	20,300
Unemployed	1,700	1,700	1,700	1,500	1,600
Unemployment Rate (%)	8.1	8.1	7.6	6.9	7.2
Lucas					
Labor Force	225,000	224,700	224,000	225,800	225,300
Employed	208,300	208,100	208,800	211,700	210,200
Unemployed	16,800	16,600	15,100	14,100	15,100
Unemployment Rate (%)	7.5	7.4	6.8	6.2	6.7
Wood					
Labor Force	66,100	66,800	67,700	68,900	68,600
Employed	62,300	63,00	63,900	65,400	64,900
Unemployed	3,800	3,800	3,800	3,500	3,700
Unemployment Rate (%)	5.8	5.7	5.6	5.1	5.4
Sandusky					
Labor Force	33,000	33,400	33,300	33,400	33,900
Employed	30,800	31,300	31,200	31,500	31,800
Unemployed	2,100	2,200	2,000	1,900	2,100
Unemployment Rate (%)	6.5	6.5	6.2	5.7	6.1

Sources: **Ottawa 2008**; **Lucas 2008**; **Wood 2008**; **Sandusky 2008**

Table 2.9-2: Employment by Industry, 2006

Employment by Industry	Average Employment				
	Ottawa County	Lucas County	Wood County	Sandusky County	Four-County Area
Private Sector	12,117 (83.6%)	196,078 (87.4%)	47,846 (81.6%)	23,006 (87.8%)	279,047 (86.2%)
Natural Resources and mining	305 (2.1%)	481 (0.2%)	304 (0.5%)	290 (1.1%)	1,380 (0.4%)
Construction	547 (3.8%)	10,343 (4.6%)	2,998 (5.1%)	897 (3.4%)	14,785 (4.6%)
Manufacturing	2434 (16.8%)	25,528 (11.4%)	13,206 (22.5%)	8,859 (33.8%)	50,027 (15.5%)
Trade, Transportation, Utilities	3,441 (23.7%)	44,349 (19.8%)	12,402 (21.1%)	3,902 (14.9%)	64,094 (19.8%)
Information	87 (0.6%)	3,125 (1.4%)	627 (1.1%)	179 (0.7%)	4,018 (1.2%)
Financial Services	535 (3.7%)	9,509 (4.2%)	1,752 (3.0%)	912 (3.5%)	12,708 (3.9%)
Professional and Business Services	406 (2.8%)	28,625 (12.8%)	3,414 (5.8%)	1,724 (6.6%)	34,169 (10.6%)
Educational and Health Services	1,468 (10.1%)	42,381 (18.9%)	5,194 (8.9%)	3,188 (12.2%)	52,231 (16.1%)
Leisure and Hospitality	2,474 (17.1%)	22,996 (10.2%)	6,159 (10.5%)	2,225 (8.5%)	33,854 (10.5%)
Other services	421 (2.9%)	8,665 (3.9%)	1,764 (3.0%)	824 (3.1%)	11,674 (3.6%)
Unclassified	No Data	74 (<0.1%)	26 (<0.1%)	7 (<0.1%)	107 (<0.1%)
Government Sector	2,376 (16.4%)	28,281 (12.6%)	10,821 (18.4%)	3,374 (12.8%)	44,852 (13.8%)
Federal	176 (1.2%)	1,993 (0.9%)	243 (0.4%)	119 (0.5%)	2,531 (0.8%)
State	204 (1.4%)	7,743 (3.5%)	3,649 (6.2%)	212 (0.8%)	11,808 (3.6%)
Local	1996 (13.8%)	18,545 (8.3%)	6,929 (11.8%)	3,043 (11.5%)	30,513 (9.4%)

Source: **Ottawa 2008**; **Lucas 2008**; **Wood 2008**; **Sandusky 2008**

Table 2.9-3: Employment Change by Industry 2001-2007

Employment by Industry	Average Employment Change (%)			
	Ottawa County	Lucas County	Wood County	Sandusky County
Natural Resources and mining	18.2	-14.1	23.1	-13.4
Construction	-0.5	-10.9	-9.4	-13.7
Manufacturing	-12.7	-19.4	-12.3	-10.8
Trade, Transportation, Utilities	-5.9	-9.6	9.1	3.1
Information	-27.5	-15.9	-31.3	-34.9
Financial Services	2.5	-1.0	10.7	30.8
Professional and Business Services	-20.7	-1.8	-25.1	16.7
Educational and Health Services	16.8	12.5	21.2	20.3
Leisure and Hospitality	-3.4	-2.3	26.8	8.4
Other services	-26.3	0.2	-6.7	-20.5
Federal	-5.9	-8.6	2.1	-7.0
State	3.0	-1.4	4.3	7.6
Local	4.7	-3.8	6.6	-6.7

Sources: **Ottawa 2008**; **Lucas 2008**; **Wood 2008**; **Sandusky 2008**

Table 2.9-4: Income and Poverty Levels, 2007

Income [a]	Ottawa County	Lucas County	Wood County	Sandusky County	State of Ohio
Median Household:	53,186	43,527	51,001	46,366	46,296
Median Family:	62,963	55,709	68,387	54,269	57,999
Per Capita:	27,246	23,759	25,878	21,447	24,296
% Below Poverty[b]:					
Families	6.1	12.9	6.3	7.0	9.7
Individuals	8.0	16.8	11.6	9.7	13.2

Source: **USCB 2009**

Notes:

(1) In 2007 inflation-adjusted dollars.
(2) Poverty level for a family of four people is $21,203; individual is $10,590.

Table 2.9-5: Housing Characteristics

Housing Characteristic	Ottawa County	Lucas County	Wood County	Sandusky County	State of Ohio
Total Units:	26,897	202,655	51,445	26,070	5,038,654
Occupied:	18,125	178,247	48,712	23,915	4,500,621
Owner-occupied	14,001	118,721	34,261	17,819	3,152,182
Renter-occupied	4,124	59,526	14,451	6,096	1,348,439
Vacant:	8,772	24,408	2,733	2,155	538,033
Total Vacancy Rate:	32.6%	12.0%	5.3%	8.3%	10.7%
Median House Value:	$140,200	$123,300	$149,000	$116,000	$134,400

Source: **USCB 2009**

Table 2.9-6: Residential Construction, 2003-2007

County	2003	2004	2005	2006	2007
Ottawa					
Total Units	259	255	336	300	276
Total Valuation (000)	$21,389	$20,421	$64,256	$62,969	$48,837
Total single-unit bldgs	247	243	328	291	207
Avg cost per unit	$84,489	$83,530	$195,866	$214,843	$209,529
Total multi-unit bldgs	12	12	8	9	69
Avg cost per unit	$43,333	$10,250	$1,500	$50,000	$79,191
Lucas					
Total Units	1,681	1,947	1,507	938	1,076
Total Valuation (000)	$240,742	$249,089	$236,733	$134,313	$111,087
Total single-unit bldgs	1,499	1,582	1,297	831	511
Avg cost per unit	$155,266	148,590	$170,178	$153,623	$175,046
Total multi-unit bldgs	182	365	210	107	565
Avg cost per unit	$43,945	$38,412	$76,248	$62,172	$38,298
Wood					
Total Units	1,095	1,705	1,152	651	521
Total Valuation (000)	$108,648	$146,084	$126,344	$68,991	$54,626
Total single-unit bldgs	616	595	609	452	439
Avg cost per unit	$134,020	$136,963	$139,909	$127,739	$109,392
Total multi-unit bldgs	479	1,110	543	199	82
Avg cost per unit	$54,471	$58,190	$75,764	$56,548	$80,519
Sandusky					
Total Units	239	198	132	112	60
Total Valuation (000)	$23,595	$23,597	$16,858	$14,117	$9,331
Total single-unit bldgs	156	167	128	102	60
Avg cost per unit	$119,980	$127,883	$127,177	$128,398	$155,517
Total multi-unit bldgs	83	31	4	10	0
Avg cost per unit	$58,768	$72,258	$144,759	$102,000	$0

Sources: **Ottawa 2008**; **Lucas 2008**; **Wood 2008**; **Sandusky 2008**

Table 2.9-7: Education Characteristics

Constituent	Ottawa County	Lucas County	Wood County	Sandusky County
Public Schools:	18	153	50	29
Students	5,683	70,472	18,708	10,404
Expenditures per student	$10,498	$10,104	$9,603	$8,575
Student-teacher Ratio	15.9	19.1	16.1	18.2
Graduation rate (%)	95.1	77.8	93.7	88.6
Non-Public Schools	2	42	9	7
Students	171	12,868	1,440	1,095
Colleges (public and private)	0	3	2	1

Sources: **Ottawa 2008**; **Lucas 2008**; **Wood 2008**; **Sandusky 2008**

Table 2.9-8: Public Facilities

Type	Ottawa County	Lucas County	Wood County	Sandusky County
Public Libraries (Branches)	3 (2)	1 (19)	7 (4)	2 (3)
Hospitals	1	8	1	2
- Beds	25	3,119	162	263
Nursing Homes	4	67	18	19
- Beds	339	6,483	1,586	1,746
Residential Care	4	24	7	16
- Beds	238	1,821	381	636
TV Stations	0	6	2	0
Radio Stations	0	21	2	1
Daily Newspapers	1	2	2	1
- Circulation	6,100	147,000	21,500	14,100
Prisons	0	1	0	0

Sources: **Ottawa 2008**; **Lucas 2008**; **Wood 2008**; **Sandusky 2008; ODCR 2010**

Table 2.9-9: Public Water Systems

County	Public Water System*	Population Served	Water Use (gpd)	Treatment Capacity (gpd)
Lucas	Toledo	380,000	75,838,000	181,000,000
	Oregon City	18,334	4,463,000	8,087,000
Ottawa	Marblehead Village	1,600	193,000	553,000
	Put-in-Bay Village	700	67,000	140,000
	Ottawa County Regional	14,500	3,507,000	9,000,000
	Carroll	2,000	300,000	1,000,000
Sandusky	Clyde	5,900	958,000	2,000,000
	Fremont City	20,500	4,917,000	7,500,000
Wood	Bowling Green City	30,000	3,389,000	5,400,000
	North Baltimore	3,361	550,000	1,600,000

* Surface water community systems that do not purchase water.

Sources: **OEPA 2010**; **OSUE 2009a, b, c, d**

Table 2.9-10: Ottawa County Annual Average Daily Traffic, 2006

Road / Location	Annual Average Daily Traffic (AADT)		
	Vehicles (2 axles)	Vehicles (>2 axles)	Total
SR-2, West of Davis-Besse			
At Lucas County Line	3,900	820	4,720
At SR-579 Intersection	5,190	1,240	6,430
At SR-590 Intersection	5,060	1,150	6,210
At SR-19 Intersection	4,810	1,070	5,880
SR-2, East of Davis-Besse			
At SR-358 Intersection	5,450	1,220	6,670
At SR-163 Intersection	9,480	1,550	11,030
At SR-53 Intersection	11,460	1,820	13,280
South of Davis-Besse			
SR-19, Salem-Carroll Rd.	2,050	150	2,200
SR-590, Trowbridge Rd.	320	10	330

Source: **ODOT 2006**

Table 2.9-11: Transportation Data Summary

Type	Ottawa County	Lucas County	Wood County	Sandusky County
Registered Vehicles	59,429	417,347	135,877	72,969
Passenger cars	36,412	312,305	87,837	43,420
Noncommercial trucks	10,451	46,578	19,462	13,541
Interstate Highway (mi)	4.57	48.59	54.64	27.34
Turnpike (mi)	4.57	14.56	11.18	27.34
U.S. Highway (mi)	0.00	65.20	61.32	62.68
State Highway (mi)	139.96	115.67	206.86	112.41
County, Local (mi)	549.08	2,068.35	1,610.78	925.58
Commercial Airports	5	1	4	2

Sources: **Ottawa 2008**, **Lucas 2008**, **Wood 2008**, **Sandusky 2008**

Table 2.9-12: Recreational Facilities

Attributes	Ottawa County	Lucas County	Wood County	Sandusky County
Acreage	5,540	4,359	670	4,018
Facilities	23	13	6	9
State Parks	-East Harbor -Lake Erie Islands -Catawba Island -Kelleys Island -Middle Bass Island -Oak Point -South Bass Island -Marblehead Lighthouse		-Mary Jane Thurston	
Forests		-Maumee		
Natural Areas	-Lakeside Daisy	-Audubon Islands -Lou Campbell Prairie -Irwin Prairie -Kitty Todd -Scenic River: Maumee	-Scenic River: Maumee	-Scenic River: Sandusky
Wildlife	-Green Island -Honey Point -Kuehnle -Little Portage -Magee Marsh -Toussaint Creek -West Harbor Refuge	-Magee Marsh -Mallard Club Marsh -Metzger Marsh -Missionary Island		-Aldrich Pond -Miller Blue Hole -Pickerel Creek -Resthaven (Erie) -Willow Point (Erie)

Table 2.9-12: Recreational Facilities
(continued)

Attributes	Ottawa County	Lucas County	Wood County	Sandusky County
Boating*	-Brown's Marina -Catawba Island Park -Dempsey Wildlife Area -East Harbor Park Camp ground -East Harbor Park Marina -Floro's Marina -Little Portage Access -Mazurik Access -Oak Point Park -Ottawa County Ramp -Portage River Wildlife Area -Put-in-Bay Docks -South Bass Island -Toussaint Creek Wildlife Area -Turtle Creek Wildlife Area	-Cullen Park -Farnsworth Metropark -Lucas County Ramp -Metzger Marsh State Wildlife Area -Walbridge Park	-Farnsworth Park -Perrysburg City Ramp -Orleans Park -Otsego Park -Rossford City Ramp	-Fremont City Ramp -Tackle Box 2 -Memory Marina -Riverfront Marina -White's Landing

* Lists obtained from referenced sources are not complete listings of boating facilities, ramps or marinas.

Sources: **Ottawa 2008**; **Lucas 2008**; **Wood 2008**; **Sandusky 2008**; **ODNR 2009**

Table 2.9-13: Ottawa-Lucas County Region Park Utilization

Facility 2009	Attendance	2009 Utilization[1]
State		
East Harbor State Park	1,310,000	75%
Marblehead Lighthouse State Park	1,200,000	80%
Kelleys Island State Park	125,000	80%
North Bass Island State Park	1,335	80%
Middle Bass Island State Park	27,000	80%
South Bass Island State Park	511,000	80%
Maumee Bay State Park	1,100,000	70%
Federal		
Ottawa NWR	176,000	60
Cedar Point NWR	600	5
West Sister Island NWR[2] 0		N/A
Total	4,450,935	**68%**

Notes:

(1) Percent utilization is seasonal. Estimates are based on summer weekdays when the parks may be near peak attendance.

(2) Closed to the public.

Table 2.9-14: Seasonal and Transient Estimated Vehicles within 10 Miles of Davis-Besse

Miles	Estimated Number of Vehicles		
	Resident	Seasonal	Transient
0-2	353	0	0
2-5	668	752	3,812
5-10	6,310	387	1,306
Total	7,331	1,139	5,118

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2.10 METEOROLOGY AND AIR QUALITY

2.10.1 METEOROLOGY

Lying in the humid continental zone, Ohio has a generally temperate climate. The Davis-Besse region also has a continental climate, but it is modified by its proximity to the Great Lakes. Summers are warm to hot, with humid weather being common. Winter is cold although frequent thaws occur. The Great Lakes have a moderating effect on temperature and extremes are seldom recorded. On average, only 15 days a year reach or exceed 90 degrees. On about eight days a year the temperature drops to zero degrees or lower. (**NOAA 2009**)

While the Great Lakes contribute little to the annual precipitation, they do enhance cloudiness during the winter months. Heavy snow storms typically occur once or twice a winter, but light snows are common. Thunderstorms occur regularly from late spring through summer, with much of the summer precipitation coming from thunderstorm rains. Strong thunderstorms occur a few times each year. (**NOAA 2009**)

The terrain in the western Lake Erie region is mostly flat and has little influence on the weather. An east wind off Lake Erie will bring significant cooling to the lake shore areas each spring and fog can also occur. The lake breeze brings a comfortable cooling effect to the lake shore during the summer months. A prolonged strong east wind, although rare, can produce lake shore flooding. (**NOAA 2009**)

Table 2.10-1 summarizes various climatological data for the western Lake Erie region computed from daily observations gathered at the Toledo Airport (**NCDC 2008**). The prevailing wind direction during most of the year (10 of the 12 months) is from the west southwest (240-260 degrees). Mean monthly wind speeds range from 7-11 mph, with peak gusts of 50-70 mph expected throughout the year. Monthly temperatures range from a normal daily maximum in January of 31.3°F to a minimum of about 16.4°F. In July, the daily average normal maximum is 83.4°F and the daily normal minimum is 62.6°F. Annual precipitation is about 33 inches, with the maximum monthly values occurring from June through September. Snowfall averages about 37 inches per year and can occur throughout the year. Thunderstorms occur nearly 32 days per year, mostly during June, July, and August.

Locally, meteorological observations at Davis-Besse began in October 1968. Wind speed and direction are collected from various levels at a 100-meter primary tower and a nearby 10-meter backup tower. The 100-meter tower also measures differential temperatures at several levels to determine atmospheric stability. Precipitation is measured at the base of the 10-meter backup tower. (**DBNPS 2009**, Pages 119-120)

During 2008, winds at Davis-Besse occurred most frequently from south-southwest to west-southwest, accounting for about 40%. Annual wind speeds averaged nearly 9.4 mph, with the maximum speed of almost 45 mph occurring in January. Stability class D (neutral conditions) was the most frequent during the year, occurring 52% of the time. Annual precipitation was nearly 28 inches, with the most (5.55 inches) occurring during June. (**DBNPS 2009**, Tables 31 and 32)

Meteorological data relevant to the Severe Accident Mitigation Alternatives (SAMA) analysis are provided in Attachment E.

2.10.2 AIR QUALITY

The USEPA has established National Ambient Air Quality Standards (NAAQS) for six common pollutants: nitrogen dioxide, sulfur dioxide, carbon monoxide, lead, ozone, and particulate matter (PM). The USEPA has designated all areas of the United States as having air quality better ("attainment") or worse ("non-attainment") than the NAAQS. Areas that have been redesignated to attainment from nonattainment are called maintenance areas. To be re-designated an area must both meet air quality standards and have a 10-year plan for continuing to meet and maintain air quality standards and other requirements of the *Clean Air Act*.

Davis-Besse is located in the Sandusky Intrastate Air Quality Control Region (40 CFR 81.203), which includes Ottawa County. Since 1984, the overall air quality in the county has been in attainment (**USEPA 2008**). Ottawa County, as noted in 40 CFR 81.336, is better than the national air quality standards for sulfur dioxide (SO_2). The county is considered unclassifiable/attainment for carbon monoxide (CO), ozone (O_3, including both the 1- and 8-hour average), and particulate matter less than 2.5 μm ($PM_{2.5}$). Particulate matter less than 10 μm (PM_{10}) is considered unclassifiable, while lead (Pb) is not designated.

There are no mandatory Class I federal areas within the 50-mile radius of Davis-Besse (**USEPA 2010**). The closest area to Davis-Besse that is designated in 40 CFR 81.400 et seq. as a mandatory Class I federal area, in which visibility is an important value, is the Otter Creek Wilderness Area located in West Virgina, approximately 350 miles southeast of the site (40 CFR 81.435).

Section 9.1, Table 9.1-1, describes Davis-Besse air emission sources and lists authorizations.

2.10.3 REFERENCES

Note to reader: This list of references identifies web pages and associated URLs where reference data were obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. FENOC has maintained hard copies of the information and data obtained from the referenced web pages.

DBNPS 2009. 2008 Annual Radiological Environmental Operating Report, including Radiological Effluent Release Report, Davis-Besse Nuclear Power Station, May 2009.

NCDC 2007. 2007 Local Climatological Data Annual Summary with Comparative Data, Toledo, Ohio (KTOL), National Climatic Data Center, NOAA, Ashville, NC.

NCDC 2008. 2008 Local Climatological Data Annual Summary with Comparative Data, Toledo, Ohio (KTOL), National Climatic Data Center, NOAA, Ashville, NC.

NOAA 2009. NOAA e-mail, J. Kosanik to J, Snooks (AREVA), National Weather Service, March 3, 2009.

USEPA 2008. Currently Designated Nonattainment Areas for all Criteria Pollutants, U.S. Environmental Protection Agency, http://www.epa.gov/air/oaqps/greenbk/, accessed February 18, 2010.

USEPA 2010. List of Mandatory Class I Federal Areas, U.S. Environmental Protection Agency, http://www.epa.gov/oar/vis/class1.html, accessedFebruary 18, 2010.

Table 2.10-1: Summary of Local Climatology Data (Toledo)

Parameter[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature (deg F)													
Daily Maximum Normal[2]	31.4	35.1	46.5	58.9	70.7	79.5	83.4	81.0	74.0	62.1	48.3	36.0	58.9
Daily Minimum, Normal[2]	16.4	18.9	27.9	37.7	48.6	58.2	62.6	60.7	52.9	41.6	32.6	22.3	40.0
Monthly, Normal[2]	23.9	27.0	37.2	48.3	59.6	68.8	73.0	70.8	63.5	51.8	40.5	29.2	49.5
Record High[3]	66	71	81	88	95	104	104	99	98	91	80	70	104
Year	2008	2000	1998	2002	1962	1988	1995	1993	1978	1963	2003	2001	Jul 1995
Record Low[3]	-20	-14	-6	8	25	32	40	34	26	15	2	-19	-20
Year	1984	1982	1984	1982	2005	1972	1988	1982	1974	1976	1958	1989	Jan 1984
Precipitation (inches, water equiv)													
Monthly, Normal[2]	1.93	1.88	2.62	3.24	3.14	3.80	2.80	3.19	2.84	2.35	2.78	2.64	33.21
Maximum Monthly[3]	4.61	5.50	5.70	6.10	6.80	8.48	9.19	8.47	8.10	6.26	6.86	6.81	9.19
Year	1965	2008	1985	1977	2000	1981	2006	1965	1972	2001	1982	1967	Jul 2006
Minimum Monthly[3]	0.27	0.27	0.58	0.88	0.96	0.27	0.34	0.40	0.58	0.27	0.55	0.54	0.27
Year	1961	1969	1958	1962	1964	1988	1995	1976	1963	2005	1976	1958	Oct 2005
Maximum in 24 hrs[3]	1.78	2.59	2.60	3.43	2.34	3.21	4.39	2.42	3.97	3.21	3.17	3.53	4.39
Year[7]	1959	1990	1985	1977	1991	1978	1969	1972	1972	1988	1982	1967	Jul 1969
Snowfall[4] (inches)													
Monthly, Normal [2]	10.8	8.5	5.6	1.3	0.1	0.0	0.0	0.0	0.0	0.2	2.6	8.3	37.4
Maximum Monthly[5]	30.8	23.6	17.7	12.0	1.3	Trace	Trace	Trace	Trace	2.0	17.9	24.2	30.8
Year	1978	2008	1993	1957	1989	1995	1992	1994	1993	1989	1966	1977	Jan 1978
Maximum in 24 Hours[5]	12.0	7.7	9.7	9.8	1.3	Trace	Trace	Trace	Trace	1.8	8.3	13.9	13.9
Year	2005	1981	1993	1957	1989	1995	1992	1994	1993	1989	1966	1974	Dec 1974

Table 2.10-1: Summary of Local Climatology Data (Toledo)
(continued)

Parameter[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind[5]													
Mean Speed (mph)[6]	10.7	10.3	10.6	10.5	9.1	7.8	7.2	6.5	7.0	8.4	9.9	10.0	9.0
Prevailing Direction[7]	25	25	07	07	24	24	24	25	25	24	25	25	25
Maximum 2-minute (mph)	47	46	46	48	46	53	44	43	38	45	51	48	53
Direction (tenths)	26	26	24	25	25	25	36	26	24	24	21	30	25
Year	2008	2001	2002	1997	2000	2007	2008	1998	2001	1996	2005	1998	Jun 2007
Peak Gust (3-second)	56	56	69	61	68	62	54	54	47	59	66	66	69
Direction (tenths)	25	26	23	27	27	26	35	26	23	25	24	25	23
Year	2008	2001	2002	2003	1999	2007	2008	1998	2001	1996	1998	2008	Mar 2002
Miscellaneous													
Pressure (inches)[6]	30.09	30.09	30.05	29.98	29.98	29.97	29.99	30.03	30.06	30.08	30.07	30.10	30.04
Percent Sunshine[8]	41	46	50	52	60	64	65	63	61	54	37	33	52
Fog (days visibility ≤¼mi)	1.7	1.7	1.8	0.8	0.8	1.1	0.8	1.5	1.7	1.7	1.4	2.4	17.4
Thunderstorms (days)	0.1	0.5	1.5	3.2	4.4	6.1	6.1	5.1	2.9	1.1	0.8	0.1	31.9

Notes:
(1) Source: **NCDC 2008**
(2) Based on 30-year period of record, 1971-2000
(3) Based on 53-year period of record; dates are the most recent occurrence
(4) Includes all forms of frozen precipitation, including hail
(5) Based on 47-year period of record; dates are the most recent occurrence
(6) Based on 25-year period of record
(7) Based on 34-year period of record; direction in tenths of degrees
(8) Average from sunrise to sunset, 40-year period of record

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2.11 HISTORIC AND ARCHAEOLOGICAL RESOURCES

The National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470-470w-6, in Section 106, requires that Federal agencies take into account the effects on properties included in or eligible for the National Register of Historic Places and to consult with the State Historic Preservation Officer to determine whether there are properties present that require protection.

Data relating to historic and archaeological resources was gathered by employing the Ohio Historic Preservation Office's Online Mapping System. A query of a 6-mile radius around the Davis-Besse site was used to identify previously recorded cultural resources that are listed in the National Register of Historic Places (NRHP); that have been determined eligible or potentially eligible for listing in the NRHP; and that have not been evaluated for NRHP listing.

As presented in Table 2.11-1 through Table 2.11-4, the background research identified 378 previously recorded cultural resources within a 6-mile radius of Davis-Besse. This number includes buildings, archaeological sites, cemeteries, churches, and other structures. Resource types range from a historic military base with many contributing structures to archaeological sites and individual architectural resources. Although consultation with the Ohio Historical Society prior to construction did not identify any known deposits of archaeological or geological interest (**AEC 1973**, Section 2.3), one resource, a historic-period site (Table 2.11-3, OT0025), appears to be located at the extreme southeastern corner of the Davis-Besse property. However, the area is overgrown with brush and there does not appear to be visible remnants of the site.

Of the 378 previously recorded cultural resources, only one was listed in the NRHP. This includes Carroll Township Hall located about 3.2 miles to the southwest of Davis-Besse at the intersection of Toussaint E. Road and Behlman Road.

The majority of structures within the 6-mile radius are related to the Camp Perry Military Reservation, located 4.5 miles to the southeast of Davis-Besse, on the shore of Lake Erie, just north of the Portage River. Camp Perry includes housing, firing ranges, railroad tracks, and other structures related to the operations of the facility.

2.11.1 REFERENCES

AEC 1973. Final Environmental Impact Statement Related to Construction of Davis-Besse Nuclear Power Station, Docket No. 50-346, Toledo Edison Company and Cleveland Electric Illuminating Company, U.S. Atomic Energy Commission, March 1973.

**Table 2.11-1: National Register Listed Properties
Within 6 miles of Davis-Besse Nuclear Power Station (*n* = 1)**

ID No.	Name	Criteria	Function
90000385	Carroll Township Hall	Event, Architecture/Engineering	Social, Government

**Table 2.11-2: Cemeteries
Within 6 miles of Davis-Besse Nuclear Power Station (*n* = 5)**

ID No.	Name	County
9173	Locust Point	Ottawa
9174	Rusha	Ottawa
9175	Saint Joseph, Saint Josephs Toussaint	Ottawa
9195	Lacarp, Lacarpe	Ottawa
9208	County Home	Ottawa

Table 2.11-3: Archaeological Sites Within 6 miles of Davis-Besse Nuclear Power Station (*n* = 88)

Site No.	Site Name	Quadrangle	Precontact / Historic	Site Type	Components*	NR Eligibility Status
LU0004	Ward's Canale / Crane's Creek	Oak Harbor	Precontact	Village	LW	Not Assessed
OT0004	Lacarne Cemetery Site and Village	Lacarne	Precontact	Cemetery / Village	--	Not Assessed
OT0006	Arthur Libben Site	Lacarne	Precontact and Historic	Cemetery / Village	LW, H	Not Assessed
OT0007	Montogomery Burial Site	Lacarne	Precontact	Cemetery	LW	Not Assessed
OT0025	Refuge Site	Lacarne	Historic	Historic Building	H	Not Assessed
OT0055	Riverview Site	Lacarne	Precontact	Camp	LW	Not Assessed
OT0072	Church of God Isolated Find	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential	UP, H (1930-present)	Not Assessed
OT0073	Horvath Site 1	Lacarne	Precontact	Unknown Precontact Site Type	LW	Not Assessed
OT0074	Gradel Site 1	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0075	Rockwell Historic Site	Lacarne	Historic	Residential	H (18^{th}-19^{th} C.)	Not Assessed
OT0076	Lipstraw Isolated Find	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0077	Van Rensselaer	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Unrecorded Historic Site Type	UP, H (1850-1899)	Not Assessed
OT0078	F. Miller Historic Scatter	Lacarne	Historic	Residential	H (19^{th}-20^{th} C)	Not Assessed
OT0079	Miller Isolated Find	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential	UP, H (1850-1929)	Not Assessed

Table 2.11-3: Archaeological Sites Within 6 miles of Davis-Besse Nuclear Power Station (n = 88)
(continued)

Site No.	Site Name	Quadrangle	Precontact / Historic	Site Type	Components*	NR Eligibility Status
OT0080	Jacobs	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0081	Dick Isolated Find A	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0082	Dick Isolated Find B	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential	UP, H (1880-1899, 20^{th} C.)	Not Assessed
OT0083	Arvilla Winter	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential	UP, H (1850-1899, 20^{th} C.)	Not Assessed
OT0084	Thorban Isolated Find	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0085	Rice	Lacarne	Precontact	Unknown Precontact Site Type	LW	Not Assessed
OT0086	Titus Road	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential	LW, H (19^{th}-20^{th} C.)	Not Assessed
OT0087	Floro Marina	Lacarne	Precontact	Unknown Precontact Site Type	LA, LW	Not Assessed
OT0088	Blausey Site	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential	LW, H (19^{th}-20^{th} C.)	Eligible
OT0089	Finken River Edge	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Unknown Historic Site Type	LW, H (19^{th}-20^{th} C.)	Not Assessed
OT0090	Finken Isolated Find	Lacarne	Precontact	Unknown Precontact Site Type	EA	Not Assessed
OT0091	Moskal Site	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential, Commerical, Government	LW, H (19^{th}-20^{th} C.)	Eligible
OT0092	Moskal Site 1	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0093	Moskal Site 2	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed

**Table 2.11-3: Archaeological Sites
Within 6 miles of Davis-Besse Nuclear Power Station (n = 88)**
(continued)

Site No.	Site Name	Quadrangle	Precontact / Historic	Site Type	Components*	NR Eligibility Status
OT0094	Moskal Isolated Find	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0095	Laubacher Isolated Find B	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0096	Apling Site 1	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0097	Apling Site 2	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0098	Apling Site Isolated Find	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0099	Hemminger Site	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0100	Mosquito Site	Oak Harbor	Precontact and Historic	Unknown Precontact Site Type / Residential	LW, PH, H (20^{th} C.)	Not Assessed
OT0101	Kontz Isolated Find	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0102	Kontx & Mowl Historic Site	Oak Harbor	Historic	Residential	H (20^{th} C.)	Not Assessed
OT0103	Elmer Kholman Historic Site	Oak Harbor	Historic	Residential	H (19^{th} C.)	Not Assessed
OT0111	5-Oaks	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0112	Tyma Historic Scatter	Lacarne	Historic	Unknown Historic Site Type	UP	Not Assessed
OT0113	Tyma Isolated Find A2	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0114	Priesman Isolated Find	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0115	Dead Egret Site A	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed

**Table 2.11-3: Archaeological Sites
Within 6 miles of Davis-Besse Nuclear Power Station (n = 88)**
(continued)

Site No.	Site Name	Quadrangle	Precontact / Historic	Site Type	Components*	NR Eligibility Status
OT0116	Dead Egret Site B	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0119	Laubacher Isolated Find A	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0122	Rusha Creek 1	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0123	Rusha Creek 2	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0140	Toussaint Burials	Lacarne	Precontact	Cemetery	UP	Not Assessed
OT0141	Finken Site	Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential	LW, H (19^{th}-20^{th} C.	Eligible
OT0155	Dornbusch Isolated Find	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0156	Fehr Isolated Find	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0160	Hetrick Isolated Find C	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0161	Hetrick Isolated Find B	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0162	Hetrick Isolated Find A	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0197	Roland Lewitz	Oak Harbor	Precontact	Unknown Precontact Site Type	EA	Not Assessed
OT0198	Lewitz Isolated Find C	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0199	Lewitz Isolated Find E	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0200	Lewitz Isolated Find F	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed

Table 2.11-3: Archaeological Sites Within 6 miles of Davis-Besse Nuclear Power Station (n = 88)
(continued)

Site No.	Site Name	Quadrangle	Precontact / Historic	Site Type	Components*	NR Eligibility Status
OT0201	Lewitz Isolated Find G	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0202	Dick Site	Lacarne	Precontact	Unknown Precontact Site Type	EA	Not Assessed
OT0203	Dick Isolated Find C	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0204	Dick Isolated Find M	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0207	Floro A	Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0218	Snyder-Nov 01	Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0228		Oak Harbor	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0229		Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0230		Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0231		Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential	UP, H (19^{th}-20^{th} C.)	Not Assessed
OT0232		Lacarne	Precontact and Historic	Unknown Precontact Site Type / Residential	UP, H (19^{th}-20^{th} C.)	Not Assessed
OT0233		Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0234		Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0235		Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0236		Lacarne	Precontact	Unknown Precontact Site Type	LW	Not Assessed

Table 2.11-3: Archaeological Sites Within 6 miles of Davis-Besse Nuclear Power Station (n = 88)
(continued)

Site No.	Site Name	Quadrangle	Precontact / Historic	Site Type	Components*	NR Eligibility Status
OT0237		Lacarne	Precontact	Unknown Precontact Site Type	LW	Not Assessed
OT0238		Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0239		Lacarne	Precontact	Unknown Precontact Site Type	LA	Not Assessed
OT0240		Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0241		Lacarne	Precontact	Unknown Precontact Site Type	UP	Not Assessed
OT0242		Lacarne	Historic	Residential, Subsistence	H (19^{th}-20^{th} C.)	Not Assessed
OT0243		Lacarne	Historic	Unknown Historic Site Type	H (19^{th}-20^{th} C.)	Not Assessed
OT0245		Lacarne	Precontact	Unknown Precontact Site Type	EA, MA	Not Assessed
OT0294	Silo	Lacarne	Historic	Residential, Subsistence	H (19^{th}-20^{th} C.)	Not Assessed
OT0295		Lacarne	Historic	Subsistence	H	Not Assessed
OT0296		Lacarne	Historic	Transportation	H	Not Assessed
OT0297		Lacarne	Historic	Residential	H (19^{th} C.)	Not Assessed
OT0300		Lacarne	Precontact	Unrecorded Precontact Site Type	MW	Not Assessed
OT0302		Lacarne	Historic	Military	H (1880-2000)	Not Assessed
OT0303	CP1	Lacarne	Historic	Military	H (1930-1949)	Not Assessed

**Table 2.11-3: Archaeological Sites
Within 6 miles of Davis-Besse Nuclear Power Station (n = 88)**
(continued)

Site No.	Site Name	Quadrangle	Precontact / Historic	Site Type	Components*	NR Eligibility Status

* Refers to the time period each site represents:

19th C. = Nineteenth Century
EA = Early Archaic (8000 to 6000 BC)
EW = Early Woodland (1000 to 1 BC)
H = Historic
LA = Late Archaic (3000 to 1000 BC)
LW = Late Woodland (500 to 1000 AD)
MA = Middle Archaic (6000 to 3000 BC)
MW = Middle Woodland (1 to 500 AD)
PH = Protohistoric
UP = Unknown Prehistoric

**Table 2.11-4: Structures
Within 6 miles of Davis-Besse Nuclear Power Station (*n* = 284)**

ID No.	Name	Address	Date	Use	NR Eligibility Status	Ownership	Agency
OTT0058003	Albert Apling House	8592 Duff-Washa Rd	1900	Single Dwelling	Not Eligible	Private	
OTT0063104	Richard Arnold House	5756 W Lakeshore Rd	1905	Single Dwelling	Not Eligible	Private	
OTT0063204	James Deluca House	5510 W Lakeshore Rd	1914	Single Dwelling	Not Eligible	Private	
OTT0063308	Dorothy Minier House	6862 W Harbor Rd	1900	Single Dwelling	Not Eligible	Private	
OTT0063403	Ruth Dick Property	8645 Toussaint E Rd	1842	Single Dwelling	Not Eligible	Private	
OTT0063503	Edward Moskal House	4864 W Lakeshore Rd	1919	Single Dwelling	Not Eligible	Private	
OTT0063603	Latter Day Saints Church	Toussaint S Rd	1870	Church/Religious Structure	Not Eligible	Private	
OTT0063703	Kenneth Priesman Etal Property	Duff-Washa Rd	1870	Church/Religious Structure	Not Eligible	Private	
OTT0063803	Toussaint Founders Club Hall	Toussaint E Rd	1875	Entertainment/ Recreation/Cultural Activities	Not Eligible	Private	
OTT0063904	Erie Twp Hall	State Rte 163 and Ontario Rd	1885	One Room Schoolhouse	Not Eligible	Public	Erie Township Trustees
OTT0064004	Erie Twp Garage	W Harbor Rd		School	Eligible	Public	Erie Township Trustees
OTT0064104	Richard Tettau Property	Tettau Rd	1912	Single Dwelling	Not Eligible	Private	
OTT0064203	Carroll Twp Hall	9977 Toussaint E Rd	1874	Village/Twp/City Hall	Not Eligible	Public	Carroll Township Trustees

**Table 2.11-4: Structures
Within 6 miles of Davis-Besse Nuclear Power Station (n = 284)**
(continued)

ID No.	Name	Address	Date	Use	NR Eligibility Status	Ownership	Agency
OTT0064403	Gerald Humphrey Property	12233 Zenzer Rd	1910	Single Dwelling	Not Eligible	Private	
OTT0064503	Kenneth Gyde Property	11055 Duff-Washa Rd	1880	Single Dwelling	Not Eligible	Private	
OTT0067008	Lorna Ballin House	7154 W Harbor Rd	1890	Single Dwelling	Not Eligible	Private	
OTT0067303	Gary Apling Property	3770 Toussaint S Rd	1860	Single Dwelling	Not Eligible	Private	
OTT0068804	Erie Industrial Park	Btwn Lake Erie & SR 2	1920	Arms Storage	Unknown	Unknown	
OTT0069703	R & D Dwight House	3985 N SR 2	1900	Single Dwelling	Not Assessed	Private	
OTT0069803	John & Ruth Dick Farm	4090 SR 2	1900	Single Dwelling	Not Assessed	Private	
OTT0069903	Arville Winter Farm	4216 N SR 2	1890	Single Dwelling	Not Assessed	Private	
OTT0070003	A Winter Farm	4216 N SR 2	1890	Barn	Not Assessed	Private	
OTT0070103	Leona Fizer House	4445 N SR 2	1900	Single Dwelling	Not Assessed	Private	
OTT0070203	Jeffrey King House	SEC of Lemon Rd & SR 2	1937	Single Dwelling	Not Eligible	Private	
OTT0070303	Blausey Property	SR 2 S of Toussaint River	1850	Single Dwelling	Not Assessed	Private	
OTT0070403	Phillip van Rensselaer Farm	S of Rusha Creek on SR 2	1875	Single Dwelling	Not Assessed	Private	

**Table 2.11-4: Structures
Within 6 miles of Davis-Besse Nuclear Power Station (n = 284)**
(continued)

ID No.	Name	Address	Date	Use	NR Eligibility Status	Ownership	Agency
OTT0070504	A Jacobs House	3225 N Lakeshore Rd	1920	Single Dwelling	Not Assessed	Private	
OTT0071708	Janet Welch Farm	8043 SR 163	1825	Single Dwelling	Not Eligible	Private	
OTT0071808	SL Schau House	8213 SR 163	1865	Single Dwelling	Not Eligible	Private	
OTT0071904-OTT0090604	Camp Perry Bldg 2811	Ariel Rd	1942	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0090704	Camp Perry Bldg 5040	Cartwright Trail	1933	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0090804	Camp Perry Pump Station 4058	CR 171	1938	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0090904-OTT0091304	Camp Perry Bldg 2008	Davis Rd	1942	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0091404	Camp Perry Main Flagpole	Lawrence Rd opposite Niagara	1876	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0091504-OTT0092004	Camp Perry Bldg 800	Lawrence Rd	1948	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0092104-OTT0092204	Camp Perry Range 5036	N of Lawrence Rd	1910	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0092304-OTT0092604	Camp Perry Rodriguez Firing Range	Lawrence Rd	1910	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0092704	Camp Perry Railroad Tracks	Near Niagara Rd	1906	Post/Military Base	Not Eligible	Public	Adjutant General's Department
OTT0092804	Camp Perry Bldg 8E	E of Niagara Rd	1942	Post/Military Base	Not Assessed	Public	Adjutant General's Department

**Table 2.11-4: Structures
Within 6 miles of Davis-Besse Nuclear Power Station (n = 284)**
(continued)

ID No.	Name	Address	Date	Use	NR Eligibility Status	Ownership	Agency
OTT0092904-OTT0093804	Camp Perry Bldg 3082Q	Niagara Rd	1942	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0093904	Camp Perry Bldg No 2100 A	Niagara Rd opposite Davis Rd	1942	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0094004	Camp Perry Bldg No 2101 Q	Niagara Rd opposite Davis Rd	1945	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0094104-OTT0094504	Camp Perry Bldg No 1841 Q	Niagara Rd	1942	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0094604	Camp Perry Bldg 2506	Niagara Rd at Davis Rd	1916	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0094704-OTT0095104	Camp Perry Bldg 2505	Niagara Rd	1942	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0095204-OTT0096204	Camp Perry Bldg No 3203	Scorpion Rd	1942	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0096304-OTT0097004	Camp Perry Bldg No 2024	Trippe Rd	1943	Post/Military Base	Eligible	Public	Adjutant General's Department
OTT0097103	Priesmans Farm Market	SR 2 & Humprey Rd	1900	Grange Hall	Not Eligible	Private	
OTT0101804 / OTT0069404	Camp Perry	Btwn Lake Erie & SR 2	1937	Post/Military Base	Some Structures are Eligible	Public	Ohio National Guard
OTT0103004	Hess Property & Silo	W Fritche Rd & N Tettau Rd	1920	Silo	Not Eligible	Private	

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2.12 KNOWN AND REASONABLY FORESEEABLE PROJECTS IN SITE VICINITY

This section describes the activities and projects, both Federal and non-Federal, in the local and regional area of the site that may potentially contribute to the cumulative environmental impacts of Davis-Besse extended plant operation for an additional 20 years.

As shown in Figure 2.1-2, there are no urban areas within the 6-mile radius of Davis-Besse. The only Federal project is the Camp Perry Military Reservation, located 4.5 miles southeast of the site (**FENOC 2010**, Section 2.2.2.2). Camp Perry is an Ohio National Guard facility used for small arms firing. The limited firing of anti-aircraft ordnance was suspended in 1988 (**FENOC 2010**, Section 2.2.2.4). Immediately adjacent to and west of Camp Perry is the Lake Erie Industrial Park.

North of the Toussaint River is the former Locust Point Firing Range, which occupied approximately 70 acres of property currently owned by The Illuminating Company and Toledo Edison (both subsidiaries of FE). This area occupied a portion of the property currently within the eastern limits of the Davis-Besse site. The balance of the former Locust Point property extends to the northeast along the western edge of the Davis-Besse intake canal, and spans the beachfront between the canal and the Toussaint River. This property served as an anti-aircraft artillery range in support of the Erie Army Depot from 1953 to 1963. In 1996 and 2001, Davis-Besse personnel found ordnance rounds along the beach area near the mouth of the Toussaint River. In both cases, the U.S. Department of Defense (USDOD) was notified, who responded and disposed of the devices.

In 2010, the USACE initiated a preliminary assessment of the former Locust Point property. The focus of the assessment is to determine whether releases or potential releases of contaminants related to operation, occurred while the property was under the USDOD jurisdiction. The USACE completed a site inspection in April 2010. No physical evidence of contamination or ordnance was observed during the inspection. Final reporting of the findings is anticipated in October 2010.

Beyond the 6-mile radius, Table 2.12-1 lists the number of local facilities within the Oak Harbor area that have the potential to contribute to the cumulative environmental impacts. These listed facilities produce and release air pollutants, have reported toxic releases, are hazardous waste sites that are or have the potential to be part of Superfund, or have permits to discharge to Lake Erie and surrounding rivers and other waters (**USEPA 2009**). Table 2.12-1 also lists these type facilities regionally in the four-county area of Ottawa, Lucas, Wood, and Sandusky.

The nearest existing electric generating plant to Davis-Besse is the Bay Shore Plant. Three coal-fired units, one petroleum coke-fired unit, and one oil-fired unit produce 648 megawatts of electricity (**FECorp 2009**). The plant site is situated on Maumee Bay in Oregon, Ohio, which is about 16 miles northwest of Davis-Besse.

New major utility facilities must obtain a certificate of environmental compatibility and public need prior to construction from the Ohio Power Siting Board (OPSB). A major utility facility is a generating plant of 50 megawatts (MW) or more; an electric transmission line of 125 kilovolts (kV) or more; or a gas or natural gas transmission line capable of transporting gas at more than 125 pounds per square inch of pressure. (**OPSB 2007**, Page 16)

As of 2007, the OPSB approved two generation plant applications within the Davis-Besse four-county area. One plant is operational, the other is under construction. The Troy Energy Facility achieved commercial operation in 2002. It is a 600 MW gas turbine peaking plant located at the Lemoyne Industrial Park, Troy Township, Wood County (**OPSB 2003**, Page 17), approximately 20 miles southwest of Davis-Besse. The Fremont Energy Center is projected for commercial operation in 2011 (**EEPI 2009**). It is a 540 MW natural gas-fired combined-cycle electric generating plant, with a peaking capacity of 704 MW (**OPSB 2007**, Page 22). The facility is located in Sandusky Township, Sandusky County, approximately 15 miles south of Davis-Besse.

2.12.1 REFERENCES

Note to reader: This list of references identifies web pages and associated URLs where reference data were obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. FENOC has maintained hard copies of the information and data obtained from the referenced web pages.

EEPI 2009. Electric Energy Publictions, Inc, Electric Energy Online.com, http://www.electricenergyonline.com/?page=show_news&id=118772, accessed July 8, 2010.

FECorp 2009. FirstEnergy Corp., Bay Shore Plant Fact Sheet, http://www.firstenergycorp.com/environmental/files/Fact_Sheets/Bay_Shore_Plant_FS_%2808-2007%29.pdf, accessed 4/3/2009.

FENOC 2010. Updated Safety Analysis Report (USAR) Davis-Besse Nuclear Power Station No. 1, Docket No: 50-346, License No: NPF-3, FirstEnergy Nuclear Operating Company (FENOC), Revision 27, June 2010.

OPSB 2003. Ohio Power Siting Board, 2003 Annual Report, http://www.puco.ohio.gov/emplibrary/files/media/OPSB/2003OPSBAR.pdf, accessed April 3, 2009.

OPSB 2007. Ohio Power Siting Board, 2007 Annual Report, http://www.puco.ohio.gov/emplibrary/files/media/OPSB/2007OPSBAR.pdf, accessed April 3, 2009.

USEPA 2009. U.S. Environmental Protection Agency, Envirofacts Warehouse, http://oaspub.epa.gov/enviro/ef_home3.html?p_zipcode=wood%2C+oh&p_type=county, accessed March 26, 2009.

Table 2.12-1: Potential Cumulative Environmental Impacts Facilities

Area	Potential Impacts (Number of Facilities)			
	Air[1]	**Toxics[2]**	**Waste[3]**	**Water[4]**
Oak Harbor	2	0	1	10
Ottawa County[5]	27[6]	7	1	57[6]
Lucas County	204	110	29	56
Wood County	88	50	0	63
Sandusky County	34	23	5	26

Source: **USEPA 2009**

Notes:

(1) Facilities that produce and release air pollutants.
(2) Facilities that reported toxic releases.
(3) Potential hazardous waste sites that are part of Superfund that exist.
(4) Facilities issued a permit to discharge to waters of the U.S. (which includes Lake Erie and surrounding rivers and other waters in the four county area).
(5) Oak Harbor facilities are also included as part of Ottawa County.
(6) Number of facilities includes Davis-Besse.

3.0 PROPOSED ACTION

> **Regulatory Requirement: 10 CFR 51.53(c)(2)**
>
> "The report must contain a description of the proposed action, including the applicant's plans to modify the facility or its administrative control procedures.... This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment…."

FirstEnergy Nuclear Operating Company (FENOC) requests that the NRC renew the Davis-Besse operating license for an additional 20 years beyond the current operating license term, which is the maximum allowable under the Atomic Energy Act and the NRC's regulations at 10 CFR 54.31. Renewal would give the State of Ohio, FirstEnergy Corp. and its subsidiary companies, and other participants in the wholesale power market the option to rely on Davis-Besse to meet future electric power needs through the period of extended operation.

The Chapter 3 sections below describe the Davis-Besse facilities and activities relevant to the assessments presented in Chapter 4. Section 3.1 discusses the plant in general. Sections 3.2 through 3.4 address the activities necessary to support the renewed operating license.

3.1 GENERAL PLANT INFORMATION

Davis-Besse is a nuclear-powered steam electric generating facility. The nuclear reactor is a Babcock and Wilcox-designed pressurized water reactor (PWR) producing a licensed reactor core power of 2,817 megawatts-thermal, and an electric rating of 908 megawatts-electric gross. Figure 3.1-1 depicts the site layout.

General information about the design and operational features of the Davis-Besse site from an environmental impact standpoint is available from a number of documents. Among the most comprehensive sources are the Final Environmental Statement (FES) prepared by the NRC and the Updated Safety Analysis Report (USAR). In 1975, the NRC issued the FES that addressed operation of Davis-Besse (**NRC 1975**). FENOC routinely updates the USAR (**FENOC 2010**) for Davis-Besse to reflect current plant design and operating features. FENOC relied on these documents, operating manuals, design-basis documents, technical documentation related to power uprate of the unit, and other relevant sources of information as a basis for descriptions of Davis-Besse presented in the remainder of Section 3.1.

3.1.1 Major Facilities

The station site is located on the southwestern shore of Lake Erie and consists of 954 acres. Approximately 733 acres are marshland that is leased to the U.S. Government as a national wildlife refuge. The topography of the site and vicinity is flat with marsh areas bordering the lake and the upland area rising to only 10 to 15 feet above the lake low water datum level in the general surrounding area. The site itself varies in elevation from marsh bottom, below lake level, to approximately six feet above lake level. (**FENOC 2010**, Section 2.1.2)

The major station structures are located approximately in the center of the site area, 3,000 feet from the shoreline. The Containment Building is located 2,400 feet from the nearest site boundary, which is to the north. (**FENOC 2010**, Section 2.1.2) The site, site arrangement, and location of the 17 major station structures are shown on Figure 3.1-1. The site boundary, as shown on Figure 2.1-3, is the limit of the exclusion area (**FENOC 2010**, Section 2.1.2.1). Ownership of the site area, within the site boundary, resides with FENGenCo (Section 1.3).

3.1.2 Nuclear Steam Supply, Containment, and Power Conversion Systems

The Reactor Coolant System (RCS) consists of the reactor vessel, two vertical once-through steam generators, four shaft-sealed coolant circulating pumps, an electrically heated pressurizer, and interconnecting piping. The system is arranged as two heat transport loops, each with two circulating pumps and one steam generator (**FENOC 2010**, Section 1.2.2.1.1).

The RCS is designed to contain and circulate reactor coolant at pressures and flows necessary to transfer the heat generated in the reactor core to the secondary fluid in the steam generators. In addition to serving as a heat transport medium, the coolant also serves as a neutron moderator and reflector, and as a solvent for the soluble boron utilized in chemical shim reactivity control.

The steam and power conversion system provides steam for driving the main turbine and the main feed pump turbines. Steam is also used for the auxiliary feed pump turbines, gland sealing, condenser inventory heating, steam jet air ejector, turbine reheater steam heating, building heating (steam supplied unit heaters), station heating heat exchangers and outdoor tank heating.

The complete core has 177 fuel assemblies arranged in a square lattice to approximate a cylinder. All fuel assemblies are identical in mechanical construction and mechanically interchangeable in any core location. Each fuel assembly will accept any control assembly. The fuel is sintered, cylindrical pellets of low-enriched uranium dioxide. The pellets are clad in Zircaloy-4 or M5 tubing and sealed by Zircaloy-4 or M5 end caps, welded at each end. The cladding, fuel pellets, end caps, and fuel support components form a fuel rod. (**FENOC 2010**, Section 4.2.1.3)

Refueling of the reactor core takes place approximately every 24 months. At this time, as dictated by the fuel management program, spent and partially spent fuel assemblies are replaced with new fuel assemblies. (**FENOC 2010**, Section 9.1.4.2.1) Fuel assemblies containing up to 5.00 wt% uranium-235 may be stored in the new fuel storage area. New fuel assemblies are transferred from the new fuel storage area into the spent fuel pool area. They are then transferred into the containment vessel by the fuel transfer carriages operating through the fuel transfer tubes. Transfer of new fuel and removal of spent fuel occurs after the reactor is shut down and the refueling canal is filled with borated water. (**FENOC 2010**, Section 1.2.7.2)

The Shield Building is a reinforced concrete structure of right cylinder configuration with a shallow dome roof. The Shield Building has a height of 279.5 feet measured from the top of the foundation ring to the top of the dome. The thicknesses of the wall and the dome are approximately 2.5 feet and 2 feet, respectively. (**FENOC 2010**, Section 3.8.2.2.1) The structure is designed to withstand an internal pressure of 40 pounds per square inch gage (psig) and sufficient to withstand design-basis accidents (**FENOC 2010**, Section 3.8.2.1.4.e).

Davis-Besse was initially licensed to operate at a maximum steady-state core power level of 2,772 megawatts-thermal (MWt). However, the Operating License and Technical Specifications were subsequently amended in 2008 to allow an increase in the Rated Thermal Power of 1.63%, to 2,817 MWt (**NRC 2008**). The description of plant facilities and operations and associated impact evaluations in this ER, therefore, assume operation at 2,817 MWt, which is equivalent to an electric capacity of 908 MWe (**FENOC 2009**).

3.1.3 Cooling and Auxiliary Water Systems

3.1.3.1 Service Water and Make-up Water Treatment Systems

The Service Water System (SWS) is designed to serve two functions during station operation. The first function is to supply cooling water to the component cooling heat exchangers, the containment air coolers, and the cooling water heat exchangers in the turbine building during normal operation. The second function is to provide, through automatic valve sequencing, a redundant supply path to the engineered safety features components during an emergency. Only one path, with one service water pump, is necessary to provide adequate cooling during this mode of operation. (**FENOC 2010**, Section 9.2.1.1)

Three service water pumps are part of the SWS. They are installed in the intake structure and use Lake Erie as a source of water. Two pumps are used in normal operation. Motor-operated strainers at the pump outlets filter any material that may plug heat exchanger tubes and the orifices of the auxiliary feedwater pump bearing oil cooler, turbine bearing cooler, and governor oil cooler. (**FENOC 2010**, Section 9.2.1.2)

The Make-up Water Treatment System is designed to supply high quality water in sufficient quantity for primary and secondary plant makeup. Under normal operation, Lake Erie water, which may be treated with sodium hypochlorite and a molluscicide (i.e., sodium bromide) at the Intake Structure, is delivered to one of two chlorine detention tanks. Sodium hypochlorite may also be injected into the tanks, but not sodium bromide, which cannot be delivered to the tanks. From the chlorine detention tank the water is sent to a vendor supplied processing system. The vendor's system provides all necessary equipment and components to produce demineralized water for makeup to the demineralized water storage tank. The demineralized water in the storage tank, in turn, is transferred to various points throughout the station, such as the condenser hotwell, condensate storage tanks, and for miscellaneous flushing operations. (**FENOC 2010**, Section 9.2.3.2)

3.1.3.2 Circulating Water and Cooling Tower Systems

The Circulating Water System (CWS) is a closed cycle system consisting of the condenser, cooling tower, circulating water pumps, makeup pumps, and water chlorination system and chemical feed system. The CWS is designed to remove 6.69×10^9 Btu/hr from the power cycle. The condenser is designed to operate efficiently with circulating water over the range of 50°F to 100°F. (**FENOC 2010**, Section 10.4.5.1)

Four equal capacity, motor driven, horizontal split-case circulating water pumps take suction from the common discharge channel from the cooling tower basin and supply cooling water to the two halves of the low pressure shell of the dual pressure condenser. Each half is supplied by two pumps. The circulating water leaves the condenser at the two high pressure shell outlet waterboxes in two independent steel pipes and returns to the cooling tower. A provision is made for cross-connecting the inlet low pressure shell waterboxes to equalize flow through each tube bundle and allow for less than four pump operation. (**FENOC 2010**, Section 10.4.5.2.1)

A natural draft hyperbolic cooling tower rejects the heat from the circulating water. Circulating water loss from the cooling tower occurs by evaporation and blowdown. A makeup water system replaces these losses. (**FENOC 2010**, Section 10.4.5.2.1) The tower is 493 feet high, constructed of non-combustible material, and its base is located about 700 feet from the closest structure, the Emergency Diesel Generator fuel oil storage tanks (**FENOC 2010**, Section 10.4.5.3). See Figure 3.1-1, No. 15.

Blowdown from the cooling tower is accomplished downstream of the circulating water pumps and is controlled to maintain a dissolved solids concentration ratio. Slime and algae control is achieved by a chlorination system, which includes the addition of a sodium bromide solution to the sodium hypochlorite to enhance the biocidal effectiveness of the water treatment without increasing the level of chlorine. Should the sodium bromide portion of the system not be available, sodium hypochlorite solution may be used alone. (**FENOC 2010**, Section 10.4.5.2.1)

The primary source of makeup water is the SWS, which is connected to the circulating water pump suction lines. Also, two vertical turbine pumps, located on the intake structure, can supply lake water as an alternate source of makeup water. Blowdown is not accomplished from a circulating water line when the same line is supplied with makeup. (**FENOC 2010**, Section 10.4.5.2.1)

Chlorination of the CWS is done on a periodic basis to prevent algae growth within the system. Sodium hypochlorite and a sodium bromide solution are mixed to enhance the biocide effectiveness of the water treatment without increasing the level of chlorine and together are injected into those circulating pump suctions whose discharges are not providing blowdown water. Should the sodium bromide portion of the system not be available, sodium hypochlorite may be used alone. In this way, blowdown water contains essentially no free chlorine residual and the chloride content is unchanged. A chemical feed system is used to reduce scaling tendencies of the circulating water and disperse silt. Treatment increases the sulfate content of the water to more than 80 ppm. Since the system water, in passing through the cooling tower, is in intimate contact with air to accomplish the cooling, the outlet water contains an oxygen content that is essentially at the saturation level corresponding to the cold water outlet temperature. The oxygen content for the highest tower outlet temperature will be 7 ppm. (**FENOC 2010**, Section 10.4.5.2.2)

3.1.3.3 Domestic Water System

The source of water for the Domestic Water System is the off-site Carroll Township Water System. Water for the township system is taken from Lake Erie west of the Davis-Besse site, filtered and treated to meet the requirements of the OEPA. The township system pressure is maintained by the use of an elevated 500,000-gallon storage tank with a maximum water level of 742.5 feet International Great Lakes Datum, which provides sufficient pressure to supply all station needs. (**FENOC 2010**, Section 9.2.4.2)

3.1.4 Power Transmission Systems

During the original construction of Davis-Besse, three new high-voltage transmission lines were constructed to connect Davis-Besse to the nearby Toledo Edison (a FirstEnergy transmission company) transmission 345 kV substations at Bay Shore, Lemoyne, and Ohio Edison - Beaver substation (**AEC 1973**, Section 3.7). See Figure 3.1-2. Office building support equipment at Davis-Besse receives some power from local distribution systems, but there are no transmission connections other than the three 345 kV connections described above (**FENOC 2010**, Section 8.1.1).

The Bay Shore line is about 21 miles long, extending from the Davis-Besse switchyard west and then northwest to Toledo Edison's Bay Shore substation. The right-of-way is 150 feet, except where it parallels the existing Bay Shore to Ottawa 138-kV line. In this region, the right-of-way is 145 feet, contiguous to the existing 100 feet for the 138 kV line. The Lemoyne line also is about 21 miles long, extending from the Davis-Besse switchyard west and then southwest to Toledo Edison's Lemoyne substation, with a 150-foot right-of-way. The Beaver line is about 59 miles long, extending from the Davis-Besse switchyard south and then southeast to Ohio Edison's Beaver substation. The portion of the Beaver line for Davis-Besse only extends about 15 miles from the station south and then southeast to a tie point on the boundary between Toledo Edison and Ohio Edison. The remaining 44 miles was constructed under a separate project. (**AEC 1973**, Section 3.7)

Approximately 1,800 acres, primarily flat agricultural land, were required for the rights of way (**AEC 1973**, Section 3.7). FirstEnergy conducts routine vegetation maintenance of its rural transmission line corridors approximately every five years. Trees and shrubs that do not interfere with transmission facilities are not disturbed, and portions of corridors that are not cultivated or devoted to other intensive uses are managed to promote a diversity of shrubs, grasses, and other groundcover that provides wildlife food and cover. Maintenance includes removal or pruning of woody vegetation as necessary to ensure adequate line clearance (no less than 30 feet from the conductor for transmission lines operated above 138 kV) and to allow vehicular access for maintenance. (**FE 2007**)

Toledo Edison uses transmission voltages other than 345 kV. The most important voltage is 138 kV (nominal). There are several interconnections to other utilities at 345 kV and 138 kV. Utilities connected to the Toledo Edison grid include Detroit Edison, American Electric Power, and Ohio Edison. Each of the 345 kV substations connected to Davis-Besse is associated with at least one inter-utility connection. (**FENOC 2010**, Section 8.1.1)

The transmission lines related to Davis-Besse are also shown in Figure 2.1-1 Figure 2.1-2, and Figure 2.1-3.

3.1.5 WASTE MANAGEMENT SYSTEMS

3.1.5.1 Non-Radioactive Waste System

Non-radioactive waste is produced from plant maintenance, cleaning, and operational processes. The majority of the wastes generated consists of non-hazardous waste oil and oily debris and result from operation and maintenance of oil-filled equipment. Universal wastes, such as spent lamps and batteries, common to any industrial facility, comprise a majority of the remaining waste volumes generated. Hazardous wastes routinely make up a small percentage of the total wastes generated and include and consist of spent and off-specification (e.g., shelf-life expired) chemicals, laboratory chemical wastes, and occasional project-specific wastes.

Non-radioactive chemicals, paint, oil, lamps, and other items that have either been used or exceeded their useful shelf life are collected in designated collection areas and managed in accordance with federal (40 CFR) and state (Ohio Administrative Code (OAC) Chapter 3745-50) rules via Davis-Besse and FENOC procedures. The materials are received in various forms and are packaged to meet regulatory requirements prior to final disposition at an offsite facility licensed to receive and manage the material. Typical waste streams include waste oil, oily debris, glycol, lighting ballasts containing PCBs (not typical), lamps, batteries, and hazardous wastes. The FENOC Chemical Control Program establishes the standard method for the control of chemicals and promotes waste minimization.

Davis-Besse is a Small Quantity Generator registered with the OEPA. However, during refueling outage years, hazardous waste generation may exceed 2,200 pounds in a month, requiring Davis-Besse to file a report with the OEPA for a temporary Large Quantity Generator status in accordance with the OAC, Rule 3745-52-41 (**FENOC 2008**).

3.1.5.2 Liquid Radioactive Waste Systems

The Liquid Radioactive Waste System is designed so that effluents released by the system, when mixed with the cooling tower blowdown, meet the requirements in Appendix B of 10 CFR Part 20 and 10 CFR Part 50 (**FENOC 2010**, Section 11.2.1). Before processed water is released to the environment it is mixed in a collection box with the discharge from the SWS, the dilution pump, a cooling tower make up pump, or the cooling tower blowdown. Processed liquid waste enters Lake Erie. The Off-site Dose Calculation Manual (ODCM) provides the day-to-day methods for determining release rates, cumulative releases and for calculating the corresponding dose rates and cumulative quarterly and yearly doses.

The design is based on receiving, segregating, and batch-storing two categories of solutions:

Clean Liquid Radwaste System - The major source of waste for this system is reactor coolant letdown resulting from boron dilution operations or from coolant expansion during reactor startups. Other sources include leakage, drainage, and relief flows from valves and equipment containing reactor-grade liquid. (**FENOC 2010**, Section 11.2.2.2.1)

Miscellaneous Liquid Radwaste System - The major sources of this class of wastes are further categorized as non-detergent wastes such as miscellaneous system leakage, drainage from area washdown, sampling and laboratory operations, condensate polishing demineralizer backwash (if there is a significant primary-secondary leak), and detergent wastes. Detergent waste comes from the hot showers (used to decontaminate personnel) and drains in the laboratory. (**FENOC 2010**, Section 11.2.2.2.2)

The system can accommodate the full range of volumes and activities delivered to it. Suitability for discharge is determined not only by comparison of waste samples with applicable limits, but also by the opportunity afforded the station to further reduce activity with existing equipment.

3.1.5.3 Gaseous Radioactive Waste System

The gaseous radioactive waste disposal system is designed to process effluents to meet the requirements of 10 CFR Part 20, 10 CFR Part 50, Appendix I, and 40 CFR Part 40 (**FENOC 2010**, Section 11.3.1). The system provides selective holdup such that the short-lived isotopes have decayed prior to release. It also provides a 30-day holdup of these gases when refueling cold shutdown degassing is required. The ODCM provides the day-to-day methods for determining release rates, cumulative releases and for calculating the corresponding dose rates and cumulative quarterly and yearly doses (**FENOC 2010**, Section 11.3.2).

When a decay tank is full (i.e., contains gas at 150 psig) or when the operator decides, it is valved out-of-service and another put in its place. A sample is then taken from the isolated tank and analyzed. If it shows a sufficiently low activity level, the stored gas can be released in a controlled manner through waste gas charcoal and high efficiency particulate air filters to the station vent. If the analysis indicates significant radioactivity, the gases are allowed to decay until future sampling shows that they are suitable for release to the environment. Using two of the decay tanks, gases can be held for at least 60 days with release spread out over the next 30 days. (**FENOC 2010**, Section 11.3.3)

Gaseous wastes that contain little or no radioactivity or may contain oxygen are handled separately. These gases are collected, passed through a charcoal filter, and then released through the station vent. (**FENOC 2010**, Section 11.3.3)

3.1.6 Transportation of Radioactive Materials

Radioactive wastes are packaged and shipped from Davis-Besse in containers that meet the requirements established in 49 CFR Parts 171-180 for the Department of Transportation and 10 CFR Part 71 for the NRC. The radiation levels of the waste containers are monitored so that provisions can be made to ensure that radiation levels established by shipping regulations are not exceeded. Radioactive waste is transported to a commercial low-level radioactive waste disposal facility located near Clive, Utah. Low activity waste may be transported to a vendor for volume reduction prior to disposal. The Davis-Besse Process Control Program and FENOC procedures related to shipment of radioactive material ensure compliance with the requirements governing packaging, transportation, and disposal of solid radioactive wastes, including spent resin liquor that is picked up and transported directly by a vendor for processing and disposal.

3.1.7 Maintenance, Inspection, and Refueling Activities

Maintenance and inspection activities are performed to ensure that plant equipment is functioning properly to support plant operations. Routine maintenance and inspection activities are performed during normal operation of the plant; other maintenance and inspection activities are performed during scheduled refueling outages. Maintenance, inspection and refueling activities are conducted in accordance with various plant programs implemented to comply with industry codes and standards, including the following:

- 10 CFR Part 50, Appendix B, Quality Assurance;
- 10 CFR 50.55a, American Society of Mechanical Engineers Boiler and Pressure Vessel Code;
- 10 CFR 50.65, The Maintenance Rule.

In addition, periodic maintenance and inspection procedures have been initiated in response to NRC generic communications. Periodic maintenance, inspection, testing, and monitoring are also performed to meet Technical Specification surveillance requirements and for managing the effects of aging on systems, structures and components.

Figure 3.1-1: General Plant Layout

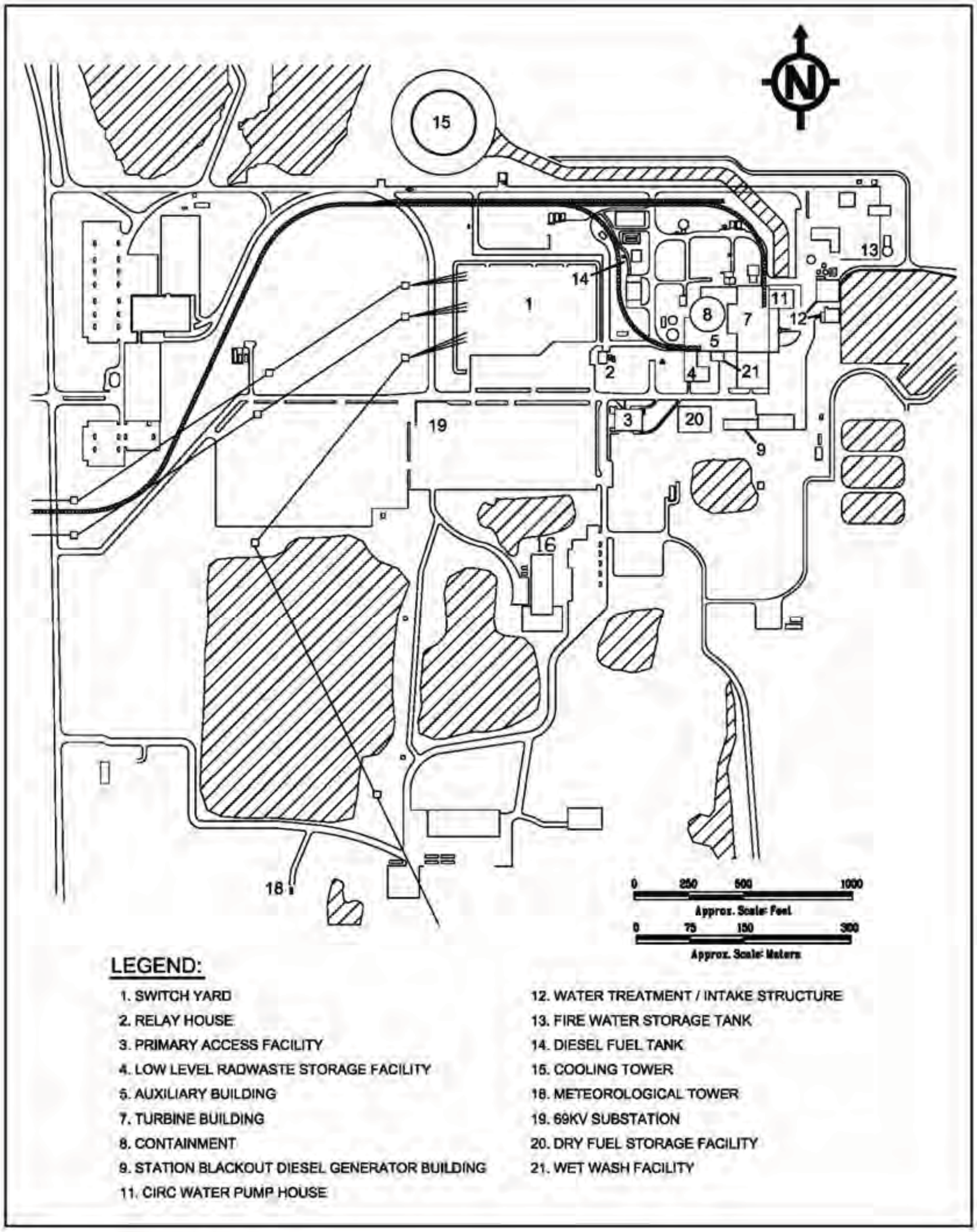

Figure 3.1-2: High-Voltage Transmission Lines Constructed to Connect Davis-Besse to Power Grid

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3.2 REFURBISHMENT ACTIVITIES

Regulatory Requirement: 10 CFR 51.53(c)(2); 51.53(c)(3)(ii)

"The report must contain a description of … the applicant's plans to modify the facility or its administrative control procedures as described in accordance with § 54.21. This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment…."

"The environmental report must contain analyses of …refurbishment activities, if any, associated with license renewal…."

FENOC has addressed refurbishment activities in accordance with NRC regulations and complementary information in the NRC GEIS for license renewal (**NRC 1996**). In particular, NRC requirements for the renewal of operating licenses for nuclear power plants include the preparation of an Integrated Plant Assessment (IPA) in accordance with 10 CFR 54.21. The IPA must identify and list systems, structures, and components subject to an aging management review. Items that are subject to aging and might require refurbishment include, for example, the reactor vessel piping, supports, and pump casings, as well as items that are not subject to periodic replacement.

In addition, the GEIS (**NRC 1996**, Section 2.6) provides information on the scope and preparation of refurbishment activities to be evaluated in this environmental report. It describes major refurbishment activities that utilities might perform for license renewal that would necessitate changing administrative control procedures and modifying the facility. The GEIS analysis assumes that an applicant would begin any major refurbishment work shortly after NRC grants a renewed license and would complete the activities during five outages, including one major outage at the end of the 40th year of operation. The GEIS refers to this as the refurbishment period.

NRC regulations for implementing the National Environmental Policy Act require environmental reports to describe in detail and assess the environmental impacts of refurbishment activities such as planned modifications to systems, structures, and components or plant effluents [10 CFR 51.53(c)(2)]. NRC regulations at 10 CFR Part 51 do not define "refurbishment," but the GEIS provides some examples of refurbishment activities and explains that these are actions that typically take place only once in the life of a nuclear plant, if at all (**NRC 1996**, Section 2.6.2.6). Relevant examples of possible refurbishment activities include replacing the turbine and turbine pedestal, steam generator, or reactor coolant system piping when these activities are carried out to ensure safe or more economic operations during the period of extended operations. The GEIS assumes, however, that refurbishment activities would take place during a "refurbishment period"; i.e., within the 10 years prior to current license expiration, over the course of numerous outages, and culminating in a major outage immediately prior to the extended (license renewal) term.

FENOC plans to replace the reactor vessel head in 2011 (see **NRC 2010**) and the two original steam generators in 2014. FENOC has determined that the most cost-effective method for long-term management of the reactor vessel head, steam generators, and other large irradiated plant equipment, is to store them on-site in a dedicated storage facility, and then disposition them along with the remaining plant equipment when Davis-Besse is decommissioned. Therefore, a new permanent Storage Facility is planned to be constructed in 2011, which will provide approximately 12,000 square feet of space to house indefinitely the current (Midland) reactor vessel head, and later house the original steam generators and the Reactor Coolant System hot legs (see below). A permanent multi-story office building also is planned to be constructed in 2011 adjacent to the Auxiliary Building to house personnel that will support the replacement activities for the reactor vessel head and steam generators.

The replacement of the reactor vessel head and the construction of the two new permanent structures to support the head replacement project are being performed for and under the current facility operating license. Therefore, the associated environmental impacts are enveloped by the Final Environmental Statement for the current Davis-Besse operating license (**NRC 1975**).

In 2014, FENOC plans to replace the two original Davis-Besse once-through steam generators with new once-through steam generators, and plans to replace the Reactor Coolant System hot leg piping in conjunction with the replacement of the steam generators. Replacement activities are expected to last approximately 70 days and are currently planned to be conducted during a slightly-extended Cycle 18 refueling outage in the spring of 2014. FENOC considers the replacement activities associated with the steam generators and the hot leg piping to be license renewal refurbishment activities. Therefore, the associated environmental impacts are assessed in this ER.

Each of the once-through steam generators is a vertically-mounted, straight-tube and shell counter-flow heat exchanger that converts heat from the reactor coolant system into steam to drive the turbine generators and produce electricity. The existing steam generators are each approximately 75 feet long, have a diameter of approximately 15 feet, and weigh approximately 590 tons. The replacement steam generators will be dimensionally equivalent to the original steam generators, but weigh only approximately 465 tons each.

The approximately 15,500 straight tubes in the original steam generators are 56 feet long and are made of Alloy 600 (inconel) material. This alloy degrades over time as a result of a variety of corrosion and mechanical factors. Alloy 600 degradation affects both of the steam generators at Davis-Besse. Accordingly, FENOC has determined that they should be replaced with steam generators that use Alloy 690 tubing material to minimize tube degradation due to Alloy 690's improved resistance to stress corrosion cracking.

The replacement steam generators are being manufactured in Cambridge, Ontario, Canada by Babcock and Wilcox Canada, Ltd., and will be transported to Davis-Besse. The steam generators are planned to ship separately, and transport is expected to involve the following methods of transportation and routes:

- Rail transport from Cambridge, Ontario, to the Port of Toronto;
- Barge transport across Lake Ontario, through the Welland Canal, and across Lake Erie to the Port of Toledo; and,
- Rail transport from the Port of Toledo to Davis-Besse.

Babcock and Wilcox Canada, Ltd., is responsible for the transportation and delivery of the steam generators to Davis-Besse, and would ensure that all federal, state, and local requirements are met for associated transportation activities. Physical modifications to the rail lines may be necessary to transport the replacement steam generators.

After the replacement steam generators arrive at Davis-Besse, FENOC plans to transport the steam generators on a heavy-duty self-propelled modular transporter, and move them to a temporary New Steam Generator Storage Facility (described below) to be constructed at Davis-Besse.

Site planning, construction of temporary facilities, modification of existing buildings, and other preparation activities are planned to occur at Davis-Besse prior to removal of the original steam generators from the Containment Vessel.

Temporary facilities consisting of approximately 80,000 square feet are planned for additional offices, fabrication and assembly activities, mock-up activities, weld testing, decontamination, warehouse areas, and lay down areas. These temporary facilities consisting of tents and portable trailers would use portions of existing Davis-Besse structures and facilities (e.g., permanent parking lot, dry cask storage pad), would require construction of a concrete pad that may remain following the steam generator replacement project, or would consist of temporary structures that would be completely removed following completion of the project. All temporary facilities and any permanent concrete pads that remain following the replacement project are planned to be located within the developed industrial areas of the site on previously-disturbed land.

FENOC estimates that the total area disturbed by permanent and temporary construction, decontamination, and laydown activities would be less than 10 acres, all of which would be on previously-disturbed property within the bounds of the Davis-Besse owner-controlled area. A load-haul path consisting of fill and gravel would likely be constructed for transporting the original steam generators to the permanent Storage Facility. A minimal amount of fill soil may be temporarily required in certain locations along the on-site haul route to ensure the stability of the roads and transporter. The small amount of disturbed area and implementation of best management practices in accordance with FENOC and site procedures (e.g., watering) would minimize the amount of fugitive dust generated by refurbishment activities.

To perform the steam generator replacement, FENOC plans for a temporary construction opening approximately 24 feet wide by 39 feet high to be created in the Shield Building and free-standing Containment Vessel. The Shield Building is composed of reinforced concrete walls approximately two and one-half feet thick, and the free standing Containment Vessel is approximately 1.5 inches thick steel. The process of creating the opening would include activities such as removing concrete, cutting rebar, and cutting and removing a section of the steel Containment Vessel. A hydro-demolition (high pressure water) process or other mechanical methods are being considered to remove the Shield Building concrete, and mechanical methods are being considered to cut the Containment Vessel opening. After installation of the new steam generators, the openings would be sealed and the Containment Vessel and Shield Building returned to their original configurations and integrity.

The two original steam generators would be drained and cut-away from existing piping and supports. Steel covers would be seal-welded to the nozzles of main coolant, steam, and feedwater piping openings of the original steam generators to preclude the release of contamination and seal-off internal sections during removal, transport and storage. Loose contamination would be removed from the exterior of each original steam generator and a coating would be applied to affix any remaining contamination. The steam generators would then be rigged-out of Containment through the temporary openings.

After removal from Containment, the original steam generators would be transported on a self-propelled modular transporter to the permanent Storage Facility. The replacement steam generators would be removed from temporary storage and moved by the self-propelled modular transporter to the vicinity of the Davis-Besse Containment, and rigged into place. Installation would include construction of supports, connection of piping, and testing of system integrity.

Construction activities would likely result in noise levels (primarily from hydro-demolition, if used, or other mechanical means of concrete removal) greater than those associated with normal Davis-Besse operation. Noise from construction activities, however, would be intermittent and temporary in nature, and would decrease as the distance from the source increases.

The peak period of activity would likely occur when the actual removal and replacement of the steam generators take place. FENOC anticipates that approximately 900 additional workers would be on-site to support the replacement of the steam generators. Approximately 1,300 additional temporary workers would be on-site supporting the refueling outage as well, for a peak total of approximately 2,200 additional workers.

FENOC anticipates that on-site storage of diesel fuel and various lubricating oils may be required during the 70-day steam generator replacement project. FENOC site and company environmental protection procedures (e.g., the Spill Prevention Control and Countermeasure (SPCC) Plan) will be used to control the storage of fuel and oils. Non-hazardous waste generated during the steam generator replacement project and hydro-demolition concrete and demolition debris will be disposed of in accordance with FENOC and site procedures. Water used in the hydro-demolition process, and other temporary discharges will be addressed in accordance with the requirements of the National Pollutant Discharge Elimination System (NPDES) permit.

In advance of the steam generator replacement project, FENOC plans to resolve relevant environmental permit requirements (e.g., Ohio Final General Permit for Storm Water Discharge) to ensure compliance. No significant impacts to bodies of water, ecological resources, cultural resources or land use are anticipated in association with the steam generator replacement project because activities are planned to be undertaken on previously-disturbed parcels of land, and fugitive dust generation and water run-off will be managed in accordance with FENOC and site procedures and best-management practices. In addition, many of the facilities and activities will be short-term and temporary in nature.

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3.3 PROGRAMS AND ACTIVITIES FOR MANAGING THE EFFECTS OF AGING

Regulatory Requirement: 10 CFR 51.53(c)(2)

"The report must contain a description of … the applicant's plans to modify the facility or its administrative control procedures…This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment…."

The IPA required by 10 CFR 54.21 identifies the programs and inspections determined to be necessary for managing aging at Davis-Besse during the additional 20 years beyond the initial license term. Appendix B of the Davis-Besse license renewal application contains descriptions of the programs and activities credited for managing the effects of aging during the period of extended operation. Appendix B also identifies programs and activities that are new and describes proposed revisions (enhancements) to the existing programs and activities.

In addition to implementation of the specific programs and inspections identified in the IPA, some enhancements to Davis-Besse administrative control procedures may be required in association with license renewal. The additional programs and inspection activities, and the potential enhancements to administrative control procedures, are consistent with normal plant component inspections and, for that reason, are not expected to cause significant environmental impact.

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3.4 EMPLOYMENT

3.4.1 CURRENT WORKFORCE

The non-outage work force at Davis-Besse, as of January 2009, consists of approximately 825 FENOC employees and approximately 60 contractor employees. As shown in Table 3.4-1, approximately 88% of employees reside in the four contiguous counties of Ottawa (37.2%), Lucas (19.8%), Wood (15.5%), and Sandusky (15%).

The Davis-Besse reactor is on a 24-month refueling cycle (Section 3.1.2). During refueling outages, which average about 48 days, site employment is supplemented with the addition of an average 1,300 temporary workers. Should turbine generator work occur during an outage, FENOC estimates that site employment would be supplemented with the addition of an average 1,500 temporary workers. FENOC expects the number of workers required on site for normal plant outages during the period of extended operation to be consistent with the number of additional workers used for past outages at Davis-Besse.

3.4.2 LICENSE RENEWAL INCREMENT

The GEIS estimated that an additional 60 employees per unit would be necessary for operation during the period of extended operation to perform the license renewal surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping activities (**NRC 1996**, Table 2.8). FENOC, however, believes that it will be able to manage the necessary programs with existing staff.

Most of the new activities, for example, are one-time inspections that will be performed prior to entering the extended license period. Many other activities will be performed during outages, when supplemental technical staff is available. The few new ongoing programs that will continue into the extended license period are not expected to require plant resources beyond the current staffing. Therefore, FENOC has no plans to add non-outage employees to support plant operations during the extended license period. As a result, there is no anticipated effect to indirect employment or population associated with the extended license period.

Table 3.4-1: Estimated Distribution of Davis-Besse Employee Residences, January 2009

State	County	Percent of Workforce*
Ohio	Ashland	0.12
	Clark	0.12
	Clyde	0.12
	Crawford	0.24
	Cuyahoga	0.12
	Erie	5.58
	Fulton	0.36
	Hancock	0.24
	Huron	1.09
	Lake	0.12
	Locus	0.12
	Lorain	0.24
	Lucas	19.76
	Morrow	0.12
	Ottawa	37.21
	Portage	0.12
	Putnam	0.12
	Richland	0.12
	Sandusky	15.03
	Seneca	1.45
	Summit	0.12
	Wood	15.52
Michigan	Monroe	1.70
	Van Buren	0.12
Pennsylvania	Beaver	0.12

*Includes approximately 825 FENOC employees.

3.5 REFERENCES

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NRC 2010. NRC Letter, M.A. Satorius to B. Allen (FENOC), CAL No. 3-10-001, Confirmatory Action Letter – Davis-Besse Nuclear Power Station, June 23, 2010.

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4.0 ENVIRONMENTAL CONSEQUENCES OF PROPOSED ACTION AND MITIGATING ACTIONS

Regulatory Requirement: 10 CFR 51.53(c)(2)

"The environmental report must include an analysis that considers…the environmental effects of the proposed action…and alternatives available for reducing or avoiding adverse environmental effects." 10 CFR 51.45(c) as adopted by 10 CFR 51.53(c)(2)

The environmental report shall discuss the "…impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance…." 10 CFR 51.45(b)(1) as adopted by 10 CFR 51.53(c)(2)

"The information submitted…should not be confined to information supporting the proposed action but should also include adverse information."
10 CFR 51.45(e) as adopted by 10 CFR 51.53(c)(2)

Chapter 4 assesses the environmental consequences associated with the renewal of the Davis-Besse operating license. The assessment is based on the 92 environmental issues that the NRC has identified, analyzed, and considered to be associated with nuclear power plant license renewal. The NRC has designated the issues as Category 1, Category 2, or NA (not applicable).

Category 1 issues met the following criteria:

- the environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic;
- a single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts that would occur at any plant, regardless of which plant is being evaluated (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent-fuel disposal); and
- mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

NRC rules do not require analyses of Category 1 issues that the NRC resolved using generic findings (10 CFR Part 51, Appendix B, Table B-1) as described in the GEIS (NRC 1996). An applicant may reference the generic findings or GEIS analyses for Category 1 issues.

If the NRC analysis concluded that one or more of the Category 1 criteria could not be met, NRC designated the issue as Category 2. NRC requires plant-specific analyses for Category 2 issues.

Finally, NRC designated two issues as NA (not applicable), signifying that the categorization and impact definitions do not apply to these issues.

Attachment A of this report lists the 92 issues and identifies the environmental report section that addresses each issue applicable to Davis-Besse. For organization and clarity, FENOC has assigned a number to each issue and uses the issue numbers throughout the environmental report.

Category 1 License Renewal Issues

FENOC has determined that, of the 69 Category 1 issues, eight are not applicable to Davis-Besse because they apply to design or operational features that do not exist at the facility. With respect to the remaining 61 Category 1 issues, including seven issues applicable to refurbishment, FENOC has not identified any new and significant information that would invalidate the NRC findings (at 10 CFR Part 51, Appendix B, Table B-1). Therefore, FENOC adopts by reference the NRC findings for these Category 1 issues.

Category 2 License Renewal Issues

NRC designated 21 issues as Category 2. Sections 4.1 through 4.20 address these Category 2 issues, beginning with a statement of the issue. Nine Category 2 issues apply to operational features that Davis-Besse does not have. In addition, four Category 2 issues apply to refurbishment activities. If the issue does not apply to Davis-Besse, the section explains the basis for inapplicability.

For the 12 Category 2 issues that FENOC has determined to be applicable to Davis-Besse, the appropriate sections contain the required analyses. These analyses include conclusions regarding the significance of the impacts relative to the renewal of the operating license for Davis-Besse and, if applicable, discuss potential mitigative alternatives to the extent required. FENOC has identified the significance of the impacts associated with each issue as either SMALL, MODERATE, or LARGE, consistent with the criteria that NRC established in 10 CFR Part 51, Appendix B, Table B-1, Footnote 3 as follows:

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.

MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource.

LARGE - Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

In accordance with National Environmental Policy Act (NEPA) practice, FENOC considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are small receive less mitigative consideration than impacts that are large).

"NA" License Renewal Issues

NRC determined that its categorization and impact-finding definitions did not apply to two issues (Issues 60 and 92). FENOC has, however, included these issues in Attachment A.

NRC noted that applicants do not need to submit information on chronic effects from electromagnetic fields (10 CFR Part 51, Table B-1, Note 5). For the environmental justice issue, NRC does not require information from applicants, but notes that it will be addressed in individual license renewal reviews (10 CFR Part 51, Table B-1, Note 6). FENOC has included environmental justice information in Sections 2.6.2 and 4.21 and both issues are listed in Attachment A, Table A-1.

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4.1 WATER USE CONFLICTS

> **Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(A)**
>
> "If the applicant's plant utilizes cooling towers or cooling ponds and withdraws make-up water from a river whose annual flow rate is less than 3.15×1012 ft^3/year (9×1010 m^3/year), an assessment of the impact of the proposed action on the flow of the river and related impacts on instream and riparian ecological communities must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 13]

The issue has been a concern at nuclear power plants with cooling ponds and at plants with cooling towers. Impacts on instream and riparian communities near these plants could be of moderate significance in some situations. See 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 13. The issue, however, is dependent on river size and the corresponding annual river flow rate.

As discussed in Section 3.1.3, Davis-Besse has a closed-cycle heat dissipation system. Although the system uses a natural draft cooling tower, it withdraws make-up water from Lake Erie instead of a small river. As a result, this issue does not apply to Davis-Besse and further assessment is not required.

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4.2 ENTRAINMENT OF FISH AND SHELLFISH IN EARLY LIFE STAGES

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(B)

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations…or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from… entrainment." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 25]

NRC made impacts on fish and shellfish resources from entrainment a Category 2 issue because it could not assign a single significance level (small, moderate, or large) to the issue. The impacts of entrainment are small at many facilities, but may be moderate or large at others. In addition, ongoing restoration efforts may increase the number of fish susceptible to intake effects during the license renewal period (**NRC 1996**, Section 4.2.2.1.2). Information needing to be ascertained includes (1) type of cooling system (whether once-through or cooling pond), and (2) status of Clean Water Act (CWA) Section 316(b) determination or equivalent state documentation.

The issue of entrainment of fish and shellfish in early life stages, however, applies to plants with once-through cooling or cooling pond heat dissipation systems. As discussed in Section 3.1.3, Davis-Besse has a closed-cycle heat dissipation system that uses a natural draft cooling tower. As a result, this issue does not apply to Davis-Besse and further assessment is not required.

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4.3 IMPINGEMENT OF FISH AND SHELLFISH

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(B)

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations…or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from…impingement…." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 26]

NRC made impacts on fish and shellfish resources from impingement a Category 2 issue, because it could not assign a single significance level to the issue. Impingement impacts are small at many facilities, but might be moderate or large at other plants (**NRC 1996**, Section 4.2.2.1.3). Information that needs to be ascertained includes (1) type of cooling system (whether once-through or cooling pond), and (2) current CWA 316(b) determination or equivalent state documentation.

The issue of impingement of fish and shellfish, however, applies to plants with once-through cooling or cooling pond heat dissipation systems (10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 26). As discussed in Section 3.1.3, Davis-Besse has a closed-cycle heat dissipation system that uses a natural draft cooling tower. As a result, this issue does not apply to Davis-Besse and further assessment is not required.

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4.4 HEAT SHOCK

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(B)

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act… 316(a) variance in accordance with 40 CFR Part 125, or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from heat shock …." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 27]

NRC made impacts on fish and shellfish resources resulting from heat shock a Category 2 issue, because of continuing concerns about thermal discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions (**NRC 1996**, Section 4.2.2.1.4). Because of continuing concerns about heat shock and the possible need to modify thermal discharges in response to changing environmental conditions, the impacts may be of moderate or large significance at some plants. See 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 27.

The issue of heat shock, however, applies to plants with once-through cooling or cooling pond heat dissipation systems. As discussed in Section 3.1.3, Davis-Besse has a closed-cycle heat dissipation system that uses a natural draft cooling tower. As a result, this issue does not apply to Davis-Besse and further assessment is not required.

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4.5 GROUNDWATER USE CONFLICTS

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(C)

"If the applicant's plant…pumps more than 100 gallons (total onsite) of groundwater per minute, an assessment of the impact of the proposed action on groundwater use must be provided." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 33]

NRC made this groundwater use conflict a Category 2 issue because overuse of an aquifer could exceed the natural recharge. Locally, a withdrawal rate of more than 100 gpm could create a cone of depression that could extend offsite. This could inhibit the withdrawal capacity of nearby offsite users.

The issue of groundwater use conflicts, however, applies to plants that use more than an annual average of 100 gpm of groundwater. As discussed in Section 2.3, Davis-Besse does not use groundwater at the site for plant operations. As a result, this issue does not apply to Davis-Besse and further assessment is not required.

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4.6 GROUNDWATER USE CONFLICTS (PLANTS USING COOLING TOWERS WITHDRAWING MAKEUP WATER FROM A SMALL RIVER)

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(A)

"If the applicant's plant utilizes cooling towers or cooling ponds and withdraws make-up water from a river whose annual flow rate is less than 3.15×1012 ft^3/year (9×1010 m^3/year), an assessment of the impact of the proposed action on the flow of the river and related impacts on instream and riparian ecological communities must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 34]

The issue has been a concern at nuclear power plants with cooling towers. Impacts may result, for example, from surface water withdrawals from small water bodies during low flow conditions, which may affect aquifer recharge. See 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 34. The issue, however, is dependent on river size and the corresponding annual river flow rate.

As discussed in Section 3.1.3, Davis-Besse has a closed-cycle heat dissipation system. Although the system uses a natural draft cooling tower, it withdraws make-up water from Lake Erie instead of a small river. As a result, this issue does not apply to Davis-Besse and further assessment is not required.

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4.7 GROUNDWATER USE CONFLICTS (PLANTS USING RANNEY WELLS)

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(C)

"If the applicant's plant uses Ranney wells…an assessment of the impact of the proposed action on groundwater use must be provided." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 35]

The issue applies to plants using Ranney wells for cooling tower make up water. Ranney wells can result in potential groundwater depression beyond the site boundary. Impacts of large groundwater withdrawal for cooling tower makeup at nuclear power plants using Ranney wells must be evaluated at the time of application for license renewal. See 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 35.

As discussed in Section 3.1.3, Davis-Besse has a closed-cycle heat dissipation system that uses a natural draft cooling tower. Davis-Besse does not use Ranney wells. As a result, this issue does not apply to Davis-Besse and further assessment is not required.

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4.8 DEGRADATION OF GROUNDWATER QUALITY

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(D)

"If the applicant's plant is located at an inland site and utilizes cooling ponds, an assessment of the impact of the proposed action on groundwater quality must be provided." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 39]

The issue applies to plants at inland sites with cooling ponds. Evaporation from closed-cycle cooling ponds concentrates dissolved solids in the water and settles suspended solids. In turn, seepage into the water table aquifer could degrade groundwater quality. See 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 30.

As discussed in Section 3.1.3, Davis-Besse has a closed-cycle heat dissipation system that does not use cooling ponds, but instead uses a natural draft cooling tower that withdraws make-up water from Lake Erie. As a result, this issue does not apply to Davis-Besse and further assessment is not required.

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4.9 Impacts of Refurbishment on Terrestrial Resources

> **Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(E)**
>
> "All license renewal applicants shall assess the impact of refurbishment and other license-renewal-related construction activities on important plant and animal habitats." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 40]

The impacts of refurbishment on terrestrial resources and the significance of the ecological impacts cannot be determined without considering site-specific and project-specific refurbishment details (**NRC 1996**, Section 3.6). Aspects of the site and the project to be ascertained are the identification of important ecological resources, the nature of refurbishment activities, and the extent of impacts to plant and animal habitat.

Activities associated with refurbishment at Davis-Besse are described in Section 3.2. Based on the Beaver Valley Power Station (BVPS) Unit 1 steam generator replacement experience in 2006, a Davis-Besse steam generator replacement project would have little potential for disturbing or otherwise impacting local flora and fauna. The total area disturbed would be less than 10 acres. The two new permanent structures should already have been constructed on previously-disturbed land in 2011 to allow them to be used in support of the reactor vessel head replacement project, expected to occur in 2011. Temporary facilities, including laydown areas and concrete pad construction, will be located within the developed industrial areas of the site. Additionally, the proposed transportation route is by rail along an existing right-of-way. Therefore, no natural habitat would be lost or altered due to the planned steam generator replacement project.

The only project effects are expected to be noise and construction activity-related impacts on existing wildlife populations, such as the bald eagles on site, possibly disrupting existing behaviors and distribution during the short period of on-site activity. However, the use of mitigation measures for bird species (see Section 4.10.1), fugitive dust, or sediment transport as directed by FENOC and site procedures during construction activities associated with the temporary facilities for the Davis-Besse steam generator replacement project will reduce impacts to the terrestrial environment. Based on these elements, FENOC concludes that refurbishment project impacts on terrestrial resources would be SMALL, and no further mitigation would be warranted.

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4.10 THREATENED OR ENDANGERED SPECIES

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(E)

"All license renewal applicants shall assess the impact of refurbishment and other license–renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 49]

The NRC has found that plant refurbishment and continued operation, in general, are not expected to adversely affect threatened or endangered species. However, consultation with appropriate agencies is needed at the time of license renewal to determine whether threatened or endangered species are present and whether they would be adversely affected. See 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 49.

In addition, a site-specific assessment is required to determine whether any identified species could be affected by refurbishment activities or continued plant operations through the renewal period. Information pertinent to this assessment includes: (a) actual or potential occurrence of threatened or endangered species on or in the vicinity of the Davis-Besse site and associated transmission lines that are in the scope of Davis-Besse license renewal, (b) impact initiators presented by continued operation of Davis-Besse and those transmission lines that could affect threatened or endangered species that do or may occur, (c) controls established for impact initiators, and (d) industry and plant experience related to potential impacts.

Section 2.2 of this ER describes the aquatic environment of Lake Erie near Davis-Besse. Section 2.4 describes the terrestrial environment of the Davis-Besse site and Section 2.5 discusses threatened or endangered species that occur in the vicinity of the site and associated transmission lines.

4.10.1 REFURBISHMENT

Section 3.2 describes Davis-Besse refurbishment activities and Section 2.5 addresses endangered, threatened or otherwise sensitive species potentially located at the Davis-Besse site. Based on this information and consultation with regulatory agencies, the only species that may be impacted by a planned steam generator replacement at Davis-Besse would be nesting and young bald eagles (see Section 4.10.2). FENOC plans to follow the requirements provided by the USFWS and ODNR regarding construction activities within the specified distance to nesting and young bald eagles.

No impacts are anticipated for the Indiana bats, as described in the ODNR letter (**ODNR 2009b**) (see Section 4.10.2), because no tree removal is proposed in the areas where permanent and temporary facilities will be located.

All planned construction-related activities are on previously-developed or altered industrial lands on site. Additionally, the proposed transportation route is by rail along an existing right-of-way. As a result, FENOC concludes that refurbishment project-related impacts to threatened or endangered species would be SMALL, and no further mitigation would be warranted.

4.10.2 License Renewal Term

Current Davis-Besse operations and the associated transmission lines do not adversely affect any special-status species or important habitats. As noted in Section 3.1.4, there are approximately 1,800 acres for the rights-of-way along the transmission lines, which are primarily located over existing farmland. FirstEnergy Corp. (FE) conducts routine vegetation maintenance of these rural transmission corridors approximately every five years. Trees and shrubs that do not interfere with transmission facilities are not disturbed, and portions of corridors that are not cultivated or devoted to other intensive uses are managed to promote a diversity of shrubs, grasses, and other groundcover that provides wildlife food and cover. Plant operations and transmission line maintenance activities are not expected to change significantly during the license renewal term.

FENOC has written to the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Ohio Department of Natural Resources, which includes the Ohio Natural Heritage Program, requesting information on any listed species or critical habitats that might occur in the vicinity of the Davis-Besse site and along transmission line corridors, with particular emphasis on species that might be adversely affected by continued operation over the license renewal period. Agency responses are provided in Attachment C.

USFWS determined that the Davis-Besse license renewal project will not impact federally listed species and will have minimal environmental impacts, as no change in operation or extent of the facility is proposed. However, the USFWS noted that a bald eagle (*Haliaeetus leucocephalus*) nest exists on the Davis-Besse property. Although the bald eagle was removed from the Federal list of endangered and threatened species in July 2007 due to recovery, this species continues to be afforded protection by the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. To avoid disturbing nesting and young eagles, USFWS requested that no activity occur within 660 feet of the nest between January 1 and July 31, when the nesting eagles are most vulnerable. FENOC plans to incorporate the USFWS requirement into station procedures. (**USFWS 2009**)

NMFS stated that no threatened or endangered species listed by NMFS are known to occur in Lake Erie and that no Essential Fish Habitat (EFH), as designated under the Magnuson-Steven Fisheries Management and Conservation Act, occurs in the vicinity of Davis-Besse. As a result, NMFS noted that no further coordination with NMFS on the effects of Davis-Besse license renewal is necessary. (**NMFS 2010**)

ODNR reported that the project is within the range of the Indiana bat *(Myotis sodalis),* a state and federally endangered species, and listed a number of high value trees that protect its habitat. ODNR requires that if such trees occur within the project area, these trees must be conserved. In addition, if suitable habitat occurs on the project area and trees must be cut, cutting must occur between September 30 and April 1. If suitable trees must be cut during the summer months of April 2 to September 29, a net survey must be conducted in May or June prior to cutting. If no tree removal is proposed, the project is not likely to impact this species. FENOC plans to incorporate the ODNR requirement into station procedures. (**ODNR 2009a**)

ODNR also reported that the project is within the range of the following state, federal, or both endangered or threatened species:*

- Piping plover *(Charadrius melodus),* a state and federally endangered bird species
- Eastern massasauga *(Sistrurus catenatus),* a state endangered and a federal candidate snake species
- Bald eagle *(Haliaeetus leucocephalus),* a state threatened species
- Eastern pondmussel *(Ligumia nasuta),* a state endangered mussel
- Spotted gar *(Lepisosteus oculatus)*, a state endangered fish
- Blacknose shiner *(Notropis heterolepis)* , a state endangered fish
- American bittern *(Botaurus lentiginosus)*, a state endangered bird
- Black tern *(Chlidonias niger),* a state endangered bird
- Cattle egret *(Bubulcus ibis),* a state endangered bird
- Common tern *(Sterna hirundo),* a state endangered bird
- King rail *(Rallus elegans*, a state endangered bird
- Loggerhead shrike *(Lanius ludovicianus)* , a state endangered bird
- Northern harrier *(Circus cyaneus)*, a state endangered bird
- Snowy egret *(Egretta thula)*, a state endangered species
- Trumpeter swan *(Cygnus buccinator),* a state endangered bird

*Section 2.5 provides a more comprehensive list developed by FENOC based on its data searches.

ODNR determined that the Davis-Besse license renewal project is not likely to impact these species. Nevertheless, because the location of bald eagle activity frequently changes, a status update must be obtained from ODNR prior to any construction activity. This requirement is in addition to the USFWS request that no activity occur within 660 feet of the nest between January 1 and July 31. FENOC plans to incorporate the ODNR requirement into station procedures. Otherwise, ODNR is not aware of any threatened or endangered species in the vicinity of Davis-Besse. (**ODNR 2009a**)

Based on the list of species identified in Section 2.5, FENOC is not aware of any potential concerns regarding threatened or endangered species that could occur due to the site or transmission line operations. Maintenance activities necessary to support license renewal would be limited to previously disturbed areas on-site and no additional land disturbance is anticipated in support of license renewal. In addition, there are no plans to alter plant operations during the license renewal term which would affect threatened or endangered species. Furthermore, FENOC has procedural controls in place to ensure that reviews are conducted for protection of envrionmental resources prior to engaging in land-disturbing construction activities on the site. These controls include activities involving disturbing land, removing trees, or vegetation, etc. Similarly, transmission line maintenance is conducted in accordance with FE policies that are protective of threatened or endangered species.

From the information above, including the results of correspondence with agencies, FENOC concludes that impact to threatened or endangered species from continued operation of Davis-Besse would be SMALL and do not warrant mitigation.

4.11 AIR QUALITY DURING REFURBISHMENT (NONATTAINMENT AREAS)

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(F)

"If the applicant's plant is located in or near a nonattainment or maintenance area, an assessment of vehicle exhaust emissions anticipated at the time of peak refurbishment workforce must be provided in accordance with the Clean Air Act as amended." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 50]

Air quality impacts from plant refurbishment associated with license renewal are expected to be small. However, vehicle exhaust emissions could be cause for concern at locations in or near nonattainment or maintenance areas. The significance of the potential impact cannot be determined without considering the compliance status of each site and the numbers of workers expected to be employed during the outage. See10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 50. Information needed to determine air quality impacts would include the attainment status of the plant-site area and the number of vehicles added as a result of refurbishment activities.

As discussed in Section 2.10, Davis-Besse is located in the Sandusky Intrastate Air Quality Control Region (40 CFR 81.203), which is in attainment for all national air quality standards. The nearest nonattainment area is located in Monroe County, Michigan, more than 50 miles northwest of the Davis-Besse site. The nearest maintenance area is located in the city of Toledo, Lucas County, approximately 25 miles west-northwest.

As a result, FENOC believes that this issue does not apply to Davis-Besse, whether or not refurbishment will occur, because Davis-Besse is not located in or near a nonattainment or maintenance area. Therefore, further assessment is not required.

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4.12 IMPACT ON PUBLIC HEALTH OF MICROBIOLOGICAL ORGANISMS

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(G)

"If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river having an annual average flow rate of less than 3.15×1012 ft^3/year (9×1010 m^3/year), an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 57]

Some microorganisms associated with cooling towers and thermal discharges can have deleterious impacts on human health, and their presence can be enhanced by thermal additions (**NRC 1996**, Section 4.3.6). These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals that discharge to small rivers. Without site-specific data, it is not possible to predict the effects generically. See 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 57.

As described in Section 3.1.3, Davis-Besse has a closed-cycle heat dissipation system that uses a natural draft cooling tower and does not make use of a cooling pond, lake or canal. In addition, the cooling tower discharges into Lake Erie instead of a small river. As a result, this issue does not apply to Davis-Besse and further assessment is not required.

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4.13 Electromagnetic Fields – Acute Effects

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(H)

"If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the National Electric Safety Code for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 59]

The NRC has concluded that electrical shock from energized conductors or from induced charges in metallic structures is not a problem at most operating plants and is not likely to be a problem during the license renewal term. However, site-specific review is required to determine the significance of the electric shock potential at the site (10 CFR Part 51, Subpart A, Table B 1, Issue 59). The transmission lines to be addressed for license renewal, as NRC noted in the GEIS and its guidance, are those that were constructed to connect the plant switchyard to the existing transmission system and reviewed as part of the construction permit for the plant (**NRC 1996**, Section 4.5.4; **NRC 2000**, Section 4.13).

The electrical shock issue, which is generic to all types of electrical generating stations, including nuclear power plants, is of small significance for transmission lines that are operated in adherence with National Electric Safety Code (NESC). Without review of each nuclear plant's transmission line conformance with NESC criteria, it is not possible to determine the significance of the electrical shock potential. (**NRC 1996**, Sections 4.5.4 and 4.5.4.1)

According to the NESC, for voltages exceeding 98 kV alternating current to ground, either the clearances shall be increased or the electric field, or effects thereof, shall be reduced by other means as required to limit the steady state current due to electrostatic effects to 5 mA if the largest anticipated truck, vehicle, or equipment under the line were short-circuited to ground. The size of the anticipated truck, vehicle, or equipment used to determine these clearances may be less than but need not be greater than that limited by federal, state, or local regulations governing the area under the line. For this determination, the conductors shall be at final unloaded sag at 120^{o}F (**IEEE 2006**, Rule 232 D.3.c).

The critical parameters associated with the calculation of electric fields below transmission lines include the line voltage, conductor and phase dimensions, the line configuration, and the overhead clearance above ground. The shape, size, and position of objects beneath the line and the electric field in the area determine the induced voltages and currents that will be developed in these objects. The maximum or peak field values occur over a small area at midspan, where conductors are closest to the ground. Transmission line electric fields at the edge of the right-of-way are not as sensitive as the peak field to conductor height.

As described in Section 3.1.4, three new high-voltage transmission lines were built to connect Davis-Besse to the nearby Toledo Edison (an FE transmission company) transmission 345 kV substations at Bay Shore, Lemoyne, and Ohio Edison - Beaver substation. These transmission lines were constructed before the NESC adopted the 5 mA provision in 1977.

Therefore, FENOC conducted a screening analysis for each road crossing under the three transmission lines to determine conformance with the existing NESC standard. The analysis used methods prescribed by EPRI (**EPRI 2008**) to determine the current induced for the maximum vehicle size limited by Federal and state transportation regulations, located in the peak electric field under the transmission line, for the worst-case configuration, i.e., the vehicle is parallel to the conductors near the lowest clearance to ground.

For specific vehicle dimensions, the induced current is directly proportional to the electric field. Thus, for the maximum allowable vehicle (a triple tractor trailer combination measuring13.5 feet tall, 8.5 feet wide, and 95 feet long), the induced vehicle current is 1.2 mA per kV per meter of electric field. To meet NESC requirements of 5 mA maximum induced current, the maximum electric field must be limited to approximately 4.1 kV/m (5 mA/1.2 mA/kV/m).

For the configurations reviewed at each road crossing, the threshold electric field of 4.1 kV/m is exceeded if the transmission line road crossing clearance is less than 40 feet at 120^{o}F. All road crossing clearances for the three Davis-Besse high-voltage transmission lines exceed 40 feet at 120^{o}F, resulting in a calculated electric field at these locations of less than 4.1 kV/m. Consequently, the maximum induced current in a triple tractor trailer combination located in the peak electric field under the transmission line for the worst-case configuration is less than 5 mA.

Similar induced currents do not occur on railroad cars beneath transmission lines because the car is effectively connected to the track, unlike a vehicle mounted on insulating rubber tires. The distributed track to ground resistance is sufficiently low to discharge any rail car to ground capacitance before an electric charge can build within half a power frequency cycle.

Based on the above considerations, FENOC concludes that the potential for electric shock is of SMALL significance and mitigation measures are not warranted.

4.14 HOUSING IMPACTS

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(I)
"An assessment of the impact of the proposed action on housing availability…(impacts from refurbishment activities only) within the vicinity of the plant must be provided." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 63]

Housing impacts depend on local conditions. Impacts result when the demand for housing, caused by the project-related population increase, approaches or exceeds the number of available housing units in the vicinity of the plant. The magnitude of the impacts is determined by the number of additional workers associated with refurbishment activities or continued operation and maintenance, and by the population categorization, growth control measures, and housing inventory within the region.

4.14.1 REFURBISHMENT

As described in Section 3.2, FENOC estimates that approximately 900 additional temporary employees in addition to the approximately 1,300 temporary refueling outage workers would be needed to perform the planned Davis-Besse steam generator replacement project activities. The 1,300 temporary refueling outage workforce impacts are already addressed under normal operations, and will not be evaluated further. The temporary steam generator replacement project workforce, however, could generate demand for up to 900 additional housing units in the local area for a period of approximately 70 days.

FENOC expects to perform the steam generator replacement during the spring of 2014, a period when the seasonal and transient populations are low and many hotel rooms and short-term rental properties are available. As discussed in Section 2.6.2.4, the total combined seasonal and transient population is approximately equivalent to the total permanent population, and this transient population increase occurs predominantly in the summer to take advantage of outdoor recreational opportunities.

Based on the large population increase in the summer months, an additional 900 employees looking for short-term housing would have a beneficial impact to the local economy during the off-season period in which the steam generator replacement project should occur. In addition, Davis-Besse is located in a high population area that is near a major metropolitan area, Toledo (see Section 2.6.1). The number of refurbishment project workers, therefore, is small compared to the area's total population and would not cause a discernable change in housing availability, rental rates, or housing values.

As a result, FENOC expects steam generator replacement project-related housing impacts to be SMALL and does not warrant mitigation.

4.14.2 License Renewal Term

NRC regulatory criteria indicate that housing impacts are expected to be of small significance at plants located in a medium or high population area and in an area where growth control measures that limit housing development are not in effect (10 CFR Part 51, Subpart A, Table B-1, Issue 63). Sections 2.6.1.1 and 2.8 demonstrate that Davis-Besse is located in a high population area that, although it is subject to growth planning, is not subject to control measures that limit housing development. Furthermore, FENOC does not anticipate a need for additional full-time workers during the license renewal period (Section 3.4).

FENOC concludes that, since there would be no increase in staffing, the impact to housing from the continued operation of Davis-Besse is categorized as SMALL and does not warrant mitigation.

4.15 PUBLIC UTILITIES: PUBLIC WATER SUPPLY AVAILABILITY

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(I)

"[T]he applicant shall provide an assessment of the impact of population increases attributable to the proposed project on the public water supply." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 65]

Potential for water shortages at some sites may lead to impacts of moderate significance on public water supply availability. See 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 65. These potential impacts to the public water supply system depend on both plant demand and plant-related population growth demands on public water systems.

Impacts on public utility services are considered SMALL if little or no change occurs in the ability to respond to the level of demand. Impacts are considered MODERATE if overtaxing of facilities during peak demand periods occurs and LARGE if existing service levels (such as quality of water and sewage treatment) are substantially degraded and additional capacity is needed to meet ongoing demands for services (**NRC 1996**, Section 3.7.4.5).

4.15.1 REFURBISHMENT

As discussed Section 3.2, FENOC estimates that approximately 900 temporary employees would be needed to perform the planned Davis-Besse steam generator replacement project activities for a period of approximately 70 days. The estimate also includes the assumption that additional indirect jobs would be filled by local residents, resulting in no additional population growth. Section 3.4.1 indicates that 88% of Davis-Besse employees reside in the four contiguous counties of Ottawa (37.2%), Lucas (19.8%), Wood (15.5%), and Sandusky (15%). FENOC assumes that the project temporary workforce would find temporary residences within this area and the workers would not relocate their families.

As noted above, impacts on public utility services are considered small if little or no change occurs in the ability to respond to the level of demand (**NRC 1996**, Section 3.7.4.5). Sections 2.9.4 and 3.1.3.3 describe the station and the public water supply systems in the four surrounding counties. Davis-Besse acquires potable water from the Carroll Township Water System, which has excess capacity of 700,000 gallons per day (Table 2.9-9). The combined water systems in the four counties surrounding Davis-Besse have a total excess capacity of approximately 121 million gallons per day.

The impact to the Carroll Township Water System due to hydro-demolition techniques, if used during the steam generator replacement project, is expected to be SMALL. Hydro-demolition requires up to approximately 230,000 gallons of water per day, which is approximately one-third of the excess capacity of the Carroll Township Water Supply system. Coordination between Davis-Besse and Carroll Township Water Supply personnel during hydro-demolition will minimize the impact of the increased demand in water use. Therefore, little or no change will occur in the ability of Carroll Township to respond to the level of water demand to its customers due to the use of hydro-demolition techniques during the proposed steam generator replacement project at Davis-Besse.

The maximum impact to the local water supply systems from the project temporary workforce was determined by calculating the amount of water that would be required by the temporary workforce for the planned Davis-Besse steam generator replacement project. The average American uses between 50 and 80 gallons per day for personal use. Conservatively assuming that each temporary employee used 80 gallons per day while at the Davis-Besse site, the additional maximum usage at Davis-Besse would be 72,000 gallons per day, well below the excess capacity available.

Also, conservatively assuming that each temporary employee also used 80 gallons per day while in their temporary residences, the additional maximum usage in the four-county region of interest would be 72,000 gallons per day, also well below the excess capacity available.

Lastly, portable sanitary units are planned to be used instead of the on-site sewage treatment facility to accommodate the temporary increase of steam generator replacement project employees. The portable units would be processed at a major wastewater treatment facility with adequate capacity, such as the Oregon or Toledo Bay plants in nearby Lucas County.

Based on the above, FENOC concludes that impacts resulting from the temporary work force at Davis-Besse and in their counties of temporary residence would be SMALL and would not require mitigation.

4.15.2 LICENSE RENEWAL TERM

FENOC does not anticipate a need for additional full-time workers during the license renewal period (Section 3.4). As a result, there will be no incremental impact to the public water supplies from refurbishment activities or additional workers in the four-county area near the plant.

Table 2.9-9 provides details on the community water suppliers in the four-county area surrounding the Davis-Besse site, including the Carroll Township Water System that supplies Davis-Besse's potable water needs (Section 3.1.3.3). For all systems, the average daily demand on the current water systems is considerably below the respective system capacities. Therefore, plant operations during the license renewal period are not projected to cause an adverse effect on the local water supply. Because no site-related population increases will occur during the license renewal period, there will be no indirect impacts to any public water systems in the area.

Based on the above, FENOC concludes that impacts to public water supplies will continue to be SMALL and further consideration of mitigation measures is not warranted.

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4.16 EDUCATION IMPACTS FROM REFURBISHMENT

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(I)

"An assessment of the impact of the proposed action on…public schools (impacts from refurbishment activities only) within the vicinity of the plant must be provided." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 66]

Impacts to education are a product of additional demand on the public education system resulting from refurbishment-related population growth and the capacity of the education system to absorb additional students.

As discussed Section 3.2, FENOC estimates that approximately 900 temporary employees would be needed for a period of approximately 70 days to perform the planned Davis-Besse steam generator replacement project activities. Based on FENOC experience from prior Davis-Besse refueling outages and the BVPS Unit 1 steam generator replacement experience gained in 2006, FENOC anticipates that the approximately 900 temporary workers would in-migrate, but would not relocate families to the plant site region for a project of this short duration. Therefore, FENOC estimates that few to no children would be relocated to the region, and there would be SMALL impacts to the education system.

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4.17 Offsite Land Use

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(I)

"An assessment of the impact of the proposed action on…land use…within the vicinity of the plant must be provided."

Refurbishment: "Impacts may be of moderate significance at plants in low population areas…." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 68]

License renewal term: "Significant changes in land use may be associated with population and tax revenue changes resulting from license renewal." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 69]

Impacts to off-site land use take place when pressures resulting from project-related population or tax revenue increases result in changes to local land use and development patterns. These impacts could occur as a result of either refurbishment or during the license renewal period.

10 CFR Part 51 identifies that housing impacts are expected to be of small significance at plants located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Moderate or large housing impacts of the workforce associated with refurbishment may be associated with plants located in sparsely populated areas or in areas with growth control measures that limit housing development. See 10 CFR 51.53(c)(3)(ii)(I).

4.17.1 Refurbishment

As discussed in Section 3.2, FENOC estimates that approximately 900 temporary employees would be needed for a period of approximately 70 days to perform the project activities associated with a planned Davis-Besse steam generator replacement project. The estimate also includes the assumption that additional short-term indirect jobs would be filled by local residents, resulting in no additional population growth.

The NRC stated in the GEIS that, if project-related population growth is less than 5 percent of the study area's total population, off-site land-use changes would be small, especially if the study area has established patterns of residential and commercial development, a population density of at least 60 persons per square mile, and at least one urban area with a population of 100,000 or more within 50 miles (**NRC 1996**, Section 3.7.5).

Table 2.6-1 indicates that, within 20 miles of the Davis-Besse plant, which is assumed to be a reasonable commuting distance to work, and within which a majority of the 825 Davis-Besse employees reside, there are 129,411 persons, which equates to 168 per square mile. Five percent of this value is 6,471 persons. The project-related temporary population growth of 900 is well below 5 percent of the study area's total population. Also, within 50 miles, there are several urban areas (Toledo, Ohio, and portions of Detroit, Michigan) with populations of 100,000 or more. The population within 50 miles of Davis-Besse is 2,448,608 persons, which equates to 326 per square mile. Therefore, the area surrounding the Davis-Besse plant satisfies the GEIS criteria for predicting project-related offsite land use changes.

Due to the small number of project workers compared to the area's total population, available residential and commercial development, proximity to a major metropolitan area, and the short duration of a planned Davis-Besse steam generator replacement project, FENOC expects that project-related off-site land use changes would be SMALL and would not warrant mitigation.

4.17.2 LICENSE RENEWAL TERM

During the license renewal term, new land use impacts could, as noted in the GEIS, result from plant-related population growth or from the use of tax payments from the plant by local government to provide public services that encourage development (**NRC 1996**, Section 4.7.4.2).

Population-Related Impacts

NRC concluded, based on the GEIS case-study analysis, that all new population-driven land use changes during the license renewal term at all nuclear plants would be small. Population growth caused by license renewal would represent a much smaller percentage of the local area's total population than the percentage presented by operations-related growth (**NRC 1996**, Section 4.7.4.2).

FENOC agrees with the NRC conclusion and judges that new population-driven land use changes at Davis-Besse during the license renewal term will, therefore, be SMALL. Furthermore, FENOC does not anticipate that additional workers will be employed at Davis-Besse during the period of extended operations (Section 3.4). As a result, there will be no impact to the offsite land use from plant-related population growth.

Tax Revenue-Related Impacts

Significance levels for license renewal are considered small if tax payments are less than 10% of the jurisdiction's tax revenue, moderate if payments are 10-20%, and large if payments are greater than 20%. (**NRC 1996**, Section 4.7.2.1).

Table 2.7-1 lists the proportional contribution of property taxes from Davis-Besse to Ottawa County and the Carroll Township property and school district tax bases for the five-year period 2004-2008.

Regionally, the tax contribution to Ottawa County and the Penta County Job Vocational School is less than 10%. Locally, the tax contribution to Carroll Township and Benton-Carroll-Salem local school district is greater, averaging nearly 19% for the township and 17% for the school district during the five-year period.

Lastly, FENOC plans to add two new permanent structures at Davis-Besse in 2011 to support the reactor vessel head replacement project. As a result, there may be related tax-increase-driven changes to offsite land use and development patterns during the license renewal term.

FENOC concludes that the regional tax-driven land use impact would be SMALL and mitigation is not warranted. FENOC concludes that the local tax-driven land use impact would be MODERATE, but positive, and for that reason mitigation is not warranted.

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4.18 Transportation

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(J)

"All applicants shall assess the impact of highway traffic generated by the proposed project on the level of service of local highways during periods of license renewal refurbishment activities and during the term of the renewed license." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 70]

Transportation impacts, as discussed in the GEIS, would continue to be of small significance at all sites during operations and would be of small or moderate significance during scheduled refueling and maintenance outages. However, because impacts are determined primarily by road conditions existing at the time of the project, the impact significance needs to be determined at the time of license renewal. (**NRC 1996,** Section 4.7.3.2)

Transportation impacts are generally expected to be of small significance. However, the increase in traffic associated with the additional workers and local road and traffic control conditions may lead to impacts of moderate or large significance at some sites. See 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 70.

4.18.1 Refurbishment

As discussed in Section 3.2, FENOC estimates that approximately 900 temporary employees would be needed for a period of approximately 70 days to perform the project activities associated with a planned Davis-Besse steam generator replacement project. Access to the Davis-Besse site would be via State Route 2, and the major commuting routes to the site are in rural and uncongested areas (Section 2.9.5). Historically, increased traffic during outages at Davis-Besse has not degraded the capacity of local roads, and does not create the need for additional or widening of roads, or traffic control devices. Some slowing of State Route 2 traffic using portable flashing caution and warning signs, however, is necessitated during outages to allow site traffic safe exit from the station into traffic flow on State Route 2.

More importantly, as shown in Table 2.6-11, the seasonal and transient populations that enter the region in the summer months cause the local population to nearly double as almost 13,000 persons descend on the area. Additionally, shown in Table 2.9-14 there are over 13,000 vehicles estimated to be within 10 miles of the plant. The addition of 900 vehicles from the temporary steam generator replacement project workforce results in an increase of less than seven percent of the total number of vehicles in the area.

Based on the seasonal and transient population changes and the number of vehicles within 10 miles of the plant, FENOC concludes that the impacts to area transportation of approximately 900 additional temporary workers and truck material deliveries associated with a short time duration (i.e., approximately 70 days) Davis-Besse steam generator replacement project expected in the spring season (i.e., off-season) would be SMALL and would not warrant mitigation.

4.18.2 LICENSE RENEWAL TERM

During the license renewal term, the GEIS noted that transportation impacts would continue to be of small significance at all sites during operations and would be of small or moderate significance during scheduled refueling and maintenance outages (**NRC 1996**, Section 4.7.3.2). In particular, highway Level of Service (LOS) A and B are associated with small impacts because the operation of individual users is not substantially affected by the presence of other users. LOS A conditions allow free flow of the traffic stream and users are unaffected by the presence of others. LOS B conditions allow stable flow in which the freedom to select speed is unaffected, but the freedom to maneuver is slightly diminished. At these levels, no delays occur and no improvements are needed. (**NRC 1996**; Section 3.7.4.2; **NRC 2000**, Section 4.18)

Given the rural character of the area in the Davis-Besse vicinity, the absence of pronounced grades, and the presence of few small metropolitan areas, commuter congestion arising from continued station operation will remain short-lived and not substantially affect other users of the roads. As a result, no added delays are expected and no improvements are needed.

Additionally, there is no expected increase in the number of employees required to support plant operation during the license renewal period (Sections 3.2 and 3.4). Therefore, impacts to transportation would be similar to those experienced during current operations and there should be no incremental impacts to transportation during the license renewal term.

Although the roads in the vicinity of Davis-Besse are adequate, compensating measures, such as staggered shift starting and ending times, are taken by the site to account for the increased traffic flow during outages to maintain a reasonable level of service. Therefore, FENOC concludes that impacts to transportation due to continued operation of Davis-Besse during the license renewal period would be SMALL and further mitigation is not warranted.

4.19 Historic and Archaeological Resources

> **Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(K)**
>
> "All applicants shall assess whether any historic or archaeological properties will be affected by the proposed project." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 71]

Generally, plant refurbishment and continued operation are expected to have only small adverse impacts on historic and archaeological resources. However, the National Historic Preservation Act requires the Federal agency to consult with the State Historic Preservation Officer to determine whether there are properties present that require protection (10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 71).

The GEIS notes that sites are considered to have small impacts to historic and archaeological resources if (1) the State Historic Preservation Office (SHPO) identifies no significant resources on or near the site; or (2) the SHPO identifies (or has previously identified) significant historic resources but determines they would not be affected by plant refurbishment, transmission lines, and license renewal term operations and there are no complaints from the affected public about altered historic character; and (3) if the conditions associated with moderate impacts from site activities do not occur. (**NRC 1996**, Section 3.7.7)

Moderate impacts, as noted in the GEIS, may result if historic resources, determined by the SHPO not to be eligible for the National Register, nonetheless are thought by the SHPO or local historians to have local historic value and to contribute substantially to an area's sense of historic character. Lastly, the GEIS notes that sites are considered to have large impacts to historic resources if resources determined by the SHPO to have significant historic or archaeological value would be disturbed or otherwise have their historic character altered through refurbishment activity, installation of new transmission lines, or any other construction (e.g., for a waste storage facility). Determinations of significance of impacts are made through consultation with the SHPO. (**NRC 1996**, Section 3.7.7)

4.19.1 Refurbishment

There were no known deposits of archaeological interest on the site prior to construction (Section 2.11). In addition, a recent query of the Ohio Historic Preservation Office's Online Mapping System conducted for a 6-mile radius around the site identified 378 previously recorded cultural resources. This number includes buildings, archaeological sites, cemeteries, churches, and other structures. Resource types range from a historic military base with many contributing structures to archaeological sites and individual architectural resources. One resource, an historic-period site (Table 2.11-3, Site No. OT0025), appears to be located at the extreme southeastern corner of the station property. Only one resource was listed in the National Register of Historic Places, the Carroll Township Hall, located about 3.2 miles to the southwest of the Davis-Besse site.

As discussed in Section 3.2, the Davis-Besse steam generator replacement project activities involving ground disturbance are the construction of temporary or permanent concrete pads for temporary facilities. These temporary facilities and any permanent concrete pads that remain following the replacement project are expected to be constructed on previously disturbed land that was graded and otherwise disturbed during station construction. Also, as noted above, there were no known deposits of archaeological interest on the site prior to construction and only one resource appears on the Ohio Historic Preservation Office's Online Mapping System, which is located well beyond the proposed disturbed area.

All activities associated with the proposed Davis-Besse steam generator replacement, including construction and excavation for temporary structures and laydown areas, are planned for previously-disturbed and evaluated areas that should not require consultation with the Ohio State Historic Preservation Office prior to commencing work. These activities also include the rail delivery of the new steam generators to Davis-Besse and any physical modifications to improve existing rail lines, and transportation of the steam generators on-site.

Based on the above, FENOC concludes that the impacts of a Davis-Besse steam generator replacement project on archeological, cultural, or historic resources would be SMALL and further mitigation is not warranted.

4.19.2 LICENSE RENEWAL TERM

FENOC is not aware of any historic or archaeological resources that have been affected by Davis-Besse operations, including operation and maintenance of transmission lines. Nevertheless, FENOC has procedural controls in place to ensure that environmental reviews are conducted prior to engaging in additional construction or operational activities that may result in an environmental impact at the site. These controls include activities involving disturbance of surface or subsurface land areas and demolition of existing structures.

FENOC also contacted the Ohio Historic Preservation Office (OHPO) for information related to any known archaeological resources in the vicinity of the Davis-Besse site. In the opinion of the OHPO, license renewal will not affect historic properties (**OHPO 2010**). Copies of the correspondence are included in Attachment C.

As a result, FENOC concludes that the potential impact of continued operation of Davis-Besse during the period of the renewed license on historic or archaeological resources will be SMALL and further mitigation is not warranted.

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4.20 SEVERE ACCIDENT MITIGATION ALTERNATIVES

Regulatory Requirement: 10 CFR 51.53(c)(3)(ii)(L)

"If the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environment assessment, a consideration of alternatives to mitigate severe accidents must be provided." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 76]

This section summarizes FirstEnergy's analysis of alternative ways to mitigate the impacts of severe accidents. Attachment E provides a detailed description of the severe accident mitigation alternative (SAMA) analysis.

The term "accident" refers to any unintentional event (i.e., outside the normal or expected plant operation envelope) that results in the release or a potential for release of radioactive material to the environment. NRC categorizes accidents as "design basis" or "severe." Design basis accidents are those for which the risk is great enough that NRC requires plant design and construction to prevent unacceptable accident consequences. Severe accidents are those that NRC considers too unlikely to warrant design controls.

The NRC concluded that the generic analysis summarized in the GEIS applies to all plants and that the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts of severe accidents are of small significance for all plants. However, not all plants have performed a site-specific analysis of measures that could mitigate severe accidents. Consequently, severe accidents are a Category 2 issue for plants that have not performed a site-specific consideration of severe accident mitigation alternatives SAMAs and submitted that analysis for Commission review. (**NRC 1996**, Section 5.5.2.5)

- The Level 1 probabilistic risk assessment (PRA) and Level 2 PRA models for Davis-Besse (as discussed in Attachment E, Sections E.3.1, E.3.2, and E.3.3) were used to estimate the core damage frequency (CDF) and release category frequencies. The release category frequencies and characterizations (using the Modular Accident Analysis Program (MAAP) code) from the Level 2 PRA were provided as input to the subsequent Level 3 PRA. The Level 2 PRA results were combined with Davis-Besse site-specific parameters (e.g., population, meteorological data, topography, and economic data) for the Level 3 PRA to estimate the off-site dose and off-site property losses. Then, based on NRC guidance in NUREG/BR-0184 (**NRC 1997**), the maximum achievable benefit for any

SAMA candidate at Davis-Besse was estimated. This value provided an upper bound of any potential SAMA candidate benefit and was used to eliminate a SAMA candidate from any further analysis.

- The following provides a summary of the steps used during the SAMA process: Level 3 PRA Analysis – The Level 3 PRA model developed to support this cost-benefit evaluation used the MELCOR Accident Consequence Code System (MACCS2), which simulates the impact of severe accidents at nuclear power plants on the surrounding environment. The results of the Level 3 PRA model are vectors of off-site exposure and off-site property costs associated with each release category. These consequence vectors were combined with the results of the Level 2 PRA model (i.e., release category frequencies) to yield the probabilistic off-site dose and probabilistic off-site property losses. The final results of the Level 3 PRA evaluation for each SAMA candidate were the value of the cumulative dose expected to be received by off-site individuals and the value of the expected off-site property losses due to severe accidents given the plant configuration under evaluation. Sensitivity analyses were performed to assess the impact of assumptions associated with the site population, meteorological conditions, and evacuation timing when defining the input parameters to MACCS2. The Level 3 PRA is discussed in Attachment E, Sections E.3.4 and E.3.5.

- Cost of Severe Accident Risk – The cost of severe accident risk was estimated using guidance from NEI 05-01 (**NEI 2005**) and NUREG/BR-0184 (**NRC 1997**). The cost of severe accident risk was defined as the maximum achievable benefit a SAMA candidate could achieve if it eliminated all risk. The maximum achievable benefit was obtained by evaluating the total risk in U.S. dollars considering the risk of dose to the public and workers, off-site and on-site economic impacts, and replacement power costs. Any SAMA candidate for which the implementation cost was greater than the maximum achievable benefit was eliminated from any further cost-benefit analysis. The severe accident risk cost calculation is provided in Attachment E, Section E.4.

- Candidate SAMA Identification – SAMA candidates are defined as potential enhancements to the plant design, operating procedures, inspection programs, or maintenance programs that have the potential to prevent core damage and prevent significant releases from the Davis-Besse containment. A comprehensive initial list of SAMA candidates was developed by reviewing industry guidance documents, SAMA analyses of other plants, Davis-Besse Individual Plant Examination (IPE), Davis-Besse Individual Plant Examination External Events (IPEEE), Davis-Besse Level 1 PRA (SAMA PRA Model, Revision 01), and Davis-Besse Level 2 PRA (SAMA PRA Model, Revision 01). The PRA results were reviewed for the dominant cutsets, system importance, significant contributors to Level 2 release categories, and any insights or recommendations provided. The list of initial SAMA candidates is discussed in Attachment E, Section E.5.

- Phase I SAMA Analysis (Screening) – A qualitative screening was performed for each of the candidates identified on the initial SAMA candidate list. Several SAMA candidates were screened on the basis that the SAMA candidate was not applicable to Davis-Besse, was already implemented at Davis-Besse, required excessive implementation cost, or had very little perceived (risk) benefit. If SAMA candidates were similar, one was subsumed into the more risk-beneficial SAMA candidate. The screening process for each SAMA candidate is discussed in Attachment E, Section E.6.

- Phase II SAMA Analysis (Cost-Benefit) – Those SAMA candidates that passed the qualitative screening were selected for a detailed cost-benefit analysis, which compared the estimated benefit in dollars of implementing the SAMA candidate to the estimated cost of implementation. The methodology used for this evaluation was based on the regulatory guidance for cost-benefit evaluation in NUREG/BR-0184 (**NRC 1997**). The estimated benefit was determined by applying a bounding modeling assumption in the PRA model. For example, if a SAMA candidate would reduce the likelihood of a specific human error, the human error probability would be set to zero in the PRA model. This would completely eliminate the human error for the SAMA candidate, thus overestimating the potential benefit. This bounding treatment is conservative for a SAMA evaluation because underestimating the risk in the modified PRA case makes the modification look more beneficial than it may actually be. The costs to implement SAMA candidates considered for further evaluation were estimated by a Davis-Besse Expert Panel. If the estimated benefit exceeded the estimated implementation cost, the SAMA candidate was considered viable for implementation. The cost-benefit evaluation is discussed in Attachment E, Section E.7.

- Sensitivity Analysis – Sensitivity cases were performed to investigate the sensitivity of the results to certain modeling assumptions in the Davis-Besse SAMA analysis. Seven sensitivity cases were investigated. These cases examined the impacts of assuming damaged plant equipment is repaired and refurbished following an accident, a lower discount rate, a higher discount rate, higher on-site dose estimates, higher total on-site cleanup costs, higher costs for replacement power, and a higher non-internals event hazard groups' multiplier. Details on the sensitivity cases are discussed in Attachment E, Section E.8.

The results of the evaluation of 167 SAMA candidates did not identify any cost-beneficial enhancements at Davis-Besse. However, assuming a lower discount rate, higher replacement power costs, or an increased multiplier identified one potential cost-beneficial SAMA candidate. The SAMA candidate identified in the sensitivity cases is not related to plant aging. Therefore, the identified cost-beneficial SAMA candidate is not a required modification for the license renewal period. Nevertheless, this SAMA candidate will be considered through the normal FENOC processes for evaluating possible modifications to the plant.

4.21 Environmental Justice

Regulatory Requirement: 10 CFR 51.53, Subpart A, Appendix B, Table B1

"The need for and the content of an analysis of environmental justice will be addressed in plant specific reviews." [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 92]

Environmental justice was not reviewed in the GEIS. However, Executive Order 12898, "Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations," issued in 1994, is intended to focus the attention of Federal agencies on the human health and environmental conditions in minority and low income communities.

The consideration of environmental justice is required to assure that federal programs and activities will not have disproportionately high and adverse human health or environmental effects on minority and low-income populations. Accordingly, the NRC's Nuclear Reactor Regulation (NRR) Office has a procedure for incorporating environmental justice into the licensing process (**NRC 2004**).

As the NRR procedure recognizes, if no significant off-site impacts occur in connection with the proposed action, then no member of the public will be substantially affected. Thus, no disproportionate impact on minority or low-income populations would occur from the proposed action.

Section 2.6.2 presents demographic information relating to environmental justice to assist the NRC in its review.

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OHPO 2010. Ohio Historic Preservation Office, Ohio Historical Society, OHPO letter, N.J. Young to C.I. Custer (FENOC), March 23, 2010.

USFWS 2009. U.S. Fish and Wildlife Service, U.S. Department of Interior, USFES letter, M.K. Knapp to B. Allen (TAILS #3142002010-TA-0132), December 16, 2009, Columbus, Ohio.

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5.0 ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION

Regulatory Requirement: 10 CFR 51.53(c)(3)(iv)

"The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware."

The NRC licenses the operation of domestic nuclear power plants and provides for license renewal, requiring a license renewal application that includes an environmental report (10 CFR 54.23). NRC regulations 10 CFR Part 51 prescribe the environmental report content and identify the specific analyses the applicant must perform. In an effort to perform the environmental review efficiently and effectively, the NRC has resolved most of the environmental issues generically, but requires an applicant's analysis of all the remaining issues.

While NRC regulations do not require an applicant's environmental report to contain analyses of the impacts of those environmental issues that have been generically resolved (10 CFR 51.53(c)(3)(i)), the regulations do require that an applicant identify any new and significant information of which the applicant is aware (10 CFR 51.53(c)(3)(iv)). The purpose of this requirement is to alert the NRC staff to such information so that the staff can determine whether to seek the Commission's approval to waive or suspend application of the rule with respect to the affected generic analysis. The NRC has explicitly indicated, however, that an applicant is not required to perform a site-specific validation of GEIS conclusions (**NRC 1996a**, Pages C9-13, Concern NEP.015).

FENOC considers new and significant information would include the following:

- information that identifies a significant environmental issue not covered in the GEIS and codified in the regulations, or
- information that was not covered in the GEIS analyses and which leads to an impact finding different from that codified in the regulation.

The NRC does not define the term "significant." As a result, FENOC used guidance available in Council on Environmental Quality (CEQ) regulations for its review. CEQ guidance provides that federal agencies should prepare environmental impact statements for actions that would significantly affect the environment (40 CFR 1502.3), to focus on significant environmental issues (40 CFR 1502.1), and to eliminate from detailed study issues that are not significant (40 CFR 1501.7(a)(3)). The CEQ guidance includes a definition of “significantly” that requires consideration of the context of the action, and the intensity or severity of the impact(s) (40 CFR 1508.27). FENOC assumes that moderate or large impacts, as defined by the NRC, would be significant. Section 4.0 presents the NRC definitions of “moderate” and “large” impacts.

5.1 DESCRIPTION OF PROCESS

FENOC relied on two processes to identify potential new and significant information. First, a FENOC procedure establishes the method and guidance to perform and document environmental evaluations when required by the FENOC regulatory applicability determination process or by the design review process. The procedure requires due consideration of the 92 environmental issues identified in 10 CFR Part 51, Table B-1, before approving station changes, tests, and experiments (i.e., "proposed actions"). The environmental review also considers other applicable or relevant standards (e.g., 40 CFR and applicable state code) when judging the effects of proposed actions. Acceptance criteria for these effects include the environmental regulatory analyses supporting the current licensing basis.

Second, FENOC established an integrated information gathering process to identify potential new and significant information specific to Davis-Besse license renewal. The integrated process included the following tasks:

- A review of internal and external documents and records including, but not limited to environmental assessments and monitoring reports, procedures, and other management controls, compliance history reports, and environmental resource plans and data.
- A review of Supplemental Environmental Impact Statements associated with other license renewal applications to determine if there were new and significant information identified for those plants that may be applicable to Davis-Besse.
- Interviews with FENOC and FirstEnergy subject-matter experts regarding Davis-Besse environmental impacts and the appropriateness of GEIS scope and conclusions with respect to Davis-Besse.
- Solicitation and review of information relevant to environmental impacts of Davis-Besse from regulatory agencies and other stakeholder organizations.

Information identified as a result of these tasks was evaluated by a panel of subject-matter experts to determine its significance and then documented.

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5.2 ASSESSMENT

Based on the processes employed to identify new information and changing conditions, FENOC is not aware of any new and significant information regarding the environmental impacts of Davis-Besse license renewal.

One issue, however, was identified as new subsequent to when Davis-Besse became operational, but determined by FENOC to be not significant. Another potentially significant environmental issue identified as part of the original Davis-Besse operating license was determined subsequently to be not significant. These issues are described in more detail below.

Recovery of Burrowing Mayflies

Burrowing mayflies (*Hexagenia supp.*) are native to western Lake Erie and were abundant until the 1950s, when they disappeared due to degraded water and sediment quality. Nymphs were absent from sediments until 1993, when several small populations were discovered near the western and southern shores of Lake Erie. By 1995, nymphs had spread throughout the western and eastern half of the lake. Factors that have permitted the mayfly recovery include improved sediment and water quality attributed to pollution abatement programs implemented in the early 1970s. (**Krieger et al. 1996**)

Increasingly larger swarms of winged *Hexagenia* (mayflies) came onshore at Davis-Besse during the spring seasons in the 1990s. Attracted by station lighting, the mayflies became both a safety and security issue. The mayflies produced a slipping hazard due to the large number of carcasses strewn about the site. The mayflies also reduced the effectiveness of station lighting, resulting in a security issue in or around sensitive areas. By 1996, it became necessary for FENOC to implement procedures to mitigate the effects of the spring mayfly infestation.

The mayfly populations and intensities during the spring seasons, however, have varied over the years. This variation is likely the result of frequent or extended periods of lake stratification, which causes fall mayfly nymph recruitment failures. A trend toward increasing frequency of hot summers in the region could result in recurrent loss of mayfly larvae in western Lake Erie. (**Bridgeman et al. 2006**) Consequently, FENOC deems the spring mayfly infestation, although a new environmental issue, to be not significant due to the variability of infestations and the implementation of mitigation procedures.

Cooling Tower Bird Collisions

Avian mortality resulting from collisions of birds with the natural-draft cooling tower and other structures at Davis-Besse was an initial concern identified during the construction and operating licensing stages. As a result, extensive surveys were required to study the topic and included as part of the Environmental Technical Specifications, Appendix B, Section 3.1, to the Davis-Besse operating license. (**AEC 1973**, Pages i and iv; **NRC 1975**, Pages i and iii)

The significance of the mortality caused by the cooling tower was determined by examining the actual numbers and species of birds killed and comparing this mortality with the total avian mortality resulting from other man-made objects and with the abundance of bird populations near the towers and other structures from fall 1972 to fall 1979. The survey results were submitted to the NRC in 1980 (**Toledo Edison 1980**) and are discussed in the GEIS (**NRC 1996b**, Section 4.3.5.2).

In 1981, the NRC staff concurred with the survey report's conclusion that there was no significant adverse effect on bird populations due to the cooling tower and other site structures. As a result, the NRC removed further monitoring of bird collisions at Davis-Besse. (**NRC 1981**)

5.3 REFERENCES

AEC 1973. Final Environmental Impact Statement Related to Construction of Davis-Besse Nuclear Power Station, Docket No. 50-346, Toledo Edison Company and Cleveland Electric Illuminating Company, U.S. Atomic Energy Commission, March 1973.

Bridgeman, et al., 2006. Recruitment of *Hexagenia* Mayfly Nymphs in Western Lake Erie Linked to Environmental Variability, Ecological Application, 16(2), pp 601-611, 2006.

Krieger, et al., 1996. Recovery of Burrowing Mayflies (Ephemeorptera: Ephemeridae: *Hexagenia*) in Western Lake Erie, Journal of Great Lakes Research, 22(2), pp 254-263, International Association of Great Lakes Research, 1996.

NRC 1975. Final Environmental Statement Related to Operation of Davis-Besse Nuclear Power Station Unit 1, NUREG-75/097, U.S. Nuclear Regulatory Commission, October 1975.

NRC 1981. NRC Letter, J.F. Stolz to R.P. Crouse (Toledo Edison Co.), Docket No. 50-346, Nonradiological Environmental Monitoring Around the Davis-Besse Site, Serial No. 646, April 14, 1981.

NRC 1996a. Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response, NUREG-1529, Volumes 1 and 2, U.S. Nuclear Regulatory Commission, May 1996.

NRC 1996b. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants (GEIS), NUREG-1437, Volumes 1 and 2, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, May 1996.

Toledo Edison, 1980. Toledo Edison Co. Letter, R.P. Crouse to R.W. Reid (NRC), Docket No. 50-346, Nonradiological Environmental Monitoring Programs at the Davis-Besse Nuclear Power Station, Serial No. 643, August 22, 1980.

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6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 LICENSE RENEWAL IMPACTS

This section summarizes in tabular form the environmental impacts related to license renewal for the Davis-Besse operating license for Category 2 issues discussed in Chapter 4. In Section 4.1, FENOC incorporates, by reference, the NRC's findings for the 61 Category 1 issues that apply to Davis-Besse, all of which have impacts that are SMALL (see Attachment A). Sections 4.2 through 4.21 present FENOC's assessment of the Category 2 issues that apply to the Davis-Besse site.

Table 6.1-1 summarizes the impacts that Davis-Besse license renewal would have on resources associated with all Category 2 issues. As shown, the Category 2 issues evaluated are either not applicable or have impacts that would be SMALL, except a MODERATE beneficial impact due to tax revenues for off-site land use during the license renewal period.

Table 6.1-1: Environmental Impacts Related to License Renewal at Davis-Besse

No.	Category 2 Issue	Environmental Impact
Surface Water Quality, Hydrology, and Use (for all plants)		
13	Water use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow) **10 CFR 51.53(c)(3)(ii)(A)**	**NONE**. This issue does not apply because Davis-Besse withdraws make-up water from Lake Erie instead of a small river with low flow.
Aquatic Ecology (for plants with once-through or cooling pond heat dissipation systems)		
25	Entrainment of fish and shellfish in early life stages **10 CFR 51.53(c)(3)(ii)(B)**	**NONE**. This issue does not apply because Davis-Besse does not use a once-through or cooling pond heat dissipation system.
26	Impingement of fish and shellfish 10 CFR 51.53(c)(3)(ii)(B)	**NONE**. This issue does not apply because Davis-Besse does not use a once-through or cooling pond heat dissipation system.
27	Heat shock **10 CFR 51.53(c)(3)(ii)(B)**	**NONE**. This issue does not apply because Davis-Besse does not use a once-through or cooling pond heat dissipation system.
Groundwater Use and Quality		
33	Groundwater use conflicts (potable and service water, and dewatering; plants that use > 100 gpm) **10 CFR 51.53(c)(3)(ii)(C)**	**NONE**. This issue does not apply because Davis-Besse does not use groundwater for plant operations.
34	Groundwater use conflicts (plants using cooling towers or cooling ponds and withdrawing makeup water from a small river) **10 CFR 51.53(c)(3)(ii)(A)**	**NONE**. This issue does not apply because Davis-Besse withdraws make-up water from Lake Erie instead of a small river.
35	Groundwater use conflicts (Ranney wells) **10 CFR 51.53(c)(3)(ii)(C)**	**NONE**. This issue does not apply because Davis-Besse does not use Ranney wells.
39	Groundwater quality degradation (cooling ponds at inland sites) **10 CFR 51.53(c)(3)(ii)(D)**	**NONE**. This issue does not apply because Davis-Besse does not use a once-through or cooling pond heat dissipation system.

Table 6.1-1: Environmental Impacts Related to License Renewal at Davis-Besse
(continued)

No.	Category 2 Issue	Environmental Impact
Terrestrial Resources		
40	Refurbishment impacts **10 CFR 51.53(c)(3)(ii)(E)**	**SMALL**. Impacts are expected to be minimal because, based on FENOC refurbishment experience at BVPS Unit 1 in 2006, the refurbishment work will be conducted within the existing industrial footprint of the station, which has previously been disturbed.
Threatened or Endangered Species		
49	Threatened or endangered species **10 CFR 51.53(c)(3)(ii)(E)**	**SMALL**. Impacts are expected to be minimal during refurbishment because FENOC will follow the requirements provided by the USFWS and ODNR regarding bald eagles and Indiana bats. Additionally, operation and maintenance of the plant and associated transmission lines are not expected to change significantly during the license renewal term.
Air Quality		
50	Air quality during refurbishment (non-attainment and maintenance areas) **10 CFR 51.53(c)(3)(ii)(F)**	**NONE**. This issue does not apply, whether or not refurbishment will occur, because Davis-Besse is not located in or near an air quality nonattainment or maintenance area.
Human Health		
57	Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river) **10 CFR 51.53(c)(3)(ii)(G)**	**NONE**. This issue does not apply because Davis-Besse uses cooling towers that discharge to Lake Erie instead of a small river.
59	Electromagnetic fields, acute effects (electric shock) **10 CFR 51.53(c)(3)(ii)(H)**	**SMALL**. The Davis-Besse transmission lines conform to the NESC provisions for preventing electric shock from induced current.

Table 6.1-1: Environmental Impacts Related to License Renewal at Davis-Besse
(continued)

No.	Category 2 Issue	Environmental Impact
Socioeconomics		
63	Housing impacts **10 CFR 51.53(c)(3)(ii)(I)**	**SMALL**. FENOC plans refurbishment during the spring of 2014, when seasonal and transient populations are low and hotel rooms and short-term rentals are plentiful. Also, no additional workers are anticipated during the license renewal term. Therefore, impacts to housing are expected to be minimal due to refurbishment or continued operation of Davis-Besse.
65	Public services: public utilities **10 CFR 51.53(c)(3)(ii)(I)**	**SMALL**. Impacts are expected to be minimal during refurbishment and the license renewal term because water suppliers in the four-county area in the vicinity of Davis-Besse have ample excess capacity.
66	Public services: education (refurbishment) **10 CFR 51.53(c)(3)(ii)(I)**	**SMALL**. Impacts are expected to minimal because, based on FENOC refurbishment experience at BVPS Unit 1 in 2006, the temporary workers in-migrate and do not relocate families to the region due to the short duration of refurbishment.
68	Offsite land use (refurbishment) **10 CFR 51.53(c)(3)(ii)(I)**	**SMALL**. Impacts are expected to be minimal because the number of project workers is small compared to the area's total population, there is available residential and commercial development, there is proximity to a major metropolitan area, and refurbishment is of short duration.
69	Offsite land use (license renewal term) **10 CFR 51.53(c)(3)(ii)(I)**	**MODERATE**. No plant-induced changes to offsite land use are expected from license renewal. Continued Davis-Besse operation would bring positive impacts due to the proportion of tax revenues to regional jurisdictions.
70	Public services: transportation **10 CFR 51.53(c)(3)(ii)(J)**	**SMALL**. Impacts to transportation are expected to be minimal due to refurbishment or continued operation of Davis-Besse because the area transportation infrastructure is capable of handling large seasonal and transient populations, FENOC plans refurbishment when seasonal and transient populations are low, and no additional workers are anticipated during the license renewal term.

Table 6.1-1: Environmental Impacts Related to License Renewal at Davis-Besse
(continued)

No.	Category 2 Issue	Environmental Impact
71	Historic and archaeological resources **10 CFR 51.53(c)(3)(ii)(K)**	**SMALL**. Refurbishment and continued operation of Davis-Besse would require limited land-altering construction and be restricted to previously disturbed areas. FENOC and site procedures ensure protection of potential unidentified archaeologically and historically sensitive areas.
Postulated Accidents		
76	Severe accident mitigation alternatives **10 CFR 51.53(c)(3)(ii)(L)**	**SMALL**. No impact from continued operation. FENOC did not identify any cost-beneficial enhancements, but did identify one potential cost-beneficial SAMA candidate, which FENOC will consider through normal processes for evaluating possible changes to the plant.

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6.2 MITIGATION

Regulatory Requirement: 10 CFR 51.53(c)(3)(iii)

"The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues in Appendix B to subpart A of this part. No such consideration is required for Category 1 issues in Appendix B to subpart A of this part."

When adverse environmental impacts are identified, 10 CFR 51.45(c) requires consideration of alternatives available to reduce or avoid these adverse effects. Furthermore, "Mitigation alternatives are to be considered no matter how small the adverse impact; however, the extent of the consideration should be proportional to the significance of the impact." (**NRC 2000**, Page 4.2-S-5)

As discussed in Chapter 4 and summarized in Table 6.1-1, the Category 2 issues evaluated are either not applicable or have impacts that would be SMALL, except for a MODERATE but beneficial impact on the local school district tax revenue, and do not require mitigation. For these issues, the current permits, practices, and programs that mitigate the environmental impacts of plant operations are adequate.

Current plant operations include monitoring programs that would continue during the license renewal period to ensure the safety of workers, the public, and the environment. These programs include, for example, the radiological environmental monitoring program, air quality emissions monitoring, and effluent chemistry monitoring. Their purpose is to ensure that the plant's permitted emissions and discharges are within regulatory limits and any unusual or off-normal emissions/discharges are quickly detected, thus mitigating potential impacts. Accordingly, FENOC concludes that further mitigation measures are not warranted.

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6.3 UNAVOIDABLE ADVERSE IMPACTS

Regulatory Requirement: 10 CFR 51.45(b)(2)

The report shall discuss …"[a]ny adverse environmental effects which cannot be avoided should the proposal be implemented" as adopted by 10 CFR 51.53(c)(2).

FENOC adopts, by reference, for this ER the NRC findings stated in the GEIS for applicable Category 1 issues (see Attachment A), including discussions of any unavoidable adverse impacts.

Chapter 4 contains the results of FENOC's review and analyses of Category 2 issues, as required by 10 CFR 51.53(c)(3)(ii). These reviews take into account the information that has been provided in the GEIS, Appendix B to Subpart A of 10 CFR Part 51, and information specific to Davis-Besse.

From the Chapter 4 reviews, FENOC identified the following unavoidable adverse impacts of license renewal and refurbishment activities:

- The cooling water system would cause some consumptive use of Lake Erie water to compensate for drift and evaporation losses from the cooling tower.
- The cooling tower and its vapor plume would be visible from offsite. This visual impact would continue during the license renewal term.
- Procedures for the disposal of sanitary, chemical, and radioactive wastes would be intended to reduce adverse impacts from these sources to acceptably low levels. Solid radioactive wastes would be a product of plant operations and long-term disposal of these materials must be considered.
- Operation of Davis-Besse would result in a very small increase in radioactivity in the air and water. However, fluctuations in natural background radiation would be expected to exceed the small incremental increase in dose to the local population. Operation of Davis-Besse also would create a very low probability of accidental radiation exposure to inhabitants of the area.
- Land is required to store the old steam generators onsite pending disposal.

Based on these reviews and analyses, FENOC is not aware of significant adverse environmental effects that cannot be avoided upon renewal of the Davis-Besse operating license.

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6.4 IRREVERSIBLE AND IRRETRIEVABLE RESOURCE COMMITMENTS

Regulatory Requirement: 10 CFR 51.45(b)(5)

The report shall discuss …"[a]ny irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented" as adopted by 10 CFR 51.53(c)(2).

The continued operation of Davis-Besse for the license renewal term will result in the following irreversible and irretrievable resource commitments:

- Nuclear fuel that is used in the reactor and is converted to radioactive waste.
- Land required to store permanently or dispose of spent nuclear fuel offsite and low-level radioactive wastes generated as a result of plant operations.
- Water that evaporates during cooling tower operation.
- Elemental materials that will become radioactive.
- Materials used for the normal industrial operations of the plant that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms.

Other than the above, there are no major changes in operation of Davis-Besse planned during the license renewal period that would irreversibly or irretrievably commit environmental components of land, water, and air. However, if Davis-Besse ceases operations on or before the expiration of the current license, then the likely power generation alternatives would require a commitment of resources for construction of the replacement plant as well as for fuel to operate the plant.

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6.5 SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

> **Regulatory Requirement: 10 CFR 51.45(b)(4)**
>
> The environmental report shall discuss …"[t]he relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity" as adopted by 10 CFR 51.53(c)(2).

The current balance between short-term use and long-term productivity at Davis-Besse has remained relatively constant since the plant began operating in 1978. The Final Environmental Statements (FESs) evaluated the relationship between the short-term uses of the environment and the maintenance and enhancement of the long-term productivity associated with the impacts of constructing (**AEC 1973**) and operating (**NRC 1975**) Davis-Besse.

The period of extended operation will not change the short-term uses of the environment from the uses previously evaluated in the FESs. In fact, these evaluations note in particular the arrangement between FENOC and the USFWS that furthers the interests of conservation by increasing the extent and improving the quality of the site marshland available as a wildlife refuge. FENOC notes that the current balance is now well established and can be expected to remain essentially unchanged by the renewal of the operating license and extended operation of Davis-Besse. The period of extended operation will postpone the availability of the land and water resources for other uses. However, extending operations will not adversely affect the long-term uses of the site.

Refurbishment would result in the consumption of additional water during hydro-demolition, if used, but the consumption would be limited in duration and would cease once the steam generators are replaced. Likewise, noise impacts would be localized and of short duration.

After decommissioning, many environmental disturbances would cease and some restoration of the natural habitat may occur. Thus, the "trade-off" between the production of electricity and changes in the local environment is reversible to some extent.

Lastly, experience with other experimental, developmental, and commercial nuclear plants has demonstrated the feasibility of decommissioning and dismantling such plants sufficiently to restore a site to its former use. The degree of dismantlement will take into account the intended new use of the site and a balance among health and safety considerations, salvage values, and environmental impact. However, decisions on the ultimate disposition of these lands have not yet been made. Continued operation for an additional 20 years would not increase the short-term productivity impacts described here.

6.6 REFERENCES

AEC 1973. Final Environmental Impact Statement Related to Construction of Davis-Besse Nuclear Power Station, Docket No. 50-346, Toledo Edison Company and Cleveland Electric Illuminating Company, U.S. Atomic Energy Commission, March 1973.

NRC 1975. Final Environmental Statement Related to the Operation of Davis-Besse Nuclear Power Station Unit 1, Docket No. 50-346, Proposed by Toledo Edison Company, NUREG-75/097, U.S. Nuclear Regulatory Commission, March 1973.

NRC 2000. Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses; Supplement 1 to Regulatory Guide 4.2, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, September 2000.

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7.0 ALTERNATIVES TO THE PROPOSED ACTION

Regulatory Requirement: 10 CFR 51.45(b)(3)

The environmental report shall discuss "Alternatives to the proposed action." [adopted by reference at 10 CFR 51.53(c)(2)].

This chapter assesses alternatives to the proposed renewal of the Davis-Besse operating license. It includes discussions of the no-action alternative and alternatives that meet system generating needs. Descriptions are provided in sufficient detail to facilitate comparison of the impacts of the alternatives to those of the proposed action. In considering the level of detail and analysis that it should provide for each category, FENOC relied on the NRC decision-making standard for license renewal:

> *…the NRC staff, adjudicatory officers, and Commission shall determine whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decision makers would be unreasonable. [10 CFR 51.95(c)(4)]*

As noted in 10 CFR 51.53(c)(2), a discussion is not required of need for power or economic costs and benefits of the proposed action or of alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation.

Section 7.1 addresses the "no-action" alternative in terms of the potential environmental impacts of not renewing the Davis-Besse operating license, independent of any actions taken to replace or compensate for the loss of generating capacity. Section 7.2 describes feasible alternative actions that could be taken, which FENOC also considers to be elements of the no-action alternative, and presents other alternatives that FENOC does not consider to be reasonable. Section 7.3 presents the environmental impacts for the reasonable alternatives.

The environmental impact evaluations of alternatives presented are intended to provide enough information to support NRC decision-making by demonstrating whether an alternative would have a smaller, comparable, or greater environmental impact than the proposed action. Additional detail or analysis was not considered useful or necessary if it would identify only additional adverse impacts of license renewal alternatives; i.e., information beyond that necessary for a decision. This approach is consistent with the CEQ regulations, which provide that the consideration of alternatives (including the proposed action) be adequately addressed so reviewers may evaluate their comparative merits (40 CFR 1502.14(b)).

The characterization of environmental impacts in this chapter applies the same definitions of “SMALL,” “MODERATE,” and “LARGE” used in Chapter 4 of this ER and by the NRC in the GEIS (**NRC 1996**). Chapter 8 presents a summary comparison of environmental impacts of the proposed action and alternatives.

7.1 NO-ACTION ALTERNATIVE

FENOC considers the no-action alternative is not to renew the Davis-Besse operating license. With this alternative, FENOC expects Davis-Besse would continue to operate until the expiration of the existing operating license in 2017, at which time plant operations would cease, decommissioning would begin, and FirstEnergy or others would take the appropriate actions to meet system-generating needs created by discontinued operation of the plant.

Section 7.1.1 addresses the impacts of terminating operations and decommissioning, whereas Section 7.1.2 discusses the actions to replace power from Davis-Besse.

7.1.1 TERMINATING OPERATIONS AND DECOMMISSIONING

In the event the NRC does not renew the Davis-Besse operating license, FENOC assumes for this ER that it would operate the plant until the current license expires, then terminate operations and initiate decommissioning activities in accordance with NRC requirements. For purposes of this discussion, terminating operations includes those actions directly associated with permanent cessation of operations, which may result in more or less immediate environmental impacts (e.g., socioeconomic impacts from reduction in employment and tax revenues).

Decommissioning, as defined in the GEIS, is the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license (**NRC 1996**, Section 7.1). The two decommissioning options typically selected for United States reactors are rapid decontamination and dismantlement (DECON), and safe storage of the stabilized and de-fueled facility (SAFSTOR), followed by final decontamination and dismantlement (**NRC 1996**, Section 7.2.2). Under the DECON option, radioactively contaminated portions of the facility and site are decontaminated or removed promptly after cessation of operations to a level that permits termination of the license; these activities require several years for large light-water reactors like Davis-Besse (**NRC 1996**, Table 7.8). The SAFSTOR option involves safe storage of the stabilized and defueled facility for a period of time followed by decontamination to levels that permit license termination. Regardless of the option selected, decommissioning typically must be completed within 60 years after operations cease in accordance with NRC requirements at 10 CFR 50.82 (**NRC 1996**, Section 7.2.2).

FENOC has not selected a decommissioning method for Davis-Besse. The decommissioning method for Davis-Besse would be described in post-shutdown decommissioning plans for the plant, which must be submitted to NRC within two years following cessation of operations. For purposes of the present analysis, FENOC assumes that the DECON option would be employed upon license termination.

The NRC presents in Chapter 7 and Section 8.4 of the GEIS a summary of generic environmental impacts of the decommissioning process and an evaluation of potential changes in impact that could result from deferring the decommissioning process for up to 20 years (**NRC 1996**). For a pressurized water reactor decommissioning, NRC used a 1,175 MWe reference reactor. Although larger than Davis-Besse (910 MWe), FENOC considers the reference reactor to be representative of Davis-Besse. As a result, FENOC believes the decommissioning activities described in the GEIS to be representative of activities FENOC would perform for decommissioning at Davis-Besse.

The NRC concluded from its evaluation that decommissioning impacts would not be significantly greater as a result of the proposed action, assumed to result in 20 additional years of operation (**NRC 1996**, Sections 7.3 and 8.4). The NRC conclusions also indicate that the impacts of the decommissioning process itself, addressed in this ER as part of the no-action alternative, would have SMALL impacts with respect to radiation dose, waste management, air quality, water quality, and ecological resources (see 10 CFR Part 51, Subpart A, Appendix B, Table B-1). FENOC considers this generic evaluation and associated conclusions applicable to Davis-Besse as well.

The NRC has provided additional analysis of the environmental impacts associated with decommissioning in the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (**NRC 2002**). Except for issues that require site-specific evaluation, environmental impacts, including radiological releases and doses from decommissioning activities, were assessed to be SMALL (**NRC 2002**, Sections 4.3 and 6.1).

Regardless of the NRC decision on license renewal, FENOC will have to decommission Davis-Besse; license renewal would only postpone decommissioning for an additional 20 years. In the GEIS, the NRC concludes that there should be little difference between the environmental impacts from decommissioning at the end of 40 years of operation versus those associated with decommissioning after an additional 20 years of operation under a renewed license (**NRC 1996**, Section 7.4).

By reference, FENOC adopts the NRC findings regarding environmental impacts of decommissioning in the license renewal GEIS (**NRC 1996**) and in the decommissioning GEIS (**NRC 2002**), and concludes that environmental impacts under the no-action alternative would be similar to those that occur following license renewal. Further, FENOC believes that decommissioning activities would not involve significant land-use disturbance offsite or significant activities beyond current operational areas that would offer potential for impacts on land use, ecological resources, or cultural resources.

Decommissioning impacts would be temporary and occur at the same time as those associated with the operation of replacement generating sources.

7.1.2 Replacement Capacity

Davis-Besse is a base-load generator of electric power, with a net generating capability of 908 MWe (Section 3.1.2). In 2008, Davis-Besse generated approximately 8.3% of FirstEnergy's total base-load electricity generation (**FirstEnergy 2008a**, Page 7; **USDOE 2010**). The power produced by Davis-Besse, which represents a significant portion of the electricity FirstEnergy supplies to 2.1 million customers in its service territories located in Ohio (**FirstEnergy 2009a**, Page 81), would be unavailable in the event the Davis-Besse operating license are not renewed. As provided in 10 CFR 51.53(c)(2), FENOC does not consider the need for power from Davis-Besse in this analysis, but does consider the potential impact of alternatives for replacing this power. Replacement options considered include building new base-load generating capacity, purchasing power, delaying retirement of non-nuclear assets, and reducing power requirements through demand reduction, as discussed in Section 7.2.

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7.2 ALTERNATIVES THAT MEET SYSTEM GENERATING NEEDS

If the Davis-Besse operating license is not renewed, then the State of Ohio, FirstEnergy Corp. and its subsidiary companies, and other participants in the wholesale power market would lose approximately 910 MWe* of base-load capacity. Renewal would preserve the option of relying on Davis-Besse to meet future electric power needs through the period of extended operation.

While many methods are available to generate electricity, the GEIS indicates that a "reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are technically feasible and commercially viable" (**NRC 1996**, Section 8.1). Considering that Davis-Besse serves as a large base-load generator, FENOC considers reasonable alternatives to be those that would also be able to generate base-load power. FENOC believes that any alternative would be unreasonable if it did not consider replacement of the energy resource.

7.2.1 ALTERNATIVES CONSIDERED AS REASONABLE

FENOC believes that coal-fired and gas-fired generation capacity are feasible alternatives to nuclear power generating capacity, based on current (and expected) technological and cost factors, as compared to the other alternatives listed in the GEIS (**NRC 1996**, Section 8.1). FENOC considers the coal-fired and gas-fired technologies reasonable alternatives for purposes of this analysis to replace Davis-Besse generating capacity in the event its operating license is not renewed. FENOC considers the other technologies listed in the GEIS as not reasonable alternatives for the reasons discussed in Section 7.2.2.

The GEIS further notes that natural gas combined-cycle plants are particularly efficient and are used as base-load facilities (**NRC 1996**, Section 8.3.10). The specific coal-generating technologies that would represent viable alternatives are less certain, particularly in view of potentially higher air emissions compared to natural gas firing. For example, large-capacity integrated gasification combined-cycle (IGCC) and fluidized-bed-combustion (FBC) technologies (atmospheric and pressurized) are at or near commercial viability and could prove to be appropriate replacements. However, modern pulverized coal plants with advanced, clean-coal technology air emission controls represent currently proven technology and are economically competitive and commercially available in large-capacity unit sizes that could effectively replace Davis-Besse. Therefore, FENOC uses a representative plant of this type for purposes

*910 MWe is used for calculation convenience instead of 908 Mwe, as noted in Section 3.1.2.

of impact evaluation, noting that air emission impacts of IGCC and FBC options may be lower than modern pulverized coal, but would be higher than the gas-fired combined-cycle alternative (**USDOE 1999**, Pages 5-7).

The NRC has noted that, while there are many methods available for generating electricity and many combinations of alternative power generation sources that could provide base-load capacity, such an expansive consideration of alternatives would be too unwieldy (**NRC 1996**, Section 8.1).

7.2.1.1 Representative Coal-Fired Generation

For purposes of this analysis, FENOC assumed development of a modern pulverized coal-fired power plant with state-of-the-art emission controls similar to that described in its license renewal application, Appendix E (Environmental Report), for the Beaver Valley Power Station (**FENOC 2007**, Section 7.2.2.2). In defining the Davis-Besse coal-fired alternative, FENOC has used site-specific input as appropriate.

The representative plant would consist of commercially available standard-sized units, with a nominal net output of approximately 910 MWe, and would be designed to meet applicable standards with respect to control of air and wastewater emissions. As a minimum, FENOC assumed that the plant would feature low nitrogen oxide burners with overfire air to minimize formation of nitrogen oxides, and selective catalytic reduction for post-combustion nitrogen oxide control. Emissions of particulate matter and mercury would be limited by use of a fabric filter (baghouse), and sulfur oxide emissions would be controlled using a wet scrubber using limestone as the reagent.

Table 7.2-1 lists the basic specifications for the representative plant.

The Davis-Besse site would not be a viable location for the representative plant as a result of space limitations (see Section 7.3.1, Land Use). Land area requirements for a coal-fired plant of similar capacity to Davis-Besse would be approximately 1.7 acres per MWe (**NRC 1996**, Section 8.3.9), or 1,547 acres for a 910 MWe plant. The needed land area, therefore, far exceeds the 954-acre Davis-Besse site, most of which is occupied by marshland that is leased to the U.S. Government as a national wildlife refuge (Section 2.1).

Therefore, FENOC assumed for the analysis that the representative coal-fired plant would be located elsewhere at a greenfield or (preferably) brownfield site close to a commercially, navigable waterway or existing railway. A navigable waterway location would be highly desirable from a technical and economic perspective, considering the relative abundance of cooling water and low fuel cost afforded by barge transportation of coal and limestone. FENOC further assumed for the analysis that the representative coal-fired plant would use closed-cycle cooling with a natural draft cooling tower.

Lastly, FENOC assumed for the analysis that the environmental impacts associated with siting, design, and operation of the plant would be subject to comprehensive review under Ohio Power Siting Board (OPSB) rules or a comparable process.

7.2.1.2 Representative Gas-Fired Generation

For purposes of this analysis, FENOC assumed development of a modern natural gas-fired combined-cycle plant based on a commercially available design similar to that described in its license renewal application, Appendix E (Environmental Report), for the Beaver Valley Power Station (**FENOC 2007**, Section 7.2.2.1). In defining the Davis-Besse gas-fired alternative, FENOC has used site-specific input as appropriate.

The representative plant would consist of commercially available standard-sized units, with a nominal net output of approximately 910 MWe, and would be designed to meet applicable standards with respect to control of air and wastewater emissions. As a minimum, FENOC assumed that the plant would use natural gas as its only fuel and feature dry low-NO_X burners to minimize formation of nitrogen oxides during combustion and selective catalytic reduction for post-combustion nitrogen oxide control. Emissions of particulate matter and carbon monoxide would be limited through proper combustion controls.

Table 7.2-2 lists the basic specifications for the representative plant.

The Davis-Besse site is uncertain as a viable location for the representative plant due to space limitations. Land area requirements for a gas-fired plant of similar capacity to Davis-Besse, for example, would be approximately 0.11 acres per MWe (**NRC 1996**, Table 8.1), or 100 for a 910 MWe plant. Of the 954 acres of land occupied by the Davis-Besse site, 733 acres is occupied by marshland that is leased to the U.S. Government as a national wildlife refuge (Section 2.1). The remaining 221 acres is mostly occupied by Davis-Besse structures. Therefore, FENOC assumed for the analysis that the representative gas-fired plant would be located elsewhere at a greenfield or (preferably) brownfield site, but has not identified a specific site. However, primary considerations for a cost-competitive site include close proximity to adequate natural gas supply, transmission infrastructure, cooling water, and sufficient land suitable for development. For this analysis, FENOC assumed, based on FirstEnergy experience in gas-fired plant siting, that northwestern Ohio would be a realistic general area to locate the new plant (**FENOC 2007**, Section 7.2.2.1). FENOC further assumed for the analysis that the representative gas-fired plant would use closed-cycle cooling with mechanical draft cooling towers.

Lastly, FENOC assumed for the analysis that the environmental impacts associated with siting, design, and operation of the plant would be subject to comprehensive review under Ohio Power Siting Board (OPSB) rules or a comparable process.

7.2.2 Alternatives Considered as Not Reasonable

The following alternatives were considered as not reasonable replacement base-load power generation for one or more reasons as listed in Section 7.2.2.1 and Section 7.2.2.2. Although several of the alternatives could be considered in combination for replacement power generation at multiple sites, they do not generally provide base-load generation, and would entail greater environmental impacts.

7.2.2.1 Alternatives Not Requiring New Generating Capacity

This section discusses the economic and technical feasibility of supplying replacement energy without constructing new base-load generating capacity. Specific alternatives include:

- Conservation measures (including implementing demand side management (DSM) actions);
- Delayed retirement of existing non-nuclear plants; and
- Purchased power from other utilities equivalent to the output of Davis-Besse (i.e., eliminating the need for license renewal).

Conservation Programs

There is a variety of conservation technologies (e.g., DSM) that could be considered as potential alternatives to generating electricity at Davis-Besse. Examples include:

- Conservation Programs—homeowner agreements to limit energy consumption; educational programs that encourage the wise use of electricity.
- Energy Efficiency Programs– discounted residential rates for homes that meet specific energy efficiency standards; programs providing residential energy audits and encouraging efficiency upgrades; incentive programs used to encourage customers to replace older inefficient appliances or equipment with newer versions that are more efficient.
- Load Management Programs – programs that encourage customers to switch load to customer-owned standby generators during periods of peak demand; programs that encourage customers to allow a portion of their load to be interrupted during periods of peak demand.

On a national basis, DSM has shown great potential in reducing peak demand (maximum power requirement of a system at a given time). In 2008, a peak load reduction of 32,741 MWe was achieved nationally, which is an increase of 8.2% from 2007; however, since these DSM costs increased by 47.4%. DSM costs can vary significantly from year to year because of business cycle fluctuations and regulatory changes. Since costs are reported as they occur, while program effects may appear in future years, DSM costs and effects may not always show a direct relationship. Since 2003, nominal DSM expenditures have increased at 22.9% average annual growth rate. During the same period, actual peak load reductions have grown at a 6.2% average annual rate from, 22,904 MW to 32,741 MW (**EIA 2010**, Page 9).

In Ohio, as part of Senate Bill 221, utilities must implement energy efficiency programs that, beginning in 2009, achieve energy savings of at least 0.3% of the utility's three-year average annual kilowatt-hour (kWh) sales, with energy savings increasing to 22.5% by the end of 2025. Peak demand reductions of 1% in 2009 and increasing to 7.75% by the end of 2018 are also required. (**FirstEnergy 2009a**, Page 100) However, since these DSM-induced load reductions typically are considered in load forecasts, the reductions do not offset the projected power demands that are expected to be supplied with the power generated by Davis-Besse.

Although FENOC believes that energy generation savings can increase from DSM practices, it would be unrealistic to increase those energy savings to completely and consistently replace the Davis-Besse generating capability. The variability in associated costs also makes DSM a less desirable option. Consequently, FENOC does not see DSM as a practicable offset for the base-load capacity of Davis-Besse.

<u>Delayed Retirement</u>

Extending the lives of existing non-nuclear generating plants beyond the time they were originally scheduled to be retired, as described in the GEIS (**NRC 1996**, Section 8.3.13), does not represent a realistic option with respect to FirstEnergy's generating assets. Also, FENOC is not knowledgeable of retirement plans of other regional electric power suppliers. Even without retiring any generating units, FirstEnergy expects to require additional capacity in the near future. Therefore, even if a substantial portion of its capacity were scheduled for retirement and could be delayed, some of the delayed retirement would be needed just to meet load growth.

Approximately 56% of FirstEnergy's generating capacity consists of coal-fired plants which, due to a lower cost of generation, are used at capacity factors higher than other fossil-fuel generating units (**FirstEnergy 2008b**). Virtually all of FirstEnergy's non-nuclear base-load generating capability is from coal firing. These coal-fired plants were developed in the 1980s or earlier and represent the only plants in FirstEnergy's portfolio that would have any potential for continued operation to replace the base-load generation represented by Davis-Besse. However, older plants that do become candidates for retirement generally represent less efficient generation and pollution control technologies than are available in more modern plants, and continued operation typically would require substantial upgrades to be economically competitive and meet applicable environmental standards. In many cases, it is unlikely that such upgrades would be economically viable. FENOC believes that the environmental impacts of implementing such upgrades and operating the upgraded plants are bounded by the assessments presented in Section 7.3 for the gas-fired and coal-fired alternatives.

For these reasons, the delayed retirement of non-nuclear generating units is not considered by FENOC as a reasonable alternative to the renewal of Davis-Besse's license.

Purchased Power

Each of the states (Ohio, Pennsylvania, and New Jersey) in which FirstEnergy serves load have undertaken electric industry restructuring initiatives that promote competition in retail energy markets by allowing participation of non-utility suppliers. Retail customers historically served by the regulated operating subsidiaries of FirstEnergy now have the option to choose between FirstEnergy-affiliated suppliers and other state-qualified energy suppliers. (**FENOC 2007**, Section 7.2.3.2)

In theory, purchased power is a feasible alternative to Davis-Besse license renewal. There is no assurance, however, that sufficient capacity or energy would be available during the entire license renewal time frame to replace the approximately 910 MWe of base-load generation. In addition, even if power to replace Davis-Besse capacity were to be purchased, FENOC assumes that the generating technology used to produce the purchased power would be one of those described in the GEIS. Thus, the environmental impacts of purchased power would still occur, but would be located elsewhere within the region.

As a result, FENOC has determined that purchased power would not be a reasonable alternative to replace power lost in the event the Davis-Besse operating license is not renewed.

7.2.2.2 Alternatives Requiring New Generating Capacity

The following conventional power plant types are evaluated in this section as potential alternatives to license renewal:

- New Nuclear Reactor
- Petroleum Liquids (Oil)

In addition, with the passage of Ohio's Senate Bill 221 in 2008, at least 25% of electricity supply for retail customers must come from renewable and advanced energy resources by 2025 **OHPUCO 2009**, Pages 3 and 4). Accordingly, the following alternative energy sources are evaluated.

- Hydropower
- Wind
- Solar
- Geothermal
- Biomass (Wood Waste)
- Municipal Solid Waste
- Other Biomass-Derived Fuels (Energy Crops)
- Fuel Cells

Criteria used to determine if the potential energy alternatives represent a reasonable alternative include whether the alternative is developed and proven, can provide generation of approximately 910 MWe of electricity as a base-load supply, is economically feasible, and does not impact the environment more than Davis-Besse.

New Nuclear Reactor

Increased interest in the development of advanced reactor technology has been expressed by members of both industry and government. With energy demands forecasted to increase and public opposition to new carbon-fueled power plants, some companies are pursuing permits and licenses to build and operate new nuclear reactors to meet the country's future energy needs. As of June 2010, for example, 18 applications, for 28 units, for combined licenses have been submitted to the NRC for review (**NRC 2010**).

Nonetheless, there is ongoing uncertainty with respect to future electric demand due to the potential impacts of policy changes that could be enacted to limit or reduce greenhouse gas emissions. The downturn in the world economy also has had a significant impact on energy demand as well. The recovery of the world's financial markets is especially important for the energy supply outlook, because the capital-intensive nature of most large energy projects makes access to financing a critical necessity. (**EIA 2010**, Pages 5). Moreover, the economics of new nuclear plants remain uncertain with escalating fuel and construction costs emerging as forces which could affect this option.

In consideration of the extended schedule for construction of a new nuclear reactor, access to capital, and the schedule for the new reactor licensing process, construction of a new nuclear reactor at the Davis-Besse site or at an alternative site is not feasible prior to the period of extended operation for Davis-Besse, i.e., in this case, 2017.

Therefore, a new nuclear reactor is not considered a reasonable alternative to renewal of Davis-Besse's operating license..

Petroleum Liquids (Oil)

Oil-fired generation has experienced a significant decline since the early 1970s. Increases in world oil prices have forced utilities to use less expensive fuels (**NRC 1996**, Section 8.3.11). From 2002 to 2008, for example, the average cost of petroleum for power generation increased by more than a factor of three (**EIA 2010**, Table 3.5).

This high cost of oil has prompted a steady decline in its use for electricity generation. Within Ohio, for example, oil-fired units produce only 0.2% of power generation (**NEI 2008**). Increasing domestic concerns over oil security also will intensify the move away from oil-fired electricity generation.

Therefore, FENOC does not consider oil-fired generation a viable alternative to renewal of Davis-Besse's operating license.

Hydropower

Considering the FirstEnergy transmission and distribution territory, Ohio and Pennsylvania have a combined potential for 1,758 MWe of additional undeveloped hydroelectric capacity, with Ohio contributing 57 MWe (**INEEL 1998**, Table 4). Thus, hydropower is a feasible alternative to Davis-Besse license renewal in theory.

However, as noted in the GEIS, hydropower's percentage of United States generating capacity is expected to decline because the facilities have become difficult to site as a result of public concern about flooding, destruction of natural habitat, and alteration of natural river courses (**NRC 1996**, Section 8.3.4). For example, the GEIS estimated that land requirements for hydroelectric power are approximately 1 million acres per 1,000 MWe. Replacement of the Davis-Besse generating capacity would therefore require flooding a substantial amount of land (910,000 acres). Consequently, even if the capacity for development were available in Ohio-Pennsylvania, there would be large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace Davis-Besse.

As a result, developing a hydropower base-load capacity of approximately 910 MWe is not considered by FENOC to be a reasonable alternative to renewal of Davis-Besse's operating license.

Wind Power

Areas suitable for wind energy applications must be wind-power Class 3 or higher (**NREL 1986**, Chapter 1). Coastal regions along Lake Erie in northwestern Ohio have an estimated wind power of Class 3, increasing to Class 5 over offshore areas (**NREL 1986**, Chapter 3) and some Class 6 areas mid-lake (**USDOE 2009a**). The rest of the state, however, is devoid of Class 3 or higher wind-power areas. Pennsylvania is mostly a wind power Class 1 region, although some areas, particularly along ridgelines, may provide wind classes ranging from 4 to 6. West Virginia is also mostly a wind power Class 1 region, with Class 2 and higher resources along highlands and ridges in the east-central part of the state. The total wind generation capacity for the three-state region in 2008 was 698 MWe. (**USDOE 2009a**)

Thus, wind power in coastal Ohio along Lake Erie and along ridgelines in Pennsylvania and West Virginia is a feasible alternative to Davis-Besse license renewal in theory. However, wind power by itself is not suitable for large base-load capacity. As discussed in the GEIS, wind has a high degree of intermittency and average annual capacity factors for wind plants are relatively low, less than 30 percent (**NRC 1996**, Section 8.3.1). Wind power in conjunction with energy storage mechanisms might serve as a means of providing base-load power. But current energy storage technologies are too expensive for wind power to serve as a large base-load generator. (**NRC 2009b**, Section 8.2.5.2)

Environmentally, wind turbine generators produce no air emissions, consume no water for cooling, result in zero wastewater discharges, require no drilling, mining or transportation of fuel, and produce no hazardous or solid wastes other than used lubrication oil that can be recycled. However, the amount of land needed for operation can be significant. An estimated 214 square miles of land are needed to generate 910 MWe of power (**NRC 1996**, Section 8.3.1), although much of the land could be collocated with other resources (e.g., solar energy production, or agriculture). Noise produced by the rotor blades, visual impacts, and bird and bat fatalities are also of some concern (**EERE 2008**).

Considering that wind conditions are variable, energy storage technologies do not currently allow supply to more closely match demand, and large land requirements and associated aesthetic impacts, FENOC does not consider a utility-scale commercial wind power project a reasonable alternative to Davis-Besse license renewal.

Solar Power

Solar power technologies, both photovoltaic (PV) and thermal, depend on the availability and strength of sunlight. As such, it is an intermittent source of energy, requiring energy storage or a supplemental power source to provide electric power at night. Solar resource availability in Ohio, western Pennsylvania, and northern West Virginia is low compared to other parts of the United States. The three-state region, for example, has about 3.3 kWh per square meter per day of solar radiation, which is less than half of that available in the southwestern United States (**NRC 1996**, Figure 8.2).

The land requirement for solar technology is large. As noted in the GEIS, it requires 14 to 35 acres for every 1 MWe generated, depending on the solar technology (**NRC 1996**, Sections 8.3.2 and 8.3.3). At a minimum, it would require approximately 12,740 acres to replace the 910 MWe produced by Davis-Besse. In addition, although solar technologies produce no air pollution, little or no noise, and require no transportable fuels, many solar power technologies are still in the demonstration phase of development and cannot be considered competitive with fossil or nuclear-based technologies in grid-connected applications, due to high costs per kilowatt of capacity (**NRC 1996**, Section 8.3.2). Lastly, since the output of solar generated power is dependent on the availability of sunlight, supplemental energy sources would be required to meet the base-load capacity of Davis-Besse.

For the reasons noted, FENOC does not consider solar power to be a reasonable alternative to renewal of Davis-Besse's operating license.

Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for base-load power where available (**NRC 2009b** Section 8.2.5.5). However, geothermal electric generation is limited by the geographical availability of geothermal resources. As illustrated by Figure 8.4 in the GEIS, no feasible eastern location for geothermal capacity exists to serve as an alternative to Davis-Besse (**NRC 1996**, Section 8.3.5). As a result, FENOC does not consider geothermal energy to be a reasonable alternative to renewal of the Davis-Besse operating license.

Biomass Energy

Biomass is any organic material made from plants or animals. Agricultural and wood wastes such as forestry residues, particularly paper mill residues, are the most common biomass resources used for generating electricity. Regionally, eastern Ohio and most of Pennsylvania provide the largest biomass resources (**EERE 2009a**, **b**). The costs of these fuels, however, are highly variable and very site specific (**NRC 1996**, Section 8.3.6).

Most biomass plants use direct-fired systems by burning biomass feedstocks to produce steam directly for conventional steam turbine conversion technology. Although the technology is relatively simple to operate, it is expensive and inefficient. Conversion efficiencies of wood-fired power plants are typically 20-25%, with capacity factors of around 70-80%. As a result, biomass plants at modest scales (≤50 MWe) make economic sense if there is a readily available supply of low-cost wood wastes and residues nearby so that feedstock delivery costs are minimal. (**NRC 1996**, Section 8.3.6)

The construction impacts of a wood-fired plant would be similar to those for a coal-fired plant, although facilities using wood waste for fuel would be built on smaller scales. Like coal-fired plants, biomass and wood-waste plants require large areas for fuel storage and processing. They also create impacts to land and water resources, primarily associated with soil disturbance and runoff, in addition to air emissions. However, unlike coal-fired plants, biomass and wood-waste plants have very low levels of sulfur oxide emissions. (**NRC 1996**, Section 8.3.6)

FirstEnergy is retrofitting units 4 and 5 of the R.E. Burger plant in Shadyside, Ohio, for biomass capability. When completed, the units will be one of the largest biomass facilities in the United States capable of producing up to 312 MWe (**FirstEnergy 2009b**). Nevertheless, due to the relatively small scale of other potential projects and uncertainties in securing long-term fuel supplies, biomass is not considered by FENOC to be a reasonable alternative to replace Davis-Besse's base-load power generation.

Municipal Solid Waste

Municipal solid waste (MSW) facilities that convert waste to energy use technology comparable to steam-turbine technology for wood waste plants, although the capital costs are greater due to the need for specialized separation and handling equipment (**NRC 1996**, Section 8.3.7). The decision to burn MSW for energy is typically made due to insufficient landfill space, rather than energy considerations.

There are 89 operational MSW energy conversion plants in the United States (**USEPA 2009a**), none of which were located in Ohio as of 2007 (**WTE 2007**). These plants generate approximately 2,500 MWe, or about 0.3% of total national power generation (**USEPA 2009a**). At an average capacity of about 28 MWe, numerous MSW-fired power plants would be needed to replace the base-load capacity of Davis-Besse.

Construction impacts for a waste-to-energy plant are estimated to be similar to those for a coal-fired plant. Air emissions are potentially harmful. Increased construction costs for new plants and economic factors (i.e., strict regulations and public opposition) may limit the growth of MSW energy generation (**NRC 1996**, Section 8.3.7; **USEPA 2009a**).

For reasons stated, MSW is not considered by FENOC to be a reasonable alternative to renewal of Davis-Besse's operating license.

Other Biomass-Derived Fuels

In addition to biomass energy such as wood and municipal solid-waste fuels, there are other concepts for biomass-fired electric generators, including direct burning of energy crops, conversion to liquid biofuels, and biomass gasification. The GEIS indicated that none of these technologies had progressed to the point of being competitive on a large scale or of being reliable enough to replace a base-load plant (**NRC 1996**, Section 8.3.8). After recently re-evaluating current technologies, the NRC staff believes other biomass-fired alternatives are still unable to reliably replace base-load capacity (**NRC 2009b**, Section 8.2.5.8). For this reason, FENOC does not consider biomass-derived fuels to be a reasonable alternative to renewal of Davis-Besse's operating license.

Fuel Cells

Fuel cells are electrochemical devices that generate electricity without combustion and without water and air pollution. Fuel cells began supplying electric power for the space program in the 1960s. Today, they are being developed for more commercial applications. The U.S. Department of Energy (USDOE) is currently partnering with several fuel cell manufacturers to develop more practical and affordable designs for the stationary power generation sector. If successful, fuel cell power generation should prove to be efficient, reliable, and virtually pollution free. At present, progress has been slow and costs are high. The most widely marketed fuel cell is currently about $4,500 per kilowatt (kW) compared to $800 to $1,500 per kW for a diesel generator and about $400 per kW or less for a natural gas turbine. By the end of this decade, the USDOE goal is to reduce costs to as low as $400 per kW. (**USDOE 2009b**).

However, fuel cells presently are not economically or technologically competitive with other alternatives for base-load capacity. Therefore, FENOC does not consider fuel cells to be a reasonable alternative to renewal of Davis-Besse's operating license.

Combination of Alternatives

Individual evaluation of renewable and advanced energy resources shows that, by themselves, these energy resources are not considered by FENOC to be reasonable alternatives to renewal of Davis-Besse's operating license. When considered in various combinations with generation equivalent to that of Davis-Besse, these same renewable and advanced energy resources still fail to be reasonable alternatives to renewal of Davis-Besse's operating license.

For example, consider a mix of 25 percent of renewable and advanced energy resources, such as wind, hydroelectric, geothermal, solar, and biomass, with 75 percent natural gas generation to replace the baseload 908 MWe of the Davis-Besse plant.

This mix of energy resources would result in an increased uncertainty in energy output due to the fluctuation of wind and solar resources. The environmental impacts associated with the large amount of land required for siting the various resources would likely exceed those associated with continued operation of Davis-Besse. And, the air quality impacts of operation of the natural gas plant greatly exceed those associated with continued operation of Davis-Besse. Therefore, FENOC believes that various combinations of renewable and advanced energy resources with generation equivalent to that of Davis-Besse are not reasonable alternatives to renewal of Davis-Besse's operating license.

Table 7.2-1 Coal-Fired Alternative Emission Control Characteristics

Characteristic	Basis
Net capacity = 910 MW	Equivalent to Davis-Besse.
Capacity factor = 80%	From FENOC 2007, Table 7.2-2
Firing mode: subcritical, tangential, dry-bottom pulverized coal	Widely demonstrated, reliable, economical; tangential firing minimizes NO_X emissions (FENOC 2007, Table 7.2-2)
Fuel type = bituminous coal	Type used in FirstEnergy Ohio River plants (FENOC 2007, Table 7.2-2)
Fuel heating value = 12,285 Btu/lb	FirstEnergy Bruce Mansfield Plant average (FENOC 2007, Table 7.2-2)
Heat rate = 9,800 Btu/kWh at full load	FirstEnergy experience (FENOC 2007, Table 7.2-2)
Fuel sulfur content = 3.52 wt% ; 2.86 lb/MMBtu	FirstEnergy Bruce Mansfield Plant average (FENOC 2007, Table 7.2-2)
Fuel ash content = 11.88 wt%	FirstEnergy Bruce Mansfield Plant average (FENOC 2007, Table 7.2-2)
Uncontrolled SO_X emissions = 130 lb/ton coal	USEPA estimate calculated as 38 x wt% sulfur in coal (FENOC 2007, Table 7.2-2)
Uncontrolled NO_X emissions = 10 lb/ton coal	USEPA estimate (FENOC 2007, Table 7.2-2)
Uncontrolled CO emission = 0.5 lb/ton coal	USEPA estimate (FENOC 2007, Table 7.2-2)
Uncontrolled PM emission = 120 lb/ton coal	USEPA estimate calculated as 10 x wt% ash in coal (FENOC 2007, Table 7.2-2)
Uncontrolled PM_{10} emission = 27 lb/ton coal	USEPA estimate calculated as 2.3 x wt% of ash in coal (FENOC 2007, Table 7.2-2)
CO_2 emissions = 6,000 lb/ton	Approximate average for bituminous coal combustion (FENOC 2007, Table 7.2-2)
SO_X control = wet limestone flue gas desulphurization (95% removal)	Best available technology for minimizing SO_X emissions (FENOC 2007, Table 7.2-2)
NOX control = low NOX burners, overfire air, selective catalytic reduction (95% reduction)	Best available technology for minimizing NO_X emissions (FENOC 2007, Table 7.2-2)
Particulate control = fabric filters (99.9% removal)	Best available technology for minimizing particulate emissions (FENOC 2007, Table 7.2-2)

Btu = British thermal unit
CO = carbon monoxide
CO_2 = carbon dioxide
ft^3 = cubic feet
kWh = kilowatt-hour
lb = pound
MMBtu = million Btu
MW = megawatt
NO_X = nitrogen oxides
PM = particulate matter
PM_{10} = PM with diameter less than 10 microns
SO_X = sulfur oxides
USEPA = U.S. Environmental Protection Agency
wt% = percent by weight

Table 7.2-2: Gas-Fired Alternative Emission Control Characteristics

Characteristic	Basis
Net capacity = 910 MW	Equivalent to Davis-Besse.
Capacity factor = 80%	From **FENOC 2007**, Table 7.2-1
Fuel type = natural gas	Assumed
Heat rate = 6,500 Btu/kWh	FENOC Estimate (**FENOC 2007**, Table 7.2-1)
Fuel heating value = 1,025 Btu/ft^3	From **FENOC 2007**, Table 7.2-1
Fuel sulfur content = 0.2 grains/100 scf (0.00068 wt%)	From **FENOC 2007**, Table 7.2-1
SO_2 emissions = 0.00064 lb/MMBtu (0.94 x wt% sulfur in fuel)	USEPA estimate for natural gas-fired turbines (**FENOC 2007**, Table 7.2-1)
NO_X emissions (assuming dry low-NO_X combustors) = 0.099 lb/MMBtu	USEPA estimate for best available NO_X combustion control (**FENOC 2007**, Table 7.2-1)
NO_X post-combustion control: selective catalytic reduction (90% reduction)	USEPA estimate for best available NO_X post-combustion control (**FENOC 2007**, Table 7.2-1)
CO emissions (assuming dry low-NO_X combustors) = 0.015 lb/MMBtu	USEPA estimate (**FENOC 2007**, Table 7.2-1)
PM emissions (all PM_{10}) = 0.0019 lb/MMBtu	USEPA estimate (**FENOC 2007**, Table 7.2-1)
CO_2 emissions = 110 lb/MMBtu	USEPA estimate (**FENOC 2007**, Table 7.2-1)

Btu = British thermal unit
CO = carbon monoxide
CO_2 = carbon dioxide
ft^3 = cubic feet
kWh = kilowatt-hour
lb = pound
MMBtu = million Btu
MW = megawatt
NO_X = nitrogen oxides
PM = particulate matter
PM_{10} = PM with diameter less than 10 microns
scf = standard cubic feet
SO_X = sulfur oxides
USEPA = U.S. Environmental Protection Agency
wt% = percent by weight

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7.3 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

Environmental impacts are evaluated in this section for the coal- and gas-fired generation alternatives determined by FENOC to be reasonable in Section 7.2.1 compared to renewal of Davis-Besse's operating license.

The impacts are characterized as being SMALL, MODERATE, or LARGE. The definitions of these impact descriptions are the same as presented in the introduction to Chapter 4, which in turn are consistent with the criteria established in 10 CFR Part 51, Appendix B to Subpart A, Table B-1, Footnote 3. FENOC believes the environmental impacts associated with the construction and operation of new generating capacity at a greenfield site would exceed those for the same type plants located at Davis-Besse or at another existing disturbed site, i.e., brownfield site.

The new generating plants addressed in Section 7.2.1 would not be constructed only to operate for the period of extended operation of Davis-Besse. Therefore, FENOC assumes for this analysis a typical design life of 40 years for the coal-fired plant, 30 years for the combined-cycle natural gas-fired plant, and considers impacts associated with operation for the entire design life of the units in this analysis.

Chapter 8 presents a summary comparison of the environmental impacts of license renewal and the alternatives discussed in this section.

7.3.1 COAL-FIRED GENERATION

This section presents the impact evaluation for the representative coal-fired generation alternative. As discussed in Section 7.2.1.1, FENOC assumed for purposes of this analysis that the representative plant would be located at a greenfield or (preferably) brownfield site along commercially navigable waterway or existing rail way. This assumption is a result of the space limitation at the Davis-Besse site.

Land Use

Land area requirements for a coal-fired plant of similar capacity to Davis-Besse, for example, would be approximately 1.7 acres per MWe (**NRC 1996**, Table 8.1), or 1,547 acres for a 910 MWe plant. This amount of land use will include plant structures and associated infrastructure. Additional acres would be needed offsite for transmission lines and possibly rail lines, depending on the location of the site relative to the nearest inter-tie connection or rail spur. This acreage could amount to a considerable loss of natural habitat or agricultural land for the plant site alone dependent upon whether a greenfield or brownfield site was used, excluding that required for mining and other fuel-cycle impacts. Some portion of the impacts could be mitigated by constructing new transmission line in existing rights-of-way (ROW) to as great an extent as possible.

Land-use changes also would occur offsite in an undetermined coal-mining area to supply coal for the plant. For example, the GEIS estimated that approximately 22 acres of land per MWe would be affected for mining the coal and disposing of the waste to support a coal-fired plant during its operational life (**NRC1996**, Section 8.3.9). Therefore, for the 910 MWe plant used in this analysis, approximately 20,020 acres of land would be needed. Partially offsetting this offsite land use would be the elimination of the need for uranium mining and processing to supply fuel for Davis-Besse. The GEIS estimated that approximately one acre per MWe would be affected for mining and processing the uranium during the operating life of a nuclear power plant (**NRC1996**, Section 8.3.12). Therefore, for Davis-Besse uranium mining and processing, approximately 910 acres of land would be required, resulting in offsite mining net land use of 19,110 acres for the representative coal-fired generation alternative.

In consideration of the above, FENOC considers that land use impacts associated with a coal-fired plant at an alternate site would depend on the location of the plant and be MODERATE to LARGE.

Water Use and Quality – Surface Water

Construction-phase impacts on water quality of greatest potential concern include erosion and sedimentation associated with land clearing and grading operations at the plant site and waste disposal site, and suspension of bottom sediments during construction of cooling water intake and discharge structures and facilities for barge delivery of coal and limestone. However, land clearing and grading activities would be subject to stormwater protections in accordance with the NPDES program, and work in waterways would be regulated by the USACE under the CWA Section 404 and Section 10 of the Rivers and Harbors Act. These activities would also be subject to corresponding state and local regulatory controls, as applicable. In addition, these adverse effects would be localized and temporary. As a result, FENOC considers that impacts on surface water quality associated with construction of the representative plant at an alternative site would be SMALL.

FENOC expects that potential impacts on water quality and use associated with operation of the representative plant would be similar to impacts associated with Davis-Besse operation. Cooling water and other wastewater discharges would be regulated by an NPDES permit, regardless of location. Cooling water intake, evaporative losses, and discharge flows for the representative coal-fired plant, assumed to use a closed-cycle cooling system, would be similar to or lower than those resulting from Davis-Besse operation (see Chapter 4). As a result, FENOC considers that impacts on surface water quality associated with operation of the representative plant at an alternative site would be SMALL.

In view of the environmental review afforded under OPSB rules or a similar program, FENOC considers the impacts of surface water use and quality from construction and operation of the representative plant at an alternative site would be SMALL.

Water Use and Quality – Ground Water

Impacts will depend on whether the plant will use ground water for any purposes, as well as the characteristics of local aquifers. Effects to ground water quality can also depend on waste-management and coal-storage practices, although proper disposal and material handling should reduce the likelihood of an effect, as would recycling a greater percentage of waste products. Regardless of location, FENOC believes it highly unlikely that a coal-fired power plant at an alternate site will rely on ground water for plant cooling, and that ground water and waste-management regulations will limit impacts to SMALL.

Air Quality

Air quality impacts of coal-fired generation differ considerably from those of nuclear generation. A coal-fired plant emits sulfur oxides (SO_x), nitrogen oxides (NO_x), particulate matter (PM), and carbon monoxide (CO), all of which are regulated pollutants. Additionally, there are substantial emissions of carbon dioxide (CO_2), a greenhouse gas, although future developments such as carbon capture and storage and co-firing with biomass have the potential to reduce the carbon footprint of coal-fired electricity generation (**POST 2006**). Coal also contains other constituents (e.g., mercury, beryllium) that are potentially emitted as hazardous air pollutants, which are also of concern from a human health standpoint (**NRC 1996**, Section 8.3.9).

As noted in Section 7.2.1.1, FENOC has assumed a plant design that includes controls to minimize emissions of regulated air pollutants effectively. Based on emission factors, estimated efficiencies for emission controls, and assumed design parameters listed in Table 7.2-1, operation of the plant would result in the following annual air emissions for criteria pollutants:

- Sulfur dioxide = 8,267 tons
- Nitrogen oxides = 5,087 tons
- Carbon monoxide = 636 tons
- Total filterable particulates = 153 tons
- PM_{10} = 34.3 tons.

The annual emissions of carbon dioxide, which is currently unregulated, would be approximately 7.63 million tons. See Table 7.3-1 for details.

FENOC expects that these emissions would result in a decrease in local air quality compared to operation of a nuclear plant. However, FENOC anticipates that both sulfur dioxide and nitrogen oxide emissions will be subject to cap and trade programs (**FENOC 2007**, Section 7.2.1.3). As a result, the plant would not be expected to add to regional sulfur dioxide emissions and may not add to regional nitrogen oxide emissions, at least during the ozone season (**FENOC 2007**, Section 7.3.2, Air Quality). The representative plant would add to regional concentrations of other pollutants, including the criteria pollutants carbon monoxide and particulates; hazardous air pollutants; and carbon dioxide, which is a greenhouse gas.

Subject to regulatory controls, FENOC anticipates that the overall air quality would be noticeable, but not destabilizing. As a result, FENOC considers that the impacts to air quality from operation of the representative plant at an alternative site would be MODERATE.

Ecological Resources

Onsite and offsite land disturbances form the basis for impacts to terrestrial ecology. Constructing a coal-fired plant at an alternate site could alter onsite ecological resources because of the need to convert about 1,547 acres of land at the site to industrial use for the plant, coal storage, and ash and scrubber sludge disposal (see the Land Use subsection above). Coal-mining operations will also affect terrestrial ecology in offsite mining areas, although some of this land is likely already disturbed by mining operations.

Impacts could include wildlife habitat loss, reduced productivity, habitat fragmentation, and a local reduction in biological diversity. Impacts, however, will vary based on the degree to which the proposed plant site is already disturbed. On a previous industrial site, impacts to terrestrial ecology will be minor, unless substantial transmission line ROWs, a lengthy rail spur, or additional roads need to be constructed through undisturbed or less-disturbed areas. Any onsite or offsite waste disposal by landfilling will also affect terrestrial ecology at least through the time period when the disposal area is reclaimed.

During construction, impacts to aquatic ecology are likely. Regardless of where the plant is constructed, site disturbance will likely increase erosion and sedimentation runoff into nearby waterways, increasing turbidity. While site procedures and management practices may limit this effect, the impact will likely be noticeable. This is particularly true when intake and outfall structures are constructed alongside or in the body of water, as well as when any ROWs, roads, or rail lines require in-stream structures to support stream crossings. Noise and disturbance from construction, in addition to increased turbidity, may have a noticeable effect. Required regulatory permits, however, will help to mitigate these impacts.

During operations, the cooling water system would have a potential impact to aquatic communities. However, this system would be designed and operated in compliance with the CWA, including NPDES limitations to ensure appropriate protection of aquatic communities from thermal discharges and cooling water intakes. The cooling water intake and discharge flows would be comparable to or less than for Davis-Besse, the impact from which is considered to be SMALL (see Chapter 4). Therefore, associated impacts at a comparable site on commercially navigable waterway would also be expected to be SMALL.

Management of runoff from coal piles will also be necessary. However, subject to regulatory oversight, as afforded under OPSB rules or a similar program, FENOC considers the impacts to ecological resources from construction and operation of the representative plant at an alternative site may be noticeable, but not destabilizing.

On this basis, FENOC considers that the overall impact to ecological resources of constructing a coal-fired plant with a closed-cycle cooling system at an alternate site would be MODERATE.

Human Health

Coal-fired power generation introduces worker risk from coal and limestone mining, worker and public risk from coal and lime/limestone transportation, worker and public risk from disposal of coal combustion wastes, and public risk from inhalation of stack emissions. For example, the GEIS noted that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates from a coal-fired plant, but the GEIS does not identify the significance of these impacts (**NRC 1996**, Section 8.3.9). In addition, the coal-fired alternative also introduces the risk of coal pile fires and attendant inhalation risks, though these types of events are relatively rare (**NRC 2009b**, Section 8.2.1, Human Health).

Regulatory agencies, including the USEPA, USOSHA, and state agencies, set air emission standards requirements for workers and the public based on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health.

Given these extensive health-based regulatory controls, FENOC considers that operating the representative coal-fired plant at an alternate site would be SMALL.

Socioeconomics

The peak workforce during construction of the coal-fired plant alternative is estimated to range between 1.2 to 2.5 workers per MWe and the workforce required during operation is estimated to be 0.25 workers per MWe (**NRC 1996**, Section 8.3.9, Table 8.1 and

Table 8.2). For a plant with a capacity of 910 MWe, workforces of approximately 1,092 to 2,275 construction workers and 228 permanent employees would be required.

Potential impacts from construction of the coal-fired alternative would be highly location dependent. As noted in the GEIS, socioeconomic impacts are expected to be larger at a rural site than at an urban site, because more of the peak construction work force would need to move to the area to work (**NRC 1996**, Section 8.3.9). Not considering impacts of terminating Davis-Besse operations, socioeconomic impacts at a remote rural site could be LARGE, while impacts at a site in the vicinity of a more populated metropolitan area (e.g., Toledo) could be SMALL to MODERATE. FENOC assumed that the OPSB or comparable review process, including application of appropriate mitigation found to be needed as a result, would ensure that these construction impacts would not be destabilizing to local communities.

At most alternate sites, coal and lime would be delivered by barge, although delivery is feasible for a location near a railway. Transportation impacts would depend upon the site location. Socioeconomic impacts associated with rail transportation would be MODERATE to LARGE. Barge delivery of coal and lime/limestone would have SMALL socioeconomic impacts.

As noted in Section 4.17, communities in Ottawa County, particularly those within the tax jurisdiction of Carroll Township and the Carroll-Benton-Salem School District, would experience losses in both employment and tax revenues due to Davis-Besse closure, assuming the plant is constructed outside the area.

Based on the above, FENOC considers that the overall socioeconomic impacts of construction and operation of the representative coal-fired plant at an alternate site would be MODERATE.

Waste Management

The representative coal-fired plant would produce substantial solid waste, especially fly ash and scrubber sludge. Based on emission factors and controls scaled from Beaver Valley (**FENOC 2007**, Section 7.3.2 and Table 7.2-2)*, the plant annual waste generation amounts would be approximately 300,000 tons/year of ash and 470,100 tons of flue gas desulphurization waste (dry basis), consisting primarily of hydrated calcium sulfate (gypsum) and excess limestone reactant. Although these wastes represent potentially usable products, FENOC assumed the total waste generated would be disposed of at an offsite landfill. Based on a fill depth of 30 feet and scaling from Beaver Valley (**FENOC 2007**, Section 7.3.2), approximately 644 acres would be required for the landfill over an assumed plant operating life of 40 years.

* The scale factor for coal is the ratio of total electric capability, 910 MWe/1980 Mwe, or 0.460.

Disposal of the waste could noticeably affect land use and ground water quality. In addition, the December 2008 failure of the dike used to contain fly ash at the Tennessee Valley Authority Kingston Fossil Plant in Roane County, Tennessee, and subsequent cleanup, highlight other waste management issues (**USEPA 2009b**). However, environmental impacts related to the location, design, and operational aspects of waste disposal for the plant would be subject to regulatory review under OPSB rules or similar programs. As a result, FENOC believes that with proper disposal siting, coupled with current waste management and monitoring practices, waste disposal would not destabilize any resources.

On this basis, FENOC considers that waste management impacts from operation of the representative coal-fired plant at an alternate site would be MODERATE.

Aesthetics

Potential aesthetic impacts of construction and operation of the representative coal-fired plant include visual impairment resulting from the presence of a large industrial facility, including 500-foot-high stacks, and cooling towers up to approximately 500 feet high with associated condensate plumes. The stacks and condensate plumes from the cooling towers could be visible some distance from the plant. There would also be an aesthetic impact if construction of a new transmission line or rail spur were needed. Similarly, noise impacts associated with rail delivery of coal and lime/limestone if used would be most significant for residents living in the vicinity of the facility and along the rail route.

These impacts, however, are highly site-specific. Site locations could reduce the aesthetic impact of a coal-fired generation, for example, if siting were in an area that was already industrialized versus locating at largely undeveloped sites.

In view of the environmental review afforded under OPSB rules or a similar program, FENOC considers that the impacts to aesthetics from construction and operation of the representative plant at an alternative site would depend on location and be SMALL to MODERATE.

Cultural Resources

FENOC assumed that the representative coal-fired plant, associated infrastructure (e.g., roads, transmission corridors, rail lines, or other rights-of-way), and associated waste disposal site would be located with consideration of cultural resources afforded under OPSB or comparable rules. FENOC further assumed that appropriate measures would be taken to recover or provide other mitigation for loss of any resources discovered during onsite or offsite construction.

On this basis, FENOC considers that the potential impact on cultural resources from construction and operation of the representative plant at an alternative site would be SMALL.

7.3.2 Gas-Fired Generation

This section presents the impact evaluation for the representative gas-fired generation alternative. As discussed in Section 7.2.1.2, FENOC assumed for purposes of this analysis that the representative plant would be located at a greenfield or (preferably) brownfield site in northwestern Ohio. This assumption is a result of the space limitation at the Davis-Besse site.

Land Use

Land-use requirements for gas-fired plants are relatively small, at about 100 acres for a 910 MWe plant (Section 7.2.1.2). An estimated 240 – 270 additional acres would be needed offsite at a greenfield location for new gas and electric transmission lines (**FENOC 2007**, Section 7.3.1, Land Use) and increased land-related impacts, which in turn would be location-specific.

Land use in northwestern Ohio is predominantly rural agricultural cropland with scattered rural residences and woodlots. Located in a rural area, the change in land use would be locally apparent and could include displacement of cropland, which is highly productive for corn, wheat, and soybeans relative to other areas of the state; however, substantial buffer with respect to highly incompatible land uses (e.g., residential use) could be provided and destabilization of overall land use would not be expected. If the plant were located in an area designated for industrial use, associated land-use impacts would not be significant. Agricultural practices could continue along most of the area occupied by offsite rights-of-way. (**FENOC 2007**, Section 7.3.1, Land Use)

Regardless of where the natural gas-fired plant is built, additional land would be required for natural gas wells and collection stations. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for Davis-Besse. The GEIS estimated that approximately one acre per MWe would be affected for mining and processing the uranium during the operating life of a nuclear power plant (**NRC 1996**, Section 8.3.12). Therefore, for Davis-Besse uranium mining and processing, approximately 910 acres of land would be required, resulting in a net gain in reclaimed land for the representative natural gas-fired generation alternative.

In view of the environmental review afforded under OPSB rules or a similar program, FENOC considers that the overall impacts of land use from construction and operation of the representative plant at an alternative site would depend on plant location and be SMALL to MODERATE.

Water Use and Quality – Surface Water

Cooling water intake, evaporative losses, and discharge flows for the plant would be less than that of Davis-Besse, primarily because less power would be derived from a steam cycle (**FENOC 2007**, Section 7.2.2.1).

During operation, cooling water and wastewater discharges would be regulated under the federal CWA and corresponding state programs by an NPDES permit. Construction activities would be similarly regulated to ensure protection of water resources. In addition, impacts on water use and quality would be subject to scrutiny in the planning stage under OPSB or similar governing authority rules.

Overall, FENOC considers that the impacts from construction and operation of the representative plant at an alternative site on surface water use and quality would be SMALL.

Water Use and Quality – Ground Water

Impacts will depend on whether the plant will use ground water for any purposes, as well as the characteristics of local aquifers. Regardless of location, FENOC assumes that a gas-fired power plant at an alternate site will not rely on ground water for plant cooling, and that regulations for ground water use for potable water will limit impacts to SMALL.

Air Quality

Natural gas is a relatively clean-burning fuel with nitrogen oxides being the primary focus of combustion emission controls. As noted in the GEIS, air quality impacts for all natural gas technologies are generally less than for fossil technologies of equal capacity because fewer pollutants are emitted (**NRC 1996**, Section 8.3.10).

As noted in Section 7.2.1.2, FENOC has assumed a plant design that includes controls to minimize emissions of regulated air pollutants effectively. Based on emission factors, estimated efficiencies for emission controls, and assumed design parameters listed in Table 7.2-2, operation of the plant would result in the following annual air emissions for criteria pollutants:

- Sulfur dioxide = 13.3 tons
- Nitrogen oxides = 205 tons
- Carbon monoxide = 311 tons
- Total filterable particulates = 39.4 tons

The annual emissions of carbon dioxide, which is currently unregulated, would be approximately 2.28 million tons. See Table 7.3-2 for details.

FENOC expects that these emissions may result in a noticeable reduction in local air quality. However, FENOC anticipates that both sulfur dioxide and nitrogen oxide emissions will be subject to cap and trade programs (**FENOC 2007**, Section 7.2.1.3). As a result, the plant would not be expected to add to regional sulfur dioxide emissions and may not add to regional nitrogen oxide emissions, at least during the ozone season (**FENOC 2007**, Section 7.3.1, Air Quality). The representative plant would add to regional concentrations of other pollutants, including the criteria pollutants carbon monoxide and particulates; hazardous air pollutants such as mercury; and carbon dioxide, which is presently unregulated.

Subject to regulatory controls, FENOC anticipates that the overall air quality would be noticeable, but not destabilizing. As a result, FENOC considers that the impacts to air quality from operation of the representative plant at an alternative site would be MODERATE, but smaller than those of coal-fired generation.

Ecological Resources

As noted in the Land Use subsection above, development of the representative combined-cycle natural gas-fired plant may require approximately 100 acres for the plant site and approximately 240 – 270 additional acres for offsite infrastructure. Although the GEIS noted that land-dependent ecological impacts from construction from gas-fired plants would be smaller than for other fossil fuel technologies of equal capacity (**NRC 1996**, Section 8.3.10), the type and quality of terrestrial habitat that would be displaced is location-specific.

However, FENOC considers it likely that most of the area required for construction would consist of agricultural cropland with relatively low habitat value. Stream crossings and wetland disturbance, if any, would be subject to provisions of a USACE permit (CWA Section 404) and relevant state and local requirements. (**FENOC 2007**, Section 7.3.1, Ecology)

The most significant potential impacts to aquatic communities relate to operation of the cooling water system. However, the cooling system for the plant would be designed and operated in compliance with the CWA, including NPDES limitations for physical and chemical parameters of potential concern and provisions of CWA Sections 316(a) and 316(b), which are respectively established to ensure appropriate protection of aquatic communities from thermal discharges and cooling water intakes. Also, the siting, design, and operation of the plant would be subject to the environmental protections under OPSB rules.

Overall, FENOC expects that development of the representative natural gas-fired plant would likely have little noticeable impact on ecological resources of the area. As a result, FENOC considers that the overall impacts to ecology resources from construction and operation of the representative plant at an alternative site would depend on plant location and be SMALL to MODERATE.

Human Health

The GEIS cites risk of accidents to workers and public health risks (e.g., cancer, or emphysema) from the inhalation of toxics and particulates associated with air emissions as potential risks to human health associated with the gas-fired generation alternative (**NRC 1996**, Table 8.2). However, regulatory requirements imposed on facility design, construction, and operations under the authority of the Occupational Safety and Health Act, Clean Air Act, and related statutes are designed to provide an appropriate level of protection to workers and the public. Additionally, regulatory agencies, including the USEPA, USOSHA, and state agencies, set air emission standards requirements for workers and the public based on human health impacts.

Given the extensive health-based regulatory control, FENOC considers that operating the representative gas-fired plant at an alternate site, regardless of plant location, would be SMALL.

Socioeconomics

Major sources of potential socioeconomic impacts from the representative gas-fired generation alternative include temporary increases in jobs, economic activity, and demand for housing and public services in communities surrounding the site during the construction period. Countering these increases are losses in permanent jobs, tax revenues, and economic activity attributable to gas-fired plant operation and termination of operations of Davis-Besse.

The estimated number of peak construction workers expected to build a gas-fired plant with a capacity of 910 MWe is 1,092 – 2,275 (**NRC 1996**, Tables 8.1). To operate the plant would require 137 workers (**NRC 1996**, Tables 8.2). Although northwestern Ohio is predominantly rural, most areas are within commuting distance of the metropolitan areas like Toledo and Cleveland, Ohio. Considering the proximity of these sources of labor and services, FENOC expects that most of the construction workforce would commute and relatively few would relocate into the area, and associated socioeconomic impacts during construction would be SMALL.

Communities in Ottawa County, however, particularly those within the taxing jurisdiction of Carroll Township and the Benton-Carroll-Salem School District, would experience losses in both employment and tax revenues due to Davis-Besse closure that could constitute MODERATE impact (see Section 4.17).

FENOC believes that these impacts, although noticeable, would not be destabilizing. As a result, FENOC considers that the overall socioeconomic impact of construction and operation of the representative gas-fired at an alternative site would be MODERATE.

Waste Management

Gas-fired generation would result in minimal waste generation, producing minor (if any) impacts (**NRC 1996**, Section 8.3.10). As a result, FENOC considers waste management impacts from the operation of the representative plant at an alternative site would be SMALL.

Aesthetics

Potential aesthetic impacts of construction and operation of a gas-fired plant include visual impairment resulting from the presence of a large industrial facility, including multiple exhaust stacks at least 150 feet high, and mechanical-draft cooling towers with associated condensate plumes. Considering the flat topography in northwestern Ohio, the stacks and condensate plumes would likely be visible for several miles from the site; new transmission lines constructed to connect the plant to the grid would also be relatively visible for the same reason, though would not be out of character for the rural northwestern Ohio landscape. (**FENOC 2007**, Section 7.3.1, Aesthetics) FENOC expects that the plant likely would be located in a rural area, and assumed that adequate buffer and vegetation screens would be provided at the plant site as needed to moderate visual and noise impacts.

In view of the environmental review afforded under OPSB rules, FENOC considers that the impacts to aesthetics from construction and operation of the representative plant at an alternative site would depend on location and be SMALL to MODERATE.

Cultural Resources

FENOC assumed that the representative gas-fired plant and associated gas-supply pipeline and transmission line would be located with consideration of cultural resources under OPSB or comparable program rules. FENOC further assumed that appropriate measures would be taken to avoid, recover, or provide other mitigation for loss of any resources discovered during onsite or offsite construction.

On this basis, FENOC concludes that the potential adverse impact on cultural resources of the representative plant at an alternative site, regardless of location, would be SMALL.

Table 7. -1 Air Emissions rom Coal-Fired Alternative

arameter [1]	Calc lation	es lt
Annual Coal Consumption	$\text{Total Gross Capability} \times \frac{\text{Heat Rate}}{\text{Heat alue}} \times \text{Conversion Factors} \times \text{Capacity Factor}$	tons/year
	$\frac{910\text{ MW} \times 9{,}800\text{ Btu}}{\text{kW x hr } 12{,}285\text{ Btu}} \times \frac{\text{lb}}{\text{MW}} \times \frac{1{,}000\text{ kW}}{\text{year}} \times \frac{8{,}760\text{ hr}}{\text{year}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times 0.80$	2,543,644
Emissions	Coal Consumption x Uncontrolled Emissions x Conversion Factors x 100 removal efficiency (%) [2]	tons/year
SO_x	$\frac{2{,}543{,}644\text{ tons}}{\text{year}} \times \frac{130\text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times \frac{100-95}{100}$	8,267
NO_X	$\frac{2{,}543{,}644\text{ tons}}{\text{year}} \times \frac{10\text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times \frac{100-60}{100}$	5,087
CO	$\frac{2{,}543{,}644\text{ tons}}{\text{year}} \times \frac{0.5\text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\text{ lb}}$	636
PM	$\frac{2{,}543{,}644\text{ tons}}{\text{year}} \times \frac{120\text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times \frac{100-99.9}{100}$	152.6
PM_{10}	$\frac{2{,}543{,}644\text{ tons}}{\text{year}} \times \frac{27\text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times \frac{100-99.9}{100}$	34.34
CO_2	$\frac{2{,}543{,}644\text{ tons}}{\text{year}} \times \frac{6{,}000\text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\text{ lb}}$	7,630,933

Btu = British thermal units
CO = carbon monoxide
CO_2 = carbon dioxide
hr = hour
kW = kilowatt
lb = pound
MW = megawatt
NO_X = nitrogen oxides
PM = total filterable particulate matter
PM_{10} = PM having a diameter less than 10 microns
SO_X = sulfur oxides

Notes:
(1) Source: Table 7.2-1
(2) There are no emission controls for CO and CO_2.

Table 7. -2 Air Emissions rom as-Fired Alternative

arameter [1]	Calc lation	es lt
Annual Gas Heat nput	Gross Capability × Heat Rate × Conversion Factors × Capacity Factor	MMBtu/year
	$910\ \text{MW} \times \frac{6{,}500\ \text{Btu}}{\text{kW}-\text{hr}} \times \frac{1{,}000\ \text{kW}}{\text{MW}} \times \frac{8{,}760\ \text{hr}}{\text{year}} \times 0.80$	41,452,320
Emissions	Annual Gas Heat nput x Uncontrolled Emissions x Conversion Factors x 100 removal efficiency (%) [2]	tons/year
SO_2	$\frac{41{,}452{,}320}{\text{year}} \times \frac{0.00064\ \text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\ \text{lb}}$	13.3
NO_X	$\frac{41{,}452{,}320}{\text{year}} \times \frac{0.099\ \text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times \frac{100-90}{100}$	205
CO	$\frac{41{,}452{,}320}{\text{year}} \times \frac{0.015\ \text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\ \text{lb}}$	311
PM (all PM_{10})	$\frac{41{,}452{,}320}{\text{year}} \times \frac{0.019\ \text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\ \text{lb}}$	39.4
CO_2	$\frac{41{,}452{,}320}{\text{year}} \times \frac{110\ \text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\ \text{lb}}$	2,279,878

Btu = British thermal units
CO = carbon monoxide
CO_2 = carbon dioxide
hr = hour
kW = kilowatt
lb/MMBtu = pounds per million British thermal units
MW = megawatt
NO_X = nitrogen oxides
PM = particulate matter
PM_{10} = PM having a diameter less than 10 microns
SO_X = sulfur oxides (mainly SO_2)

Notes:

(1) Source: Table 7.2-2

(2) There are no emission controls for SO_2, CO, PM, and CO_2.

7.4 REFERENCES

Note to reader: This list of references identifies web pages and associated URLs where reference data were obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. FENOC has maintained hard copies of the information and data obtained from the referenced web pages.

EERE 2008. Advantages and Disadvantages of Wind Energy, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Website: http://www1.eere.energy.gov/windandhydro/wind_ad.html, accessed July 8, 2009.

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8.0 Comparison of Environmental Impact of License Renewal with the Alternatives

> Regulatory Requirement: 10 CFR 51.45(b)(3)
>
> "To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form." as adopted by 10 CFR 51.53(c)(2)."

FENOC presents its evaluations of the environmental impacts of Davis-Besse license renewal in Chapter 4 and reasonable alternatives in Chapter 7. In this chapter, FENOC provides a comparative summary of these impacts.

Table 8.0-1 summarizes environmental impacts of the proposed action (license renewal) and the alternatives, for comparison purposes. The environmental impacts compared in Table 8.0-2 are those that are either Category 2 issues for the proposed action or are issues that the GEIS (**NRC 1996**) identified as major considerations in an alternatives analysis. For example, although the NRC concluded that air quality impacts from the proposed action would be small (Category 1), the GEIS identified major human health concerns associated with air emissions from alternatives (Section 7.2.2). Therefore, Table 8.0-1 compares air quality impacts from the proposed action to the alternatives. Table 8.0-2 is a more detailed comparison of the alternatives.

As shown in Table 8.0-1 and Table 8.0-2, environmental impacts of the proposed action (Davis-Besse license renewal) are expected to be SMALL for all impact categories evaluated. In contrast, FENOC expects that environmental impacts in some impact categories would be MODERATE or MODERATE to LARGE for the no-action alternative (NRC decision not to renew Davis-Besse operating license), considered with or without development of replacement generation facilities.

As a result, FENOC concludes that the environmental impacts of the continued operation of Davis-Besse, providing approximately 910 MWe of base-load power generation through 2037, are superior to impacts associated with the best case among reasonable alternatives. Davis-Besse continued operation would create significantly less environmental impact than the construction and operation of new base-load generation capacity. Additionally, Davis-Besse continued operation will have a significant positive economic impact on the communities surrounding the station.

Table 8.0-1: Impacts Comparison Summary

Impact[2]	Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives[1]	
			With Coal-Fired Generation	With Gas-Fired Generation
Land Use	SMALL	SMALL	MODERATE to LARGE	SMALL to MODERATE
Water Quality	SMALL	SMALL	SMALL	SMALL
Air Quality	SMALL	SMALL	MODERATE	MODERATE[3]
Ecological Resources	SMALL	SMALL	MODERATE	SMALL to MODERATE
Human Health	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	SMALL	MODERATE	MODERATE
Waste Management	SMALL	SMALL	MODERATE	SMALL
Aesthetics	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE
Cultural Resources	SMALL	SMALL	SMALL	SMALL

Notes:

(1) Environmental impacts associated with the construction and operation of new coal-fired or gas-fired generating capacity at a greenfield site would exceed those for a coal-fired or gas-fired plant located at a brownfield, i.e., existing disturbed site.

(2) From 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3:
- SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- MODERATE - Environmental effects are sufficient to alter noticeably, but not destabilize, any important attribute of the resource.
- LARGE - Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

(3) Moderate, but less than with coal-fired generation.

Table 8.0-2: Impacts Comparison Detail

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives[(1), (2)]	
		With Coal-Fired Generation	With Gas-Fired Generation
Alternative Descriptions			
Davis-Besse license renewal for 20 years, followed by decommissioning	Decommissioning following expiration of current Davis-Besse license. Adopting by reference, as bounding Davis-Besse decommissioning, GEIS description (**NRC 1996**, Section 7.1).	New construction at greenfield (but preferably brownfield) site.	New construction at greenfield (but preferably brownfield) site.
		Pulverized coal units, 910-MW (equivalent to Davis-Besse); capacity factor 0.80.	Combined-cycle units, 910-MW (equivalent to Davis-Besse); capacity factor 0.80.
		Closed-cycle cooling with 500-foot-tall natural-draft cooling towers.	Closed-cycle cooling with mechanical-draft cooling towers.
		Coal and limestone delivery via waterway or rail.	Delivery of natural gas via a new 10-mile-long pipeline.
		Air emission controls: Particulates: fabric filter (99.9% removal) Sulfur oxide: wet limestone scrubber (95% removal) Nitrogen oxide: low-NO_X burners, overfire air, selective catalytic reduction (95% removal).	Air emission controls: Nitrogen oxides: dry low-NO_X burners; selective catalytic reduction (90% removal). Particulate matter and carbon monoxide emissions limited through proper combustion controls.
		Emissions dispersed via 500-foot-tall stacks.	Exhaust dispersed via 150-foot-tall stacks.
825 permanent and 60 contract workers (Section 3.4).		Estimated workforce: Construction: 1,092 – 2,275; Operation: 228	Estimated workforce: Construction: 1,092 – 2,275; Operation: 137

Table 8.0-2: Impacts Comparison Detail
(continued)

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives[(1), (2)]	
		With Coal-Fired Generation	With Gas-Fired Generation
Land Use Impacts			
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 52, 53).	SMALL – Adopting by reference applicable NRC impact conclusions in the GEIS Section 8.4 and Supplement 1 to NUREG-0586.	MODERATE to LARGE – 1,547 acres required for the powerblock and associated facilities; assumed 10 miles of 345-kV transmission line on a 150-foot right-of-way; 22 acres/MW for mining and disposal (Section 7.3.1).	SMALL to MODERATE – 100 acres for facility and 240 to 270 additional acres for gas pipeline and electric transmission lines (Section 7.3.2).
Water Quality Impacts			
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 1-3, 6-11 and 31). Five Category 2 water quality issues do not apply: Section 4.1, Issue 13; Section 4.6, Issue 34; Section 4.5, Issue 33; Section 4.7, Issue 35; and Section 4.8, Issue 39.	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 89) in the GEIS Chapter 7 and Section 8.4, and in Supplement 1 to NUREG-0586.	SMALL – Construction impacts minimized by regulatory controls; operation-phase impacts similar to those of Davis-Besse; cooling water and wastewater discharges subject to regulatory controls (Section 7.3.1).	SMALL – Construction impacts minimized by regulatory controls; cooling water and wastewater discharges subject to regulatory controls (Section 7.3.2).
Air Quality Impacts			
SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 51). One Category 2 issue does not apply: Section 4.11, Issue 50.	SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issue 88) in the GEIS Chapter 7 and Section 8.4, and in Supplement 1 to NUREG-0586.	MODERATE – 8,267 tons SO_X/year 5,087 tons NO_X/year 636 tons CO/year 153 tons PM/year 34.3 tons PM_{10}/year 7.63×10^6 tons CO_2/year (Section 7.3.1).	MODERATE – 13.3 tons SO_2/year 205 tons NO_X/year 311 tons CO/year 39.4 tons PM/year 2.28×10^6 tons CO_2/year (Section 7.3.2).

Table 8.0-2: Impacts Comparison Detail
(continued)

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives[(1), (2)]	
		With Coal-Fired Generation	**With Gas-Fired Generation**
Ecological Resource Impacts			
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 14-24,28-30, 41-43, and 45-48). Three Category 2 issues do not apply: Section 4.2, Issue 25; Section 4.3, Issue 26; Section 4.4, and Issue 27.	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 90) in the GEIS Chapter 7 and Section 8.4, and in Supplement 1 to NUREG-0586.	MODERATE – Potential loss or alteration of more than 1,500 acres of habitat (e.g., transmission, waste disposal landfill); facilities siting would be subject to regulatory controls limiting impacts to ecological resources, including wetlands and threatened or endangered species. Impact on aquatic habitats and biota from dredging (e.g., for intake and discharge structures and, if applicable, barge terminal), cooling water withdrawal, and discharge would be subject to regulatory controls (Section 7.3.1).	SMALL to MODERATE – Approximately 100 acres onsite and 240 to 270 acres offsite of largely agricultural land would be converted to industrial use for plant site and offsite infrastructure, respectively; facilities siting would be subject to regulatory controls limiting impacts to ecological resources, including wetlands and threatened or endangered species. Potential for impacts to aquatic resources from construction and operation (e.g., cooling water withdrawal and discharge) reduced by best management practices and regulatory controls (Section 7.3.2).
Threatened or Endangered Species Impacts			
SMALL – Federally and state threatened or endanagered species are protected through company and plant procedures. (Section 4.10, Issue 49)	SMALL – Not an impact evaluated by the GEIS.	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats.	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats.

Table 8.0-2: Impacts Comparison Detail
(continued)

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives[(1), (2)]	
		With Coal-Fired Generation	With Gas-Fired Generation
Human Health Impacts			
SMALL – Adopting by reference Category 1 issues (Table A-1, Issues 54-56, 58, 61, 62). One Category 2 issue does not apply: Section 4.12, Issue 57. Risk due to transmission-line induced currents minimal due to conformance with consensus code (Section 4.13, Issue 59).	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 86) in the GEIS Chapter 7 and Section 8.4, and in Supplement 1 to NUREG-0586.	SMALL – Some risk of cancer and emphysema from air emissions and risk of accidents to workers, as the NRC notes in the GEIS. Assumed that regulatory controls would reduce risks to acceptable levels (Section 7.3.1).	SMALL – Similar to the coal-fired alternative (Section 7.3.2).
Socioeconomic Impacts			
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 64, 67). Two Category 2 issues do not apply: Section 4.16, Issue 66 and Section 4.17.1, Issue 68. Location in high population area with no growth controls minimizes potential for housing impacts (Section 4.14, Issue 63).	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 91) in the GEIS Chapter 7 and Section 8.4, and in Supplement 1 to NUREG-0586.	MODERATE – Reduction in permanent work force and tax base at Davis-Besse would adversely affect surrounding communities. Construction and operational impacts would depend upon the site location. Regulatory controls and appropriate mitigation would ensure that impacts are not destabilizing (Section 7.3.1).	MODERATE – Reduction in permanent work force and tax base at Davis-Besse would adversely affect surrounding communities. Impacts from construction would be mitigated by siting plant within commuting distance of large metropolitan areas (Section 7.3.2).

Table 8.0-2: Impacts Comparison Detail
(continued)

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives[1], [2]	
		With Coal-Fired Generation	With Gas-Fired Generation
Capacity of public water supply as well as education and transportation infrastructures minimizes potential for related impacts (Section 4.15, Issue 65; Section 4.16, Issue 66; and Section 4.18, Issue 70). Plant tax payments range from <10% to nearly 20% of local jurisdictions tax revenues (Section 4.17.2, Issue 69).			
Waste Management Impacts			
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 77-85).	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 87) in the GEIS Chapter 7 and Section 8.4, and in Supplement 1 to NUREG-0586.	MODERATE – Annual waste of approximately 300,000 tons ash and 470,000 tons flue gas desulphurization waste, requiring disposal offsite in a 644-acre landfill over an assumed 40-year plant life (Section 7.3.1).	SMALL – Solid waste is minimal (Section 7.3.2).
Aesthetic Impacts			
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 73, 74).	SMALL – Adopting by reference conclusions in the GEIS Section 8.4 and Supplement 1 to NUREG-0586.	SMALL to MODERATE – Highly dependent on location. Stacks, cooling tower plumes likely would be visible for several miles. Operation of waste disposal site would have adverse impact potential (Section 7.3.1).	SMALL to MODERATE – Highly dependent on location. Stacks, cooling tower plumes would be visible offsite (Section 7.3.2).

Table 8.0-2: Impacts Comparison Detail
(continued)

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives(1), (2)	
		With Coal-Fired Generation	With Gas-Fired Generation
Cultural Resource Impacts			
SMALL –License renewal does not require additional land disturbance (Section 4.19, Issue 71).	SMALL – Adopting by reference conclusions in the GEIS Section 8.4 and Supplement 1 to NUREG-0586.	SMALL – Siting of plant and offsite infrastructure (e.g., transmission line, natural gas pipeline) would be subject to regulatory review, and mitigation measures would be implemented (Section 7.3.1).	SMALL – Same as the coal-fired alternative (Section 7.3.2).

Btu = British thermal unit
CO = carbon monoxide
CO_2 = carbon dioxide
ft^3 = cubic foot
GEIS = Generic Environmental Impact Statement (NRC 1996)
kWh = kilowatt hour
lb = pound
MM = million
MW = megawatt
NO_X = nitrogen oxides
PM = particulate matter
PM_{10} = particulates having diameter less than 10 microns
SO_X = sulfur oxides

Notes:

(1) Environmental impacts associated with the construction and operation of new coal-fired or gas-fired generating capacity at a greenfield site would exceed those described in the table for a coal-fired or gas-fired plant located at a brownfield, i.e., existing disturbed site.

(2) From 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3:
- SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource.
- LARGE - Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

8.1 REFERENCES

NRC 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants (GEIS), NUREG-1437, Volumes 1 and 2, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, May 1996.

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9.0 STATUS OF COMPLIANCE

This chapter lists and discusses the compliance status of the requirements in connection with the proposed action as well as the alternatives.

9.1 PROPOSED ACTION

Regulatory Requirement: 10 CFR 51.45(d) and 51.53(c)(2)

"The environmental report shall list all Federal permits, licenses, approvals and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection.

Table 9.1-1 lists the various federal and state environmental permits, licenses, approvals, or other entitlements that FENOC has obtained for current Davis-Besse site operations. As needed, FENOC intends to seek timely renewal of these authorizations during the current license period and throughout the period of extended operation with the objective of ensuring compliance with the provisions of these authorizations and applicable environmental standards and requirements. Because the NRC regulatory focus is prospective, Table 9.1-1 does not include authorizations that FENOC obtained for past activities that did not include continuing obligations.

Before preparing the application for license renewal, FENOC conducted an assessment to identify any new and significant environmental information (Section 5.2). The assessment included interviews with FENOC subject-matter experts, review of Davis-Besse environmental documentation, and communication with state and federal environmental protection agencies. Based on the most recent assessments, FENOC concludes that Davis-Besse is in conformance with applicable environmental standards and requirements.

Table 9.1-2 lists additional environmental consultations related to NRC renewal of the Davis-Besse license to operate. As indicated, FENOC anticipates needing relatively few such authorizations and consultations. These items are discussed in more detail below.

Threatened or Endangered Species

Section 7 of the *Endangered Species Act* (16 USC 1531 et seq.) requires federal agencies to ensure that agency action is not likely to jeopardize any species that is listed, or proposed for listing as endangered, or threatened. Depending on the action involved, the Act requires consultation with the USFWS regarding effects on non-marine species, the National Marine Fisheries Service (NMFS) for marine species, or both. USFWS and NMFS have issued joint procedural regulations at 50 CFR Part 402, Subpart B, that address consultation, and FWS maintains the joint list of threatened or endangered species at 50 CFR Part 17. Additionally, the Ohio Department of Natural Resources (ODNR) maintains a list of endangered species in the state (Ohio Revised Code 1531.25).

Although not required of an applicant by federal law or NRC regulation, FENOC has solicited comment from federal and state resource agencies regarding potential effects that Davis-Besse license renewal might have on species of concern. Attachment C includes copies of FENOC correspondence with USFWS, NMFS, and ODNR.

USFWS determined that the Davis-Besse license renewal project will not impact federally listed species and will have minimal environmental impacts, as no change in operation or extent of the facility is proposed. However, the USFWS noted that a bald eagle (*Haliaeetus leucocephalus*) nest exists on the Davis-Besse property. Although the bald eagle was removed from the Federal list of endangered and threatened species in July 2007 due to recovery, this species continues to be afforded protection by the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. To avoid disturbing nesting and young eagles, USFWS requested that no activity occur within 660 feet of the nest between January 1 and July 31, when the nesting eagles are most vulnerable. FENOC plans to incorporate the USFWS requirement into station procedures. (**USFWS 2009**)

NMFS stated that no threatened or endangered species listed by NMFS are known to occur in Lake Erie and that no Essential Fish Habitat (EFH), as designated under the Magnuson-Steven Fisheries Management and Conservation Act, occurs in the vicinity of Davis-Besse. As a result, NMFS noted that no further coordination with NMFS on the effects of Davis-Besse license renewal is necessary. (**NMFS 2010**)

ODNR reported that the project is within the range of the Indiana bat *(Myotis sodalis),* a state and federally endangered species, and listed a number high value trees that protect its habitat. ODNR requires that if such trees occur within the project area, these trees must be conserved. In addition, if suitable habitat occurs on the project area and trees must be cut, cutting must occur between September 30 and April 1. If suitable trees must be cut during the summer months of April 2 to September 29, a net survey must be conducted in May or June prior to cutting. If no tree removal is proposed, the project is not likely to impact this species. FENOC plans to incorporate the ODNR requirement into station procedures. (**ODNR 2009a**)

ODNR also reported that the project is within the range of 15 other state, federal, or both endangered or threatened species (**ODNR 2009a**). However, ODNR determined that the Davis-Besse license renewal project is not likely to impact these species (see Section 4.10.2). Nevertheless, because the location of bald eagle activity frequently changes, a status update must be obtained from ODNR prior to any construction activity. This requirement is in addition to the USFWS request that no activity occur within 660 feet of the nest between January 1 and July 31. FENOC plans to incorporate the ODNR requirement into station procedures. Otherwise, ODNR is not aware of any threatened or endangered species in the vicinity of Davis-Besse.

Historic Preservation

Section 106 of the *National Historic Preservation Act* (16 USC 470 et seq.) requires federal agencies having the authority to license any undertaking to, prior to issuing the license, take into account the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for the State Historic Preservation Officer (SHPO) to have a consulting role (36 CFR 800.7). Although not required of an applicant by federal law or NRC regulation, FENOC invited comment on the proposed action by the Ohio Historic Preservation Office. Copies of the correspondence are included in Attachment C. In the opinion of the OHPO, license renewal will not affect historic properties (**OHPO 2010**).

Water Quality (401) Certification

Federal Clean Water Act Section 401 requires an applicant for a federal license who conducts an activity that might result in a discharge into navigable waters to provide the licensing agency a certification from the state that the discharge will comply with applicable Clean Water Act requirements (33 USC 1341).

In 2006, the Ohio Environmental Protection Agency, Division of Surface Water, issued a renewal to the Davis-Besse National Pollutant Discharge Elimination System (NPDES) permit (**OEPA 2006**). NRC has indicated in the GEIS (**NRC 1996**, Section 4.2.1.1) that issuance of a NPDES permit implies certification by the state. FENOC is applying to NRC for license renewal to continue Davis-Besse operations. Consistent with the GEIS, FENOC is providing Davis-Besse's NPDES permit approval letter and cover sheet as evidence of state water quality (401) certification (see Attachment B).

Coastal Zone Management Program Compliance

The *Coastal Zone Management Act* (16 USC 1451 et seq.) imposes requirements on applicants for a federal license to conduct an activity that could affect a state's coastal zone. The Act requires the applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal zone management program [16 USC 1456(c)(3)(A)]. The Act further requires that the license applicant provide its certification to the federal licensing agency and a copy to the applicable state agency [15 CFR 930.57(a)].

The NRC's office of Nuclear Reactor Regulation has issued guidance to its staff regarding compliance with the Act. This guidance acknowledges that Ohio has an approved Coastal Management Program (**NRC 2004**). Davis-Besse, located in Ottawa County, is within the Ohio Coastal Management Program. Accordingly, FENOC has contacted the Ohio Department of Natural Resources, Coastal Management Program. Copies of the correspondence are included in Attachment C. A copy of the certification of consistency is included in Attachment D.

Table 9.1-1: Environmental Authorizations for Current Davis-Besse Operations

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Authorized
Federal Authorizations					
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011, et seq.), 10CFR50.10	License to operate	NPF-3	Issued: 4/22/1977 Expires: 4/22/2017	Operation of Davis-Besse
U.S. Nuclear Regulatory Commission	10 CFR Part 72	Requirements to store spent nuclear fuel and high-level radioactive waste	Certificate Number 1004	Issued: 1/23/1995 Expires: 1/31/2015	Use of radioactive waste cask Model Number NUHOMS-24P
U.S. Department of Transportation	49 CFR Part 107, Subpart G	Hazardous material registration	042009 450 002RT	Issued: 5/19/2009 Expires: 6/30/2012 (Renewed Triennially)	Transportation of hazardous materials
U.S. Environmental Protection Agency	RCRA [42 U.S.C. s/s 321 et seq. (1976)]	Notification of regulated waste activity	EPA ID# OHD000720508	Issued: -- Expires: Indefinite	Generation and accumulation of hazardous waste
State and Local Authorizations					
Ohio Environmental Protection Agency, Division of Surface Water	Federal Water Pollution Control Act, as amended (33 U.S.C Section 1251 et seq.); Ohio Water Pollution Control Act (Ohio Revised Code Section 6111)	National Pollutant Discharge Elimination System (NPDES) Permit	Ohio Permit No. 2IB00011*ID	Issued: 9/1/2006 Expires: 4/30/2011 (every 5 years)	Treatment of wastewater and effluent discharge to surface receiving waters (Toussaint River and Lake Erie)

Table 9.1-1: Environmental Authorizations for Current Davis-Besse Operations
(continued)

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Authorized
Ohio Environmental Protection Agency, Division of Surface Water	Federal Water Pollution Control Act, as amended (33 U.S.C Section 1251 et seq.); Ohio Water Pollution Control Act (Ohio Revised Code Section 6111)	NPDES construction stormwater permit	Ohio Permit No. 2GC02563*AG	Issued: 12/21/2009 Expires: Upon project completion	Construction of Switchyard project and control-discharge of stormwater in Ottawa County, Carroll Township
Ohio Environmental Protection Agency, Division of Air Pollution Control	Clean Air Act, 40 U.S.C. 1857 et seq.; Ohio Air Pollution Control Act (Ohio Administrative Code Chapter 3745-31)	Permit to operate an air contaminant source	Permit Application No. 0362000091B001	Issued: Annual reporting Expires: Indefinite	Operation of station auxiliary boiler
Ohio Environmental Protection Agency, Division of Hazardous Waste Management	Ohio Administrative Code Chapter 3745-52-41	Report of regulated waste activity	EPA ID# OHD000720508	Issued: Annual reporting Expires: Indefinite	Generation, accumulation, and off-site disposal of hazardous waste
Ohio Department of Natural Resources, Division of Wildlife	Ohio Revised Code Section 1531.08	Scientific collection permit	Permit #10-21	Issued: Annually Expires: 3/15/2011	Collection of wildlife specimens for Radiological Environmental Monitoring Program (REMP)

Table 9.1-1: Environmental Authorizations for Current Davis-Besse Operations
(continued)

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Authorized
Ohio Department of Natural Resources, Division of Water Resources	Ohio Revised Code Section 1521.16	Water withdrawal and use registration and file annual report	Registration # 00598	Issued: 1/1/1990 Expires: Indefinite	Withdraw and use of more than 100,00 gallons of water daily from all sources
Ohio Department of Health	Ohio Administrative Code 3701: 1-38-03(C); Ohio Revised Code 3748.06 and 3748.07	X-Ray generating equipment registration	Registration # 17-M-07181-005	Issued: Biennially Expires: 5/31/2012	Operation of X-ray generation equipment
Ohio Department of Commerce, Division of State Fire Marshal	Ohio Administrative Code 1301: 7-9-04	Underground storage tank registration	Certificate # 62000072	Issued: Annually Expires: 6/30/2011	Registration of underground diesel storage tanks T00001, T00002, and T00003
Tennessee Department of Environment and Conservation	Tennessee Code Annotated 68-202-206	License to deliver radioactive waste	Tennessee Delivery License # T-OH003-LO9	Issued: Annually Expires: 12/31/2010	Shipment of radioactive material to a licensed disposal-processing facility within the State of Tennessee

Table 9.1-2: Environmental Consultations Related to License Renewal

Agency	Authority	Activity
U.S. Fish and Wildlife Service & National Marine Fisheries Service	Endangered Species Act Section 7 (16 USC 1531)	Requires federal agency issuing a license to consult with US Fish and Wildlife Service (USFWS) regarding terrestrial and freshwater species, and National Marine Fisheries Service (NMFS) regarding marine species (including anadromous fishes).
Ohio Historic Preservation Office	National Historic Preservation Act, Section 106 (16 USC 470)	Requires federal agency issuing a license to consider cultural impacts and consult with State Historic Preservation Officer (SHPO), who must concur that license renewal will not affect any sites listed or eligible for listing.
Ohio Environmental Protection Agency, Division of Surface Water	Clean Water Act (CWA), Section 401 (33 USC 1341)	State issuance of NPDES permit, which constitutes 401 certification that discharge would comply with CWA standards.
Ohio Department of Natural Resources, Coast Management Program	Coastal Zone Management (16 USC 1451)	Requires an applicant to provide certification to the federal agency issuing the license that license renewal would be consistent with the federally-approved state coastal zone management program. Based on its review of the proposed activity, the state must concur with or object to the applicant's certification.

9.2 ALTERNATIVES

Regulatory Requirement: 10 CFR 51.45(d) and 51.53(c)(2)

"…The discussion of alternatives in the report shall include a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements."

The coal- and gas-fired generation alternatives, and purchased power alternatives discussed in Section 7.2.1 could be constructed and operated to comply with applicable environmental quality standards and requirements. FENOC notes, however, that increasingly stringent air quality protection requirements could make the construction of a large fossil-fueled power plant infeasible in many locations.

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9.3 REFERENCES

NRC 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants (GEIS), NUREG-1437, Volumes 1 and 2, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, May 1996.

NRC 2004. Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues, NRR Office Instruction No. LIC-203, Revision 1, U.S. Nuclear Regulatory Commission, May 24, 2004.

NMFS 2010. Northeast Region, National Marine Fisheries Service, National Oceanic Atmospheric Adminsitration, U.S. Department of Commence, NMFS letter, M.A. Colligan to B. Allen (FENOC) January 15, 2010, Gloucester, Massachusetts.

ODNR 2009a. Ohio Department of Natural Resources, Division of Wildlife, ODNR letter, J. Navarro to B. Allen (FENOC), December 22, 2009, Columbus, Ohio.

ODNR 2009b. Ohio Department of Natural Resources, Division of Wildlife, ODNR e-mail, B. Mitch to C.I. Custer (FENOC), December 22, 2009, Columbus, Ohio.

OEPA 2006. National Pollutant Discharge Elimination System (NPDES) Permit for Davis-Besse Nuclear Power Station, EPA ID No. OH0003786, Permit No. 21B0011*ID, Ohio Environmental Protection Agency, Division of Surface Water, August 14 and September 8, 2006.

OHPO 2010. Ohio Historic Preservation Office, Ohio Historical Society, OHPO letter, N.J. Young to C.I. Custer (FENOC), March 23, 2010.

USFWS 2009. U.S. Fish and Wildlife Service, U.S. Department of Interior, USFES letter, M.K. Knapp to B. Allen (FENOC), TAILS #3142002010-TA-0132, December 16, 2009, Columbus, Ohio.

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Attachment A:

NRC National Environmental Policy Act Issues For License Renewal

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A.1 NRC NATIONAL ENVIRONMENTAL POLICY ACT ISSUES FOR LICENSE RENEWAL OF NUCLEAR POWER

FirstEnergy Nuclear Operating Company (FENOC) has prepared this environmental report in accordance with the requirements of U.S. Nuclear Regulatory Commission (NRC) regulation 10 CFR 51.53. NRC included in the regulation a list of National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants. Table A-1 lists these 92 issues and identifies the section of the environmental report in which an applicable issue is addressed. For organization and clarity, FENOC has assigned a number to each issue and uses the issue numbers throughout the environmental report.

Table A-1. Davis-Besse Environmental Report Discussion of License Renewal NEPA Issues

Issue[1]	Category	Section of this Environmental Report	GEIS Cross Reference[2] (Section/Page)
Surface Water Quality, Hydrology, and Use (for all plants)			
1. Impacts of refurbishment on surface water quality	1	4.0	3.4.1/3-4
2. Impacts of refurbishment on surface water use	1	4.0	3.4.1/3-1
3. Altered current patterns at intake and discharge structures	1	4.0	4.2.1.2.1/4-5
4. Altered salinity gradients	1	NA	4.2.1.2.2/4-5 Issue applies to a plant feature, discharge to saltwater, that Davis-Besse does not have.
5. Altered thermal stratification of lakes	1	4.0	4.2.1.2.3/4-6
6. Temperature effects on sediment transport capacity	1	4.0	4.2.1.2.3/4-8
7. Scouring caused by discharged cooling water	1	4.0	4.2.1.2.3/4-6
8. Eutrophication	1	4.0	4.2.1.2.3/4-9
9. Discharge of chlorine or other biocides	1	4.0	4.2.1.2.4/4-10
10. Discharge of sanitary wastes and minor chemical spills	1	4.0	4.2.1.2.4/4-10
11. Discharge of other metals in waste water	1	4.0	4.2.1.2.4/4-10
12. Water use conflicts (plants with once-through cooling systems)	1	NA	4.2.1.3/4-13 Issue applies to a plant feature, once-through cooling, that Davis-Besse does not have.
13. Water use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	2	NA, and discussed in Section 4.1	4.3.2.1/4-29 Issue applies to features, cooling ponds or water withdrawals from a small river, that Davis-Besse does not have.

Table A-1. Davis-Besse Environmental Report Discussion of License Renewal NEPA Issues
(continued)

Issue[1]	Category	Section of this Environmental Report	GEIS Cross Reference[2] (Section/Page)
Aquatic Ecology (for all plants)			
14. Refurbishment impacts to aquatic resources	1	4.0	3.5/3-5
15. Accumulation of contaminants in sediments or biota	1	4.0	4.2.1.2.4/4-10
16. Entrainment of phytoplankton and zooplankton	1	4.0	4.2.2.1.1/4-15
17. Cold shock	1	4.0	4.2.2.1.5/4-18
18. Thermal plume barrier to migrating fish	1	4.0	4.2.2.1.6/4-19
19. Distribution of aquatic organisms	1	4.0	4.2.2.1.6/4-19
20. Premature emergence of aquatic insects	1	4.0	4.2.2.1.7/4-20
21. Gas supersaturation (gas bubble disease)	1	4.0	4.2.2.1.8/4-21
22. Low dissolved oxygen in the discharge	1	4.0	4.2.2.1.9/4-23
23. Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	1	4.0	4.2.2.1.10/4-24
24. Stimulation of nuisance organisms (e.g., shipworms)	1	4.0	4.2.2.1.11/4-25
Aquatic Ecology (for plants with once-through and cooling pond heat dissipation systems)			
25. Entrainment of fish and shellfish in early life stages for plants with once-through and cooling pond heat dissipation systems	2	NA, and discussed in Section 4.2	4.2.2.1.1/4-16 Issue applies to a plant feature, once-through cooling or a cooling pond, that Davis-Besse does not have.
26. Impingement of fish and shellfish for plants with once-through and cooling pond heat dissipation systems	2	NA, and discussed in Section 4.3	4.2.2.1.2/4-16 Issue applies to a plant feature, once-through cooling or a cooling pond, that Davis-Besse does not have.

Table A-1. Davis-Besse Environmental Report Discussion of License Renewal NEPA Issues
(continued)

Issue[1]	Category	Section of this Environmental Report	GEIS Cross Reference[2] (Section/Page)
27. Heat shock for plants with once-through and cooling pond heat dissipation systems	2	NA, and discussed in Section 4.4	4.2.2.1.4/4-17 Issue applies to a plant feature, once-through cooling or a cooling pond, that Davis-Besse does not have.
Aquatic Ecology (for plants with cooling-tower-based heat dissipation systems)			
28. Entrainment of fish and shellfish in early life stages for plants with cooling-tower-based heat dissipation systems	1	4.0	4.3.3/4-33
29. Impingement of fish and shellfish for plants with cooling-tower-based heat dissipation systems	1	4.0	4.3.3/4-33
30. Heat shock for plants with cooling-tower-based heat dissipation systems	1	4.0	4.3.3/4-33
Groundwater Use and Quality			
31. Impacts of refurbishment on groundwater use and quality	1	4.0	3.4.2/3-5
32. Groundwater use conflicts (potable and service water; plants that use < 100 gpm)	1	4.0	4.8.1.1/4-116
33. Groundwater use conflicts (potable, service water, and dewatering; plants that use > 100 gpm)	2	NA, and discussed in Section 4.5	4.8.1.2/4-117 Issue applies to an operational feature, annual average groundwater withdrawals greater than 100 gpm, that Davis-Besse does not have.
34. Groundwater use conflicts (plants using cooling towers withdrawing make-up water from a small river)	2	NA, and discussed in Section 4.6	4.8.1.3/4-117 Issue applies to a feature, withdrawals from a small river; that Davis-Besse does not have.
35. Groundwater use conflicts (Ranney wells)	2	NA, and discussed in Section 4.7	4.8.2.2/4-120 Issue applies to a feature, Ranney wells, that Davis-Besse does not have.

Table A-1. Davis-Besse Environmental Report Discussion of License Renewal NEPA Issues
(continued)

Issue[1]	Category	Section of this Environmental Report	GEIS Cross Reference[2] (Section/Page)
36. Groundwater quality degradation (Ranney wells)	1	NA	4.8.2.2/4-120 Issue applies to a feature, Ranney wells, that Davis-Besse does not have.
37. Groundwater quality degradation (saltwater intrusion)	1	NA	4.8.2.1/4-119 Issue applies to a feature, location in estuary or oceanic areas, that Davis-Besse does not have.
38. Groundwater quality degradation (cooling ponds in salt marshes)	1	NA	4.8.3/4-121 Issue applies to a feature, cooling ponds, that Davis-Besse does not have.
39. Groundwater quality degradation (cooling ponds at inland sites)	2	NA, and discussed in Section 4.8	4.8.3/4-121 Issue applies to a feature, cooling ponds at inland sites, that Davis-Besse does not have.
Terrestrial Resources			
40. Refurbishment impacts to terrestrial resources	2	4.0	3.6/3-6
41. Cooling tower impacts on crops and ornamental vegetation	1	4.0	4.3.4/4-34
42. Cooling tower impacts on native plants	1	4.0	4.3.5.1/4-42
43. Bird collisions with cooling towers	1	4.0	4.3.5.2/4-45
44. Cooling pond impacts on terrestrial resources	1	NA	4.4.4/4-58 Issue applies to a feature, cooling ponds, that Davis-Besse does not have.
45. Power line right-of-way management (cutting and herbicide application)	1	4.0	4.5.6.1/4-71
46. Bird collisions with power lines	1	4.0	4.5.6.2/4-74

Table A-1. Davis-Besse Environmental Report Discussion of License Renewal NEPA Issues
(continued)

Issue[1]	Category	Section of this Environmental Report	GEIS Cross Reference[2] (Section/Page)
47. Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	1	4.0	4.5.6.3/4-77
48. Floodplains and wetlands on power line right-of-way	1	4.0	4.5.7/4-81
Threatened or Endangered Species (for all plants)			
49. Threatened or endangered species	2	4.10	3.9/3-48 (refurbishment) 4.1/4-1 (renewal term)
Air Quality			
50. Air quality during refurbishment (non-attainment and maintenance areas)	2	NA, and discussed in Section 4.11	3.3/3-2 Issue applies to areas that Davis-Besse is not located near.
51. Air quality effects of transmission lines	1	4.0	4.5.2/4-62
Land Use			
52. Onsite land use	1	4.0	3.2/3-1
53. Power line right-of-way land use impacts	1	4.0	4.5.3/4-62
Human Health			
54. Radiation exposures to the public during refurbishment	1	4.0	3.8.1/3-27.
55. Occupational radiation exposures during refurbishment	1	4.0	3.8.2/3-42.
56. Microbiological organisms (occupational health)	1	4.0	4.3.6/4-48
57. Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	2	NA, and discussed in Section 4.12	4.3.6/4-48 Issue applies to features – cooling pond, cooling lake, or discharges to a small river – that Davis-Besse does not have.
58. Noise	1	4.0	4.3.7/4-49
59. Electromagnetic fields, acute effects (electric shock)	2	4.13	4.5.4.1/4-66

Table A-1. Davis-Besse Environmental Report Discussion of License Renewal NEPA Issues
(continued)

Issue[1]	Category	Section of this Environmental Report	GEIS Cross Reference[2] (Section/Page)
60. Electromagnetic fields, chronic effects	NA	4.0	4.5.4.2/4-67 The categorization and impact finding definitions do not apply to this issue.
61. Radiation exposures to public (license renewal term)	1	4.0	4.6.2/4-87
62. Occupational radiation exposures (license renewal term)	1	4.0	4.6.3/4-95
Socioeconomics			
63. Housing impacts	2	4.14	3.7.2/3-10 (refurbishment) 4.7.1/4-101 (renewal term)
64. Public services: public safety, social services, and tourism and recreation	1	4.0	Refurbishment 3.7.4/3-14 (public services) 3.7.4.3/3-18 (safety) 3.7.4.4/3-19 (social) 3.7.4.6/3-20 (tourism & rec.) Renewal Term 4.7.3/4-104 (public services) 4.7.3.3/4-106 (safety) 4.7.3.4/4-107 (social) 4.7.3.6/4-107 (tourism & rec.)
65. Public services: public utilities	2	4.15	3.7.4.5/3-19 (refurbishment) 4.7.3.5/4-107 (renewal term)
66. Public services: education (refurbishment)	2	4.16	3.7.4.1/3-15)
67. Public services: education (license renewal term)	1	4.17	4.7.3.1/4-106
68. Offsite land use (refurbishment)	2	4.17.1	3.7.5/3-20
69. Offsite land use (license renewal term)	2	4.17.2	4.7.4/4-107
70. Public services: transportation	2	4.18	3.7.4.2/3-17 (refurbishment) 4.7.3.2/4-106 (renewal term)
71. Historic and archaeological resources	2	4.19	3.7.7/3-23 (refurbishment) 4.7.7/4-114 (renewal term)
72. Aesthetic impacts (refurbishment)	1	4.0	3.7.8/3-24.
73. Aesthetic impacts (license renewal term)	1	4.0	4.7.6/4-111

Table A-1. Davis-Besse Environmental Report Discussion of License Renewal NEPA Issues
(continued)

Issue[1]	Category	Section of this Environmental Report	GEIS Cross Reference[2] (Section/Page)
74. Aesthetic impacts of transmission lines (license renewal term)	1	4.0	4.5.8/4-83
Postulated Accidents			
75. Design basis accidents	1	4.0	5.3.2/5-11 (design basis) 5.5.1/5-114 (summary)
76. Severe accidents	2	4.20	5.3.3/5-12 (probabilistic analysis) 5.3.3.2/5-19 (air dose) 5.3.3.3/5-49 (water) 5.3.3.4/5-65 (groundwater) 5.3.3.5/5-96 (economic) 5.4/5-106 (mitigation) 5.5.2/5-114 (summary)
Uranium Fuel Cycle and Waste Management			
77. Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste)	1	4.0	6.1/6-1 (intro) 6.2.1/6-8/6-8 (background) 6.2.2.1/6-8 (effluents) 6.2.2.3/6-20 (dose) 6.2.3/6-22 (sensitivity) 6.2.4/6-27 (conclusions) 6.6/6-87 (summary)
78. Offsite radiological impacts (collective effects)	1	4.0	6.1/6-1 (intro) 6.2.2.1/6-8 (effluents) 6.2.3/6-22 (sensitivity) 6.2.4/6-27 (conclusions)
79. Offsite radiological impacts (spent fuel and high-level waste disposal)	1	4.0	6.1/6-1 (intro) 6.2.2.1/6-8 (effluents) 6.2.3/6-22 (sensitivity) 6.2.4/6-27 (conclusions)
80. Nonradiological impacts of the uranium fuel cycle	1	4.0	6.2.2.6/6-20 (land use) 6.2.2.7/6-20 (water use) 6.2.2.8/6-21 (fossil fuel) 6.2.2.9/6-21 (chemical)
81. Low-level waste storage and disposal	1	4.0	6.4.2/6-36 (low-level definition) 6.4.3/6-37 (low-level volume) 6.4.4/6-48 (renewal effects)
82. Mixed waste storage and disposal	1	4.0	6.4.5/6-63

Table A-1. Davis-Besse Environmental Report Discussion of License Renewal NEPA Issues
(continued)

Issue[1]	Category	Section of this Environmental Report	GEIS Cross Reference[2] (Section/Page)
83. Onsite spent fuel	1	4.0	6.4.6/6-70
84. Nonradiological waste	1	4.0	6.5/6-86 (wastes) 6.6/6-87 (summary)
85. Transportation	1	4.0	6.3/6-31, as revised by Addendum 1, August 1999.
Decommissioning			
86. Radiation doses (decommissioning)	1	4.0	7.3.1/7-15
87. Waste management (decommissioning)	1	4.0	7.3.2/7-19 (impacts) 7.4/7-25 (conclusions)
88. Air quality (decommissioning)	1	4.0	7.3.3/7-21 (air) 7.4/7-25 (conclusion)
89. Water quality (decommissioning)	1	4.0	7.3.4/7-21 (water) 7.4/7-25 (conclusion)
90. Ecological resources (decommissioning)	1	4.0	7.3.5/7-21 (ecological) 7.4/7-25 (conclusion)
91. Socioeconomic impacts (decommissioning)	1	4.0	7.3.7/7-24 (socioeconomic) 7.4/7-25 (conclusion)
Environmental Justice			
92. Environmental justice	NA	2.6.2 and 4.21	Not in GEIS

Notes:

(1) Source: 10 CFR Part 51, Subpart A, Appendix A, Table B-1. (Issue numbers added to facilitate discussion.)
(2) Source: Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437).

NEPA = National Environmental Policy Act.
NA = Not Applicable

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Attachment B:

National Pollutant Discharge Elimination System Permit

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Ohio EPA
State of Ohio Environmental Protection Agency

RAIC 06-0049

STREET ADDRESS:
Lazarus Government Center
122 S. Front Street
Columbus, Ohio 43215

TELE: (614) 644-3020 FAX: (614) 644-3184
www.epa.state.oh.us

MAILING ADDRESS:
P.O. Box 1049
Columbus, OH 43216-1049

September 8, 2006

Re: Ohio EPA Permit No. 2IB00011*ID
Application No. OH0003786
Facility: Davis-Besse Nuclear Power Station

RECEIVED
SEP 12 2006
DBNPS

FirstEnergy Nuclear Operating Company
5501 North State Route 2
Oak Harbor OH 43449

Ladies and Gentlemen:

We propose to make to following minor modifications to the above referenced permit.

Page	Correction
3	Revise Total Residual Chlorine notes for final outfall 2IB00011001.
7	Revise Total Residual Chlorine notes for final outfall 2IB00011004.

If you consent to these changes, please sign below and incorporate the corrected pages into your permit. The proposed minor modifications will become effective on the date we receive this signed letter from you at the following address: Ohio Environmental Protection Agency, Division of Surface Water, Permit Administration Section, P. O. Box 1049, Columbus, Ohio 43266-0149.

Sincerely,

Patti L. Smith

Patti L. Smith, Supervisor
Permit Processing Unit
Division of Surface Water

PLS/dks

Enclosure

CERTIFIED MAIL

I consent to the minor modification.

[signature] — *Name*   Vice President — *Title*

10/5/06 — *Date*

Bob Taft, Governor
Bruce Johnson, Lieutenant Governor
Joseph P. Koncelik, Director

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**** Total Residual Chlorine or Total Residual Oxidants may not be discharged from any single generating unit for more than 2 hours per day. If it is necessary to discharge TRC or TRO for more than two hours, the discharge shall be treated with a dehalogenating agent dosed to achieve levels of 0.038 mg/l TRC or 0.01 mg/l TRO as appropriate. (1) Total Residual Oxidants reflects the use of bromine compounds. Bromine can be used separately or in combination with chlorine. These limits are effective when bromine is used. Discharge limitations for TRO may be met using a dehalogenation agent, if necessary. Dehalogenation shall then be achieved by using stoichiometric calculations to determine the amount of dehalogenating agent necessary to completely eliminate the residual.

***** Dissolved Oxygen: In addition to the monitoring requirements noted above, sampling shall be performed daily by grab sample during discharge of hydrazine.

****** Water Temperature: Report daily average.

******* Total Residual Chlorine & Total Residual Oxidants shall be monitored daily (during treatment event) except on days when plant is not normally staffed. Report "AN" on the monthly report form for those days.

(2) Report on days when bromine compounds are used with or without chlorine. On days when no bromine compounds are used, state this in the remarks section and LEAVE THE DATA AREA BLANK.

(3) Report on days when ONLY chlorine compounds are used (i.e. no bromine compounds. On days when bromine or a combination of bromine and chlorine IS used, state this in the remarks section and LEAVE THE DATA AREA BLANK.

(4) Monitor when discharging.

- See Part II for other requirements.

and/or bromination. The daily grab samples for TRC and TRO shall represent the maximumm concentration discharged during chlorination and/or bromination.

** Measure TRO, TRC, and Cl/Br duration on days when using treatment.

*** Grab sample for TRO and TRC will be taken during treatment event.

**** Asbestos, See Part II, Other Requirements, Item O.

*****Total Residual Chlorine or Total Residual Oxidants may not be discharged from any single generating unit for more than 2 hours per day. If it is necessary to discharge TRC or TRO for more than two hours, the discharge shall be treated with a dehalogenating agent dosed to achieve levels of 0.038 mg/l TRC or mg/l TRO, as appropriate.

(1) Total Residual Oxidants reflects the use of bromine compounds. Bromine can be used separately or in combination with chlorine. These limits are effective when bromine is used. Discharge limitations for TRO may be met using a dehalogenation agent, if necessary. Dehalogenation shall then be achieved by using stoichiometric calculations to determine the amount of dehalogenating agent necessary to completely eliminate the residual.

(2) Report on days when bromine compounds are used with or without chlorine. On days when no bromine compounds are used, state this in the remarks section and LEAVE THE DATA AREA BLANK.

(3) Report on days when ONLY chlorine compounds are used (i.e. no bromine compounds. On days when bromine or a combination of bromine and chlorine IS used, state this in the remarks section and LEAVE THE DATA AREA BLANK.

(4) Daily monitoring is required for the parameters during discharge from the circulating water system (i.e., Cooling Tower Basin Drain).

OhioEPA

State of Ohio Environmental Protection Agency

RAIC 06-0047

STREET ADDRESS:
Lazarus Government Center
122 S. Front Street
Columbus, Ohio 43215

TELE: (614) 644-3020 FAX: (614) 644-3184
www.epa.state.oh.us

MAILING ADDRESS
P.O. Box 1049
Columbus, OH 43216-1049

August 14, 2006

Re: Ohio EPA Permit No. 2IB00011*ID
Facility Name: Davis-Besse Nuclear Power Station

RECEIVED
AUG 16 2006
DBNPS

FirstEnergy Nuclear Operating Company
5501 North State Route 2
Oak Harbor, OH 43449

Ladies and Gentlemen:

Transmitted herewith is one copy of the final National Pollutant Discharge Elimination System permit referenced above.

You are hereby notified that this action of the Director is final and may be appealed to the Environmental Review Appeals Commission pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and shall set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Environmental Review Appeals Commission within thirty (30) days after notice of the Director's action. The appeal must be accompanied by a filing fee of $70.00 which the Commission, in its discretion, may reduce if by affidavit you demonstrate that payment of the full amount of the fee would cause extreme hardship. Notice of the filing of the appeal shall be filed with the Directors within three (3) days of filing with the Commission. Ohio EPA requests that a copy of the appeal be served upon the Ohio Attorney General's Office, Environmental Enforcement Section. An appeal may be filed with the Environmental Review Appeals Commission at the following address:

Environmental Review Appeals Commission
309 South Fourth Street, Room 222
Columbus, Ohio 43215

Sincerely,

Patti L. Smith

Patti L. Smith, Supervisor
Permit Processing Unit
Division of Surface Water

PLS/kep

Enclosure

CERTIFIED MAIL

Bob Taft, Governor
Bruce Johnson, Lieutenant Governor
Joseph P. Koncelik, Director

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Ohio EPA Invoice/Receipt

Date Printed: August 11, 2006

Revenue ID: 568806

Please include this Revenue ID with all correspondence.

Organization ID: 12148

Information: FirstEnergy Corp
76 S Main St
Akron, OH 44308-

Due Date: **September 16, 2006**

Amount Due: **$1,625.00**

Effective Date: September 01, 2006

Revenue Description: DSW- NPDES Permit Issuance

Program Name: NPDES Permitting

Reason: NPDES Permit Issuance 2IB00011*ID-Davis Besse Nuclear Power Plant

For some Revenues, Interest and/or Penalties may be charged for late payment.

Next Interest Date (if applicable): October 16, 2006

Next Penalty Date (if applicable):

Remittance Advice **Detach Here - Please Return This Portion With Your Payment**

Organization ID: 12148

Information: FirstEnergy Corp
76 S Main St
Akron, OH 44308-

Due Date: **Sep 16, 2006**

Amount Due: **$1,625.00**

Secondary Type/Id: SNPDE / 2IB00011

Revenue Type: PTONI

Amount Enclosed: $________________

Please write this number on your check. Revenue ID: 568806
Make check or money order payable to "Treasurer, State of Ohio"

Remit to: **Ohio Environmental Protection Agency - OFA**
Department L-2711
Columbus, OH 43260-2711

For Ohio EPA use only

Check ID: ____________________

Check Date: ____________________

Check Number: ____________________

Check Amount: $____________________

12148	**FirstEnergy Corp**	**162500**	**PTONI**	**568806**

Application No. OH0003786

Issue Date: August 14, 2006

Effective Date: September 1, 2006

Expiration Date: April 30, 2011

Ohio Environmental Protection Agency
Authorization to Discharge Under the
National Pollutant Discharge Elimination System

In compliance with the provisions of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et. seq., hereinafter referred to as the "Act"), and the Ohio Water Pollution Control Act (Ohio Revised Code Section 6111),

FirstEnergy Nuclear Operating Company

is authorized by the Ohio Environmental Protection Agency, hereinafter referred to as "Ohio EPA," to discharge from the Davis-Besse Nuclear Power Station located at 5501 North State Route 2, Oak Harbor, Ohio, Ottawa County and discharging to Lake Erie, Navarre Marsh and the Toussaint River in accordance with the conditions specified in Parts I, II, and III of this permit.

This permit is conditioned upon payment of applicable fees as required by Section 3745.11 of the Ohio Revised Code.

This permit and the authorization to discharge shall expire at midnight on the expiration date shown above. In order to receive authorization to discharge beyond the above date of expiration, the permittee shall submit such information and forms as are required by the Ohio EPA no later than 180 days prior to the above date of expiration.

Joseph P.Koncelik
Director

Total Pages: 26

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 2IB00011001. See Part II, OTHER REQUIREMENTS, for locations of effluent sampling.

Table - Final Outfall - 001 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day					
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Measuring Frequency	Sampling Type	Monitoring Months
00011 - Water Temperature - F	-	-	-	-	-	-	-	1/Day	Continuous	All
00300 - Dissolved Oxygen - mg/l	-	6.0	-	-	-	-	-	1 / 2 Weeks	Grab	All
00400 - pH - S.U.	9.0	6.5	-	-	-	-	-	1/Day	Grab	All
01119 - Copper, Total Recoverable - ug/l	-	-	-	-	-	-	-	1/Quarter	Composite	Quarterly
34044 - Oxidants, Total Residual - mg/l	0.05	-	-	-	-	-	-	When Disch.	Grab	All
50050 - Flow Rate - MGD	-	-	-	-	-	-	-	1/Day	24hr Total Estimate	All
50060 - Chlorine, Total Residual - mg/l	0.2	-	-	-	-	-	-	When Disch.	Grab	All
78739 - Chlorination/Bromination Duration - Minutes	120	-	-	-	-	-	-	When Disch.	24hr Total	All

Notes for station 2IB00011001:

* The Total Residual Chlorine (TRC) and Total Residual Oxidants (TRO) limits are the maximum allowed at the outfall at any time. Analyses are to be performed by amperometric titration, Orion Residual Chlorine Electrode, or other approved methods during chlorination and/or bromination. The daily grab samples for TRC and TRO shall represent the maximum concentration discharged during chlorination and/or bromination.

** Measure for TRO, TRC, and Cl/Br duration on on days when using treatment.

*** Grab sample for TRO and TRC will be taken during treatment event.

**** Total Residual Chlorine or Total Residual Oxidants may not be discharged from any single generating unit for more than 2 hours per day. (1) Total Residual Oxidants reflects the use of bromine compounds. Bromine can be used separately or in combination with chlorine. These limits are effective when bromine is used. Discharge limitations for TRO may be met using a dehalogenation agent, if necessary. Dehalogenation shall then be achieved by using stoichiometric calculations to determine the amount of dehalogenating agent necessary to completely eliminate the residual.

***** Dissolved Oxygen: In addition to the monitoring requirements noted above, sampling shall be performed daily by grab sample during discharge of hydrazine.

****** Water Temperature: Report daily average.

******* Total Residual Chlorine & Total Residual Oxidants shall be monitored daily (during treatment event) except on days when plant is not normally staffed. Report "AN" on the monthly report form for those days.

(2) Report on days when bromine compounds are used with or without chlorine. On days when no bromine compounds are used, state this in the remarks section and LEAVE THE DATA AREA BLANK.

(3) Report on days when ONLY chlorine compounds are used (i.e. no bromine compounds. On days when bromine or a combination of bromine and chlorine IS used, state this in the remarks section and LEAVE THE DATA AREA BLANK.

(4) Monitor when discharging.

- See Part II for other requirements.

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 2IB00011002. See Part II, OTHER REQUIREMENTS, for locations of effluent sampling.

Table - Final Outfall - 002 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day					
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Measuring Frequency	Sampling Type	Monitoring Months
00300 - Dissolved Oxygen - mg/l	-	6.0	-	-	-	-	-	When Disch.	Grab	All
00400 - pH - S.U.	9.0	6.5	-	-	-	-	-	1/Week	Grab	All
00530 - Total Suspended Solids - mg/l	100	-	-	30	-	-	-	1/Week	Grab	All
00550 - Oil and Grease, Total - mg/l	20	-	-	15	-	-	-	1/Week	Grab	All
50050 - Flow Rate - MGD	-	-	-	-	-	-	-	1/Day	24hr Total Estimate	All

Notes for Station Number 2IB00011002:

* Dissolved Oxygen: Sampling shall be performed daily by grab sample only during discharge of hydrazine.

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 2IB00011003. See Part II, OTHER REQUIREMENTS, for locations of effluent sampling.

Table - Final Outfall - 003 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day					
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Measuring Frequency	Sampling Type	Monitoring Months
00530 - Total Suspended Solids - mg/l	-	-	-	-	-	-	-	When Disch.	Grab	All
50050 - Flow Rate - MGD	-	-	-	-	-	-	-	When Disch.	24hr Total Estimate	All

Notes for Station Number 2IB00011003:

*Monitoring required only when discharge occurs. Flow estimation is required for any day that a discharge occurs; monitoring for suspended solids is required once per month during discharge.

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 2IB00011004. See Part II, OTHER REQUIREMENTS, for locations of effluent sampling.

Table - Final Outfall - 004 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day					
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Measuring Frequency	Sampling Type	Monitoring Months
00400 - pH - S.U.	9.0	6.5	-	-	-	-	-	When Disch.	Grab	All
00951 - Fluoride, Total (F) - mg/l	-	-	-	-	-	-	-	When Disch.	Grab	Quarterly
00978 - Arsenic, Total Recoverable - ug/l	-	-	-	-	-	-	-	When Disch.	Grab	Quarterly
00980 - Iron, Total Recoverable - ug/l	-	-	-	-	-	-	-	When Disch.	Grab	Quarterly
00999 - Boron, Total Recoverable - ug/l	-	-	-	-	-	-	-	When Disch.	Grab	Quarterly
01009 - Barium, Total Recoverable - ug/l	-	-	-	-	-	-	-	When Disch.	Grab	Quarterly
01079 - Silver, Total Recoverable - ug/l	-	-	-	-	-	-	-	When Disch.	Grab	Quarterly
01104 - Aluminum, Total Recoverable - ug/l	-	-	-	-	-	-	-	When Disch.	Grab	Quarterly
01119 - Copper, Total Recoverable - ug/l	-	-	-	-	-	-	-	When Disch.	Grab	Quarterly
34044 - Oxidants, Total Residual - mg/l	0.05	-	-	-	-	-	-	When Disch.	Grab	All
50050 - Flow Rate - MGD	-	-	-	-	-	-	-	When Disch.	24hr Total Estimate	All
50060 - Chlorine, Total Residual - mg/l	0.2	-	-	-	-	-	-	When Disch.	Grab	All
78739 - Chlorination/Bromination Duration - Minutes	120	-	-	-	-	-	-	When Disch.	24hr Total	All
81855 - Asbestos - Fibers/L	-	-	-	-	-	-	-	When Disch.	Grab	Quarterly

Notes for station 2IB00011004:

Flow estimation is required for any day that a discharge occurs;

* The Total Residual Chlorine (TRC) and Total Residual Oxidants (TRO) limits are the maximum allowed at the outfall at any time. Analyses are to be performed by amperometric titration, Orion Residual Chlorine Electrode, or other approved methods during chlorination

and/or bromination. The daily grab samples for TRC and TRO shall represent the maximumm concentration discharged during chlorination and/or bromination.

** Measure TRO, TRC, and Cl/Br duration on days when using treatment.

*** Grab sample for TRO and TRC will be taken during treatment event.

**** Asbestos, See Part II, Other Requirements, Item O.

*****Total Residual Chlorine or Total Residual Oxidants may not be discharged from any single generating unit for more than 2 hours per day.

(1) Total Residual Oxidants reflects the use of bromine compounds. Bromine can be used separately or in combination with chlorine. These limits are effective when bromine is used. Discharge limitations for TRO may be met using a dehalogenation agent, if necessary. Dehalogenation shall then be achieved by using stoichiometric calculations to determine the amount of dehalogenating agent necessary to completely eliminate the residual.

(2) Report on days when bromine compounds are used with or without chlorine. On days when no bromine compounds are used, state this in the remarks section and LEAVE THE DATA AREA BLANK.

(3) Report on days when ONLY chlorine compounds are used (i.e. no bromine compounds. On days when bromine or a combination of bromine and chlorine IS used, state this in the remarks section and LEAVE THE DATA AREA BLANK.

(4) Daily monitoring is required for the parameters during discharge from the circulating water system (i.e., Cooling Tower Basin Drain).

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Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 2IB00011601. See Part II, OTHER REQUIREMENTS, for locations of effluent sampling.

Table - Internal Monitoring Station - 601 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day					
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Measuring Frequency	Sampling Type	Monitoring Months
00083 - Color, Severity - Units	-	-	-	-	-	-	-	1 /Day	Estimate	All
00310 - Biochemical Oxygen Demand, 5 Day - mg/l	45	-	-	30	-	-	-	1 / 2 Weeks	Grab	All
00530 - Total Suspended Solids - mg/l	45	-	-	30	-	-	-	1 / 2 Weeks	Grab	All
01330 - Odor, Severity - Units	-	-	-	-	-	-	-	1 /Day	Estimate	All
01350 - Turbidity, Severity - Units	-	-	-	-	-	-	-	1/Day	Estimate	All
50050 - Flow Rate - MGD	-	-	-	-	-	-	-	1 /Day	24hr Total Estimate	All

Notes for station 2IB00011601:

*Color, Odor, Turbidity: See Part II, Item G.
**See Part II, Other Requirements, Item B for location of sampling station.

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2IB00011*ID

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 2IB00011602. See Part II, OTHER REQUIREMENTS, for locations of effluent sampling.

Table - Internal Monitoring Station - 602 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day					
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Measuring Frequency	Sampling Type	Monitoring Months
00530 - Total Suspended Solids - mg/l	100	-	-	30	-	-	-	1 / 2 Weeks	Grab	All
00550 - Oil and Grease, Total - mg/l	20	-	-	15	-	-	-	1 / 2 Weeks	Grab	All
50050 - Flow Rate - MGD	-	-	-	-	-	-	-	1/Day	24hr Total Estimate	All

Notes for station 2IB00011602:

*See Part II, Other Requirements, Item B for location of sampling station.

Part I, B. - SLUDGE MONITORING REQUIREMENTS

1. Sludge Monitoring. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee shall monitor the treatment works' final sludge at Station Number 2IB00011588, and report to the Ohio EPA in accordance with the following table. See Part II, OTHER REQUIREMENTS, for location of sludge sampling.

Table - Sludge Monitoring - 588 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day					
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Measuring Frequency	Sampling Type	Monitoring Months
80991 - Sludge Volume, Gallons - Gals	-	-	-	-	-	-	-	1/Year	Total	December

NOTES for Station Number 2IB00011588:

* Monitoring is required when sewage sludge is removed from the permittee's facility for transfer to a publicly owned treatment works. Monthly Operating Report (MOR) data shall be submitted in December. The total for the entire calendar year shall be reported in the data area for the first day of December. If no sewage sludge is removed from the permittee's facility during the calendar year, report "AL" in the first column of the first day in December on the 4500 Form. A signature is still required.

- See Part II, Items J. and N.

Part I, B. - INTAKE MONITORING REQUIREMENTS

1. Intake Monitoring. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee shall monitor the Intake at Station Number 2IB00011801, and report to the Ohio EPA in accordance with the following table. See Part II, OTHER REQUIREMENTS, for location of sampling.

Table - Intake Monitoring - 801 - Final

Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
	Concentration Specified Units				Loading* kg/day					
Parameter	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly	Measuring Frequency	Sampling Type	Monitoring Months
00011 - Water Temperature - F	-	-	-	-	-	-	-	1/Day	Continuous	All

Part II, OTHER REQUIREMENTS

A. The wastewater treatment works must be under supervision of a Class I State certified operator as required by rule 3745-7- 02 of the Ohio Administrative Code.

B. Description of the location of the required sampling stations are as follows:

Sampling Station	Description of Location
2IB00011001	Pump station sampling port prior to discharging to Lake Erie
.	(Lat: N 41 36' 05"; Long: W 83 04' 10")
2IB00011002	Outfall from Training Center Pond to Navarre Marsh
.	Pool No. 3
.	(Lat: N 41 35' 35"; Long: W 83 05' 20")
2IB00011003	Outfall from screen wash catch basin prior to Navarre
.	Marsh Pool No. 2
.	(Lat: N 41 35' 45"; Long: W 83 05' 00")
2IB00011004	Outfall to ditch @ State Route 2
.	(Lat: N 41 36' 02"; Long: W 83 05' 40")
2IB00011588	Sludge removed from the wastewater treatment facility
and disposed of at another municipal wastewater	
.	treatment plant
2IB00011601	Sanitary sewage treatment plant effluent prior to mixing
.	with other wastewaters.
.	(Lat: N 41 35' 58"; Long: W 83 05' 03")
2IB00011602	Low volume wastewater settling basin overflow.
.	(Lat: N 41 35' 59"; Long: W 83 05' 05")
2IB00011801	Intake water prior to cooling operation

C. This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved.

1. Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
2. Controls any pollutant not limited in the permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

D. All parameters, except flow, need not be monitored on days when the plant is not normally staffed (Saturdays, Sundays, and Holidays). On those days, report "AN" on the monthly report form.

E. In the event that the permittee's operation requires the use of cooling or boiler water treatment additives that are discharged to surface waters of the state, written permission must be obtained from the director of the Ohio EPA prior to use. Reporting and testing requirements to apply for permission to use additives can be obtained from the Ohio EPA, Central Office, Division of Surface Water, Water Resources Management Section. Reported information will be used to evaluate whether the use of the additive(s) at concentrations expected in the final discharge will be harmful or inimical to aquatic life.

F. Permit limitations may be revised in order to meet water quality standards after a stream use determination and waste load allocation are completed and approved. This permit may be modified, or alternatively, revoked and reissued, to comply with any applicable water quality effluent limitations.

G. If Severity Units are required for Turbidity, Odor, or Color, use the following table to determine the value between 0 and 4 that is reported.

REPORTED VALUE*	SEVERITY DESCRIPTION	TURBIDITY	ODOR	COLOR
0	None	Clear	None	Colorless
1	Mild			
2	Moderate	Light Solids	Musty	Grey
3	Serious			
4	Extreme	Heavy Solids	Septic	Black

* Interpolate between the descriptive phrases.

H. Composite samples shall be comprised of a series of grab samples collected over a 24-hour period and proportionate in volume to the wastewater flow rate at the time of sampling. Such samples shall be collected at such times and locations, and in such a fashion, as to be representative of the facility's overall performance.

I. Grab samples shall be collected at such times and locations, and in such fashion, as to be representative of the facility's performance.

J. Not later than January 31 of each calendar year, the permittee shall submit two (2) copies of a report summarizing the sludge disposal and/or reuse activities of the facility during the previous year. One copy of the report shall be sent to the Ohio EPA, Division of Surface Water, Central Office, and one copy of the report shall be sent to the appropriate Ohio EPA District Office. This report shall address:

1) Amount of sludge disposed of/reused in gallons.

2) Method(s) of disposal/reuse.

3) Summary of all analyses made on the sludge, including any priority pollutant scans that may have been performed. (If a priority pollutant scan has been conducted as a part of the pretreatment program, the most recent analysis should be submitted.)

4) Problems encountered including any complaints received. The cause or reason for the problem and corrective actions taken to solve the problem should also be included. Any incidents of interference with the method of sludge disposal shall be identified, along with the cause of interference (i.e., excessive metals concentration, contaminated sludge, etc.) and the corrective actions taken.

K. There shall be no discharge of polychlorinated biphenyl compounds.

L. Right of Entry

The permittee shall allow authorized representatives of Ohio EPA and U.S. EPA upon the presentation of credentials subject to applicable requirements under the Atomic Energy Act of 1954, as amended, and any regulations, order, license or technical specification or other requirement established or required by the Nuclear Regulatory Commission thereunder;

A. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

B. At reasonable times to have access to copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample for any pollutants. And

C. To enter upon the permittee's premisis at any reasonable time to inspect any collection, treatment , pollution management, or discharge facilities required under this permit.

M. The permittee shall take every possible measure to reduce discharge of hydrazine (used as an additive) through outfalls 2IB00011602 and 2IB00011002. In order to protect aquatic life from toxicity, hydrazine must not be discharged above 8.7 ug/l (within a discharge period of 48 hours) and above 0.39 ug/l (for a period beyond 48 hours). During discharge of hydrazine from outfalls, one detailed sample result per month from each outfall must be sent to Ohio EPA Northwest District Office (Attention: Group Leader, NPDES Permit Section). If only one outfall discharges hydrazine, sampling must be done for that outfall.

N. All disposal, use, storage, or treatment of sewage sludge by the permittee shall comply with Chapter 6111. of the Ohio Revised Code, Chapter 3745-40 of the Ohio Administrative Code, any further requirements specified in this NPDES permit, and any other actions of the Director that pertain to the disposal, use, storage, or treatment of sewage sludge by the permittee.

O. The permittee shall use analytical Method 2570B in Standard Methods, 19th Edition to satisfy asbestos monitoring requirement at outfall 2IB00011004. Results of analysis shall be reported in # of asbestos fibers/ liter.

PART III - GENERAL CONDITIONS

1. DEFINITIONS

"Daily discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

"Average weekly" discharge limitation means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week. Each of the following 7-day periods is defined as a calendar week: Week 1 is Days 1 - 7 of the month; Week 2 is Days 8 - 14; Week 3 is Days 15 - 21; and Week 4 is Days 22 - 28. If the "daily discharge" on days 29, 30 or 31 exceeds the "average weekly" discharge limitation, Ohio EPA may elect to evaluate the last 7 days of the month as Week 4 instead of Days 22 - 28. Compliance with fecal coliform bacteria or E coli bacteria limitations shall be determined using the geometric mean.

"Average monthly" discharge limitation means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month. Compliance with fecal coliform bacteria or E coli bacteria limitations shall be determined using the geometric mean.

"85 percent removal" means the arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period.

"Absolute Limitations" Compliance with limitations having descriptions of "shall not be less than," "nor greater than," "shall not exceed," "minimum," or "maximum" shall be determined from any single value for effluent samples and/or measurements collected.

"Net concentration" shall mean the difference between the concentration of a given substance in a sample taken of the discharge and the concentration of the same substances in a sample taken at the intake which supplies water to the given process. For the purpose of this definition, samples that are taken to determine the net concentration shall always be 24-hour composite samples made up of at least six increments taken at regular intervals throughout the plant day.

"Net Load" shall mean the difference between the load of a given substance as calculated from a sample taken of the discharge and the load of the same substance in a sample taken at the intake which supplies water to given process. For purposes of this definition, samples that are taken to determine the net loading shall always be 24-hour composite samples made up of at least six increments taken at regular intervals throughout the plant day.

"MGD" means million gallons per day.

"mg/l" means milligrams per liter.

"ug/l" means micrograms per liter.

"ng/l" means nanograms per liter.

"S.U." means standard pH unit.

"kg/day" means kilograms per day.

"Reporting Code" is a five digit number used by the Ohio EPA in processing reported data. The reporting code does not imply the type of analysis used nor the sampling techniques employed.

"Quarterly (1/Quarter) sampling frequency" means the sampling shall be done in the months of March, June, August, and December, unless specificially identified otherwise in the Effluent Limitations and Monitoring Requirements table.

"Yearly (1/Year) sampling frequency" means the sampling shall be done in the month of September, unless specificially identified otherwise in the effluent limitations and monitoring requirements table.

"Semi-annual (2/Year) sampling frequency" means the sampling shall be done during the months of June and December, unless specificially identified otherwise.

"Winter" shall be considered to be the period from November 1 through April 30.

"Bypass" means the intentional diversion of waste streams from any portion of the treatment facility.

"Summer" shall be considered to be the period from May 1 through October 31.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

"Sewage sludge" means a solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works as defined in section 6111.01 of the Revised Code. "Sewage sludge" includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes. "Sewage sludge" does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator, grit and screenings generated during preliminary treatment of domestic sewage in a treatment works, animal manure, residue generated during treatment of animal manure, or domestic septage.

"Sewage sludge weight" means the weight of sewage sludge, in dry U.S. tons, including admixtures such as liming materials or bulking agents. Monitoring frequencies for sewage sludge parameters are based on the reported sludge weight generated in a calendar year (use the most recent calendar year data when the NPDES permit is up for renewal).

"Sewage sludge fee weight" means the weight of sewage sludge, in dry U.S. tons, excluding admixtures such as liming materials or bulking agents. Annual sewage sludge fees, as per section 3745.11(Y) of the Ohio Revised Code, are based on the reported sludge fee weight for the most recent calendar year.

2. GENERAL EFFLUENT LIMITATIONS

The effluent shall, at all times, be free of substances:

A. In amounts that will settle to form putrescent, or otherwise objectionable, sludge deposits; or that will adversely affect aquatic life or water fowl;

B. Of an oily, greasy, or surface-active nature, and of other floating debris, in amounts that will form noticeable accumulations of scum, foam or sheen;

C. In amounts that will alter the natural color or odor of the receiving water to such degree as to create a nuisance;

D. In amounts that either singly or in combination with other substances are toxic to human, animal, or aquatic life;

E. In amounts that are conducive to the growth of aquatic weeds or algae to the extent that such growths become inimical to more desirable forms of aquatic life, or create conditions that are unsightly, or constitute a nuisance in any other fashion;

F. In amounts that will impair designated instream or downstream water uses.

3. FACILITY OPERATION AND QUALITY CONTROL

All wastewater treatment works shall be operated in a manner consistent with the following:

A. At all times, the permittee shall maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee necessary to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with conditions of the permit.

B. The permittee shall effectively monitor the operation and efficiency of treatment and control facilities and the quantity and quality of the treated discharge.

C. Maintenance of wastewater treatment works that results in degradation of effluent quality shall be scheduled during non-critical water quality periods and shall be carried out in a manner approved by Ohio EPA as specified in the Paragraph in the PART III entitled, "UNAUTHORIZED DISCHARGES".

4. REPORTING

A. Monitoring data required by this permit may be submitted in hardcopy format on the Ohio EPA 4500 report form pre-printed by Ohio EPA or an approved facsimile. Ohio EPA 4500 report forms for each individual sampling station are to be received no later than the 15th day of the month following the month-of-interest. The original report form must be signed and mailed to:

Ohio Environmental Protection Agency
Lazarus Government Center
Division of Surface Water
Enforcement Section ES/MOR
P.O. Box 1049
Columbus, Ohio 43216-1049

Monitoring data may also be submitted electronically using Ohio EPA developed SWIMware software. Data must be transmitted to Ohio EPA via electronic mail or the bulletin board system by the 20th day of the month following the month-of-interest. A Surface Water Information Management System (SWIMS) Memorandum of Agreement (MOA) must be signed by the responsible official and submitted to Ohio EPA to receive an authorized Personal Identification Number (PIN) prior to sending data electronically. A hardcopy of the Ohio EPA 4500 form must be generated via SWIMware, signed and maintained onsite for records retention purposes.

B. If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified below, the results of such monitoring shall be included in the calculation and reporting of the values required in the reports specified above.

C. Analyses of pollutants not required by this permit, except as noted in the preceding paragraph, shall not be reported on Ohio EPA report form (4500) but records shall be retained as specified in the paragraph entitled "RECORDS RETENTION".

5. SAMPLING AND ANALYTICAL METHOD

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored flow. Test procedures for the analysis of pollutants shall conform to regulation 40 CFR 136, "Test Procedures For The Analysis of Pollutants" unless other test procedures have been specified in this permit. The permittee shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals to insure accuracy of measurements.

6. RECORDING OF RESULTS

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

A. The exact place and date of sampling; (time of sampling not required on EPA 4500)

B. The person(s) who performed the sampling or measurements;

C. The date the analyses were performed on those samples;

D. The person(s) who performed the analyses;

E. The analytical techniques or methods used; and

F. The results of all analyses and measurements.

7. RECORDS RETENTION

The permittee shall retain all of the following records for the wastewater treatment works for a minimum of three years except those records that pertain to sewage sludge disposal, use, storage, or treatment, which shall be kept for a minimum of five years, including:

A. All sampling and analytical records (including internal sampling data not reported);

B. All original recordings for any continuous monitoring instrumentation;

C. All instrumentation, calibration and maintenance records;

D. All plant operation and maintenance records;

E. All reports required by this permit; and

F. Records of all data used to complete the application for this permit for a period of at least three years, or five years for sewage sludge, from the date of the sample, measurement, report, or application.

These periods will be extended during the course of any unresolved litigation, or when requested by the Regional Administrator or the Ohio EPA. The three year period, or five year period for sewage sludge, for retention of records shall start from the date of sample, measurement, report, or application.

8. AVAILABILITY OF REPORTS

Except for data determined by the Ohio EPA to be entitled to confidential status, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the appropriate district offices of the Ohio EPA. Both the Clean Water Act and Section 6111.05 Ohio Revised Code state that effluent data and receiving water quality data shall not be considered confidential.

9. DUTY TO PROVIDE INFORMATION

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking, and reissuing, or terminating the permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

10. RIGHT OF ENTRY

The permittee shall allow the Director or an authorized representative upon presentation of credentials and other documents as may be required by law to:

A. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit.

B. Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit.

C. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit.

D. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

11. UNAUTHORIZED DISCHARGES

A. Bypassing or diverting of wastewater from the treatment works is prohibited unless:

1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of downtime. This condition is not satisfied if adequate back up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

3. The permittee submitted notices as required under paragraph D. of this section,

B. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.

C. The Director may approve an unanticipated bypass after considering its adverse effects, if the Director determines that it has met the three conditions listed in paragraph 11.A. of this section.

D. The permittee shall submit notice of an unanticipated bypass as required in section 12. A.

E. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded if that bypass is for essential maintenance to assure efficient operation.

12. NONCOMPLIANCE NOTIFICATION

A. The permittee shall by telephone report any of the following within twenty-four (24) hours of discovery at (toll free) 1-800-282-9378:

1. Any noncompliance which may endanger health or the environment;

2. Any unanticipated bypass which exceeds any effluent limitation in the permit; or

3. Any upset which exceeds any effluent limitation in the permit.

4. Any violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit.

B. For the telephone reports required by Part 12.A., the following information must be included:

1. The times at which the discharge occurred, and was discovered;

2. The approximate amount and the characteristics of the discharge;

3. The stream(s) affected by the discharge;

4. The circumstances which created the discharge;

5. The names and telephone numbers of the persons who have knowledge of these circumstances;

6. What remedial steps are being taken; and

7. The names and telephone numbers of the persons responsible for such remedial steps.

C. These telephone reports shall be confirmed in writing within five days of the discovery of the discharge and/or noncompliance and submitted to the appropriate Ohio EPA district office. The report shall include the following:

1. The limitation(s) which has been exceeded;

2. The extent of the exceedance(s);

3. The cause of the exceedance(s);

4. The period of the exceedance(s) including exact dates and times;

5. If uncorrected, the anticipated time the exceedance(s) is expected to continue, and

6. Steps being taken to reduce, eliminate, and/or prevent occurrence of the exceedance(s).

D. Compliance Schedule Events:

If the permittee is unable to meet any date for achieving an event, as specified in the schedule of compliance, the permittee shall submit a written report to the appropriate district office of the Ohio EPA within 14 days of becoming aware of such situation. The report shall include the following:

1. The compliance event which has been or will be violated;

2. The cause of the violation;

3. The remedial action being taken;

4. The probable date by which compliance will occur; and

5. The probability of complying with subsequent and final events as scheduled.

E. The permittee shall report all instances of noncompliance not reported under paragraphs A, B, or C of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraphs B and C of this section.

F. Where the permittee becomes aware that it failed to submit any relevant application or submitted incorrect information in a permit application or in any report to the director, it shall promptly submit such facts or information.

13. RESERVED

14. DUTY TO MITIGATE

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

15. AUTHORIZED DISCHARGES

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than, or at a level in excess of, that authorized by this permit shall constitute a violation of the terms and conditions of this permit. Such violations may result in the imposition of civil and/or criminal penalties as provided for in Section 309 of the Act and Ohio Revised Code Sections 6111.09 and 6111.99.

16. DISCHARGE CHANGES

The following changes must be reported to the appropriate Ohio EPA district office as soon as practicable:

A. For all treatment works, any significant change in character of the discharge which the permittee knows or has reason to believe has occurred or will occur which would constitute cause for modification or revocation and reissuance. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. Notification of permit changes or anticipated noncompliance does not stay any permit condition.

B. For publicly owned treatment works:

1. Any proposed plant modification, addition, and/or expansion that will change the capacity or efficiency of the plant;

2. The addition of any new significant industrial discharge; and

3. Changes in the quantity or quality of the wastes from existing tributary industrial discharges which will result in significant new or increased discharges of pollutants.

C. For non-publicly owned treatment works, any proposed facility expansions, production increases, or process modifications, which will result in new, different, or increased discharges of pollutants.

Following this notice, modifications to the permit may be made to reflect any necessary changes in permit conditions, including any necessary effluent limitations for any pollutants not identified and limited herein. A determination will also be made as to whether a National Environmental Policy Act (NEPA) review will be required. Sections 6111.44 and 6111.45, Ohio Revised Code, require that plans for treatment works or improvements to such works be approved by the Director of the Ohio EPA prior to initiation of construction.

D. In addition to the reporting requirements under 40 CFR 122.41(l) and per 40 CFR 122.42(a), all existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

1. That any activity has occurred or will occur which would result in the discharge on a routine or frequent basis of any toxic pollutant which is not limited in the permit. If that discharge will exceed the highest of the "notification levels" specified in 40 CFR Sections 122.42(a)(1)(i) through 122.42(a)(1)(iv).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" specified in 122.42(a)(2)(i) through 122.42(a)(2)(iv).

17. TOXIC POLLUTANTS

The permittee shall comply with effluent standards or prohibitions established under Section 307 (a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement. Following establishment of such standards or prohibitions, the Director shall modify this permit and so notify the permittee.

18. PERMIT MODIFICATION OR REVOCATION

A. After notice and opportunity for a hearing, this permit may be modified or revoked, by the Ohio EPA, in whole or in part during its term for cause including, but not limited to, the following:

1. Violation of any terms or conditions of this permit;

2. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

3. Change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge.

B. Pursuant to rule 3745-33-04, Ohio Administrative Code, the permittee may at any time apply to the Ohio EPA for modification of any part of this permit. The filing of a request by the permittee for a permit modification or revocation does not stay any permit condition. The application for modification should be received by the appropriate Ohio EPA district office at least ninety days before the date on which it is desired that the modification become effective. The application shall be made only on forms approved by the Ohio EPA.

19. TRANSFER OF OWNERSHIP OR CONTROL

This permit may be transferred or assigned and a new owner or successor can be authorized to discharge from this facility, provided the following requirements are met:

A. The permittee shall notify the succeeding owner or successor of the existence of this permit by a letter, a copy of which shall be forwarded to the appropriate Ohio EPA district office. The copy of that letter will serve as the permittee's notice to the Director of the proposed transfer. The copy of that letter shall be received by the appropriate Ohio EPA district office sixty (60) days prior to the proposed date of transfer;

B. A written agreement containing a specific date for transfer of permit responsibility and coverage between the current and new permittee (including acknowledgement that the existing permittee is liable for violations up to that date, and that the new permittee is liable for violations from that date on) shall be submitted to the appropriate Ohio EPA district office within sixty days after receipt by the district office of the copy of the letter from the permittee to the succeeding owner;

At anytime during the sixty (60) day period between notification of the proposed transfer and the effective date of the transfer, the Director may prevent the transfer if he concludes that such transfer will jeopardize compliance with the terms and conditions of the permit. If the Director does not prevent transfer, he will modify the permit to reflect the new owner.

20. OIL AND HAZARDOUS SUBSTANCE LIABILITY

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

21. SOLIDS DISPOSAL

Collected grit and screenings, and other solids other than sewage sludge, shall be disposed of in such a manner as to prevent entry of those wastes into waters of the state, and in accordance with all applicable laws and rules.

22. CONSTRUCTION AFFECTING NAVIGABLE WATERS

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

23. CIVIL AND CRIMINAL LIABILITY

Except as exempted in the permit conditions on UNAUTHORIZED DISCHARGES or UPSETS, nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

24. STATE LAWS AND REGULATIONS

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Clean Water Act.

25. PROPERTY RIGHTS

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

26. UPSET

The provisions of 40 CFR Section 122.41(n), relating to "Upset," are specifically incorporated herein by reference in their entirety. For definition of "upset," see Part III, Paragraph 1, DEFINITIONS.

27. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

28. SIGNATORY REQUIREMENTS

All applications submitted to the Director shall be signed and certified in accordance with the requirements of 40 CFR 122.22.

All reports submitted to the Director shall be signed and certified in accordance with the requirements of 40 CFR Section 122.22.

29. OTHER INFORMATION

A. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

B. ORC 6111.99 provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $25,000 per violation.

C. ORC 6111.99 states that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $25,000 per violation.

D. ORC 6111.99 provides that any person who violates Sections 6111.04, 6111.042, 6111.05, or division (A) of Section 6111.07 of the Revised Code shall be fined not more than $25,000 or imprisoned not more than one year, or both.

30. NEED TO HALT OR REDUCE ACTIVITY

40 CFR 122.41(c) states that it shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with conditions of this permit.

31. APPLICABLE FEDERAL RULES

All references to 40 CFR in this permit mean the version of 40 CFR which is effective as of the effective date of this permit.

32. AVAILABILITY OF PUBLIC SEWERS

Not withstanding the issuance or non-issuance of an NPDES permit to a semi-public disposal system, whenever the sewage system of a publicly owned treatment works becomes available and accessible, the permittee operating any semi-public disposal system shall abandon the semi-public disposal system and connect it into the publicly owned treatment works.

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Attachment C:

Agency Consultation Correspondence

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ATTAC ENT C

Table o Contents

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FENOC
FirstEnergy Nuclear Operating Company

5501 North State Route 2
Oak Harbor, Ohio 43449

Barry S. Allen
Vice President - Nuclear

419-321-7676
Fax: 419-321-7582

November 12, 2009
L-09-295

Ms. Mary Knapp
Field Supervisor
U.S. Fish and Wildlife Service
Ohio Ecological Services Field Office
4625 Morse Rd., Suite 104
Columbus, OH 43230

SUBJECT:
Request for Information on Threatened or Endangered Species

FirstEnergy Nuclear Operating Company (FENOC) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for the Davis-Besse Nuclear Power Station (Davis-Besse). If approved, the renewal term would be for an additional 20 years beyond the original Davis-Besse license expiration date in 2017.

As part of the license renewal process, the NRC requires (10 CFR 51.53(c)(3)(ii)(E)) license renewal applicants to assess the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act. The NRC also will request, under Section 7 of the Endangered Species Act (16 USC 1531), an informal consultation with your office at a later date. By contacting you early in the application process, FENOC wishes to identify any potential issues that need to be addressed or information that your office may require to expedite the NRC consultation.

Davis-Besse is located on the southwestern shore of Lake Erie in Ottawa County, Ohio (Attachment 1). Coordinates for the station are 41° 35' 49" north Latitude and 83° 05' 16" west Longitude. The site consists of 954 acres, of which approximately 733 acres are marshland that is leased to the U.S. Government as a national wildlife refuge (Attachment 2). Approximately 100 miles of transmission lines were constructed to connect the station to the regional electric grid.

FENOC has no plans to alter current Davis-Besse operations over the 20-year license renewal period. In addition, maintenance activities necessary to support license renewal would be limited to previously disturbed areas on site. License renewal at Davis-Besse would require neither the expansion of existing facilities nor additional land disturbance. As a result, FENOC is confident that continued operation of Davis-Besse during the license renewal period would have minimal environmental impacts.

To ensure that impacts are adequately addressed, FENOC requests information from your office regarding concerns you may have, if any, related to potential environmental impacts from continued operation of Davis-Besse, including the associated transmission lines and corridors. FENOC would appreciate receiving a letter in reply detailing any concerns you may have or confirmation that no concerns exist. Receipt of your reply by December 31, 2009, will provide us the time needed to evaluate and incorporate the information into our application.

Thank you for your attention to our request.

Please feel free to contact Mr. Clifford Custer, Davis-Besse License Renewal Project Manager, at 724-682-7139. Please address any questions or need for additional information about the environmental review to:

Mr. Clifford I. Custer
Davis-Besse License Renewal Project Manager
Mail Stop 3370
Davis-Besse Nuclear Power Station
5501 N. State Route 2
Oak Harbor, OH 43449

Telephone: 724-682-7139
Email: custerc@firstenergycorp.com

Sincerely,

Barry S. Allen

Attachments:
1. Davis-Besse Nuclear Power Station Area Map, 6-Mile Radius
2. Davis-Besse Nuclear Power Station Site Map

cc: DB-1 NRC Senior Resident Inspector

Attachment 1
L-09-295

Davis-Besse Nuclear Power Station
Area Map, 6-Mile Radius
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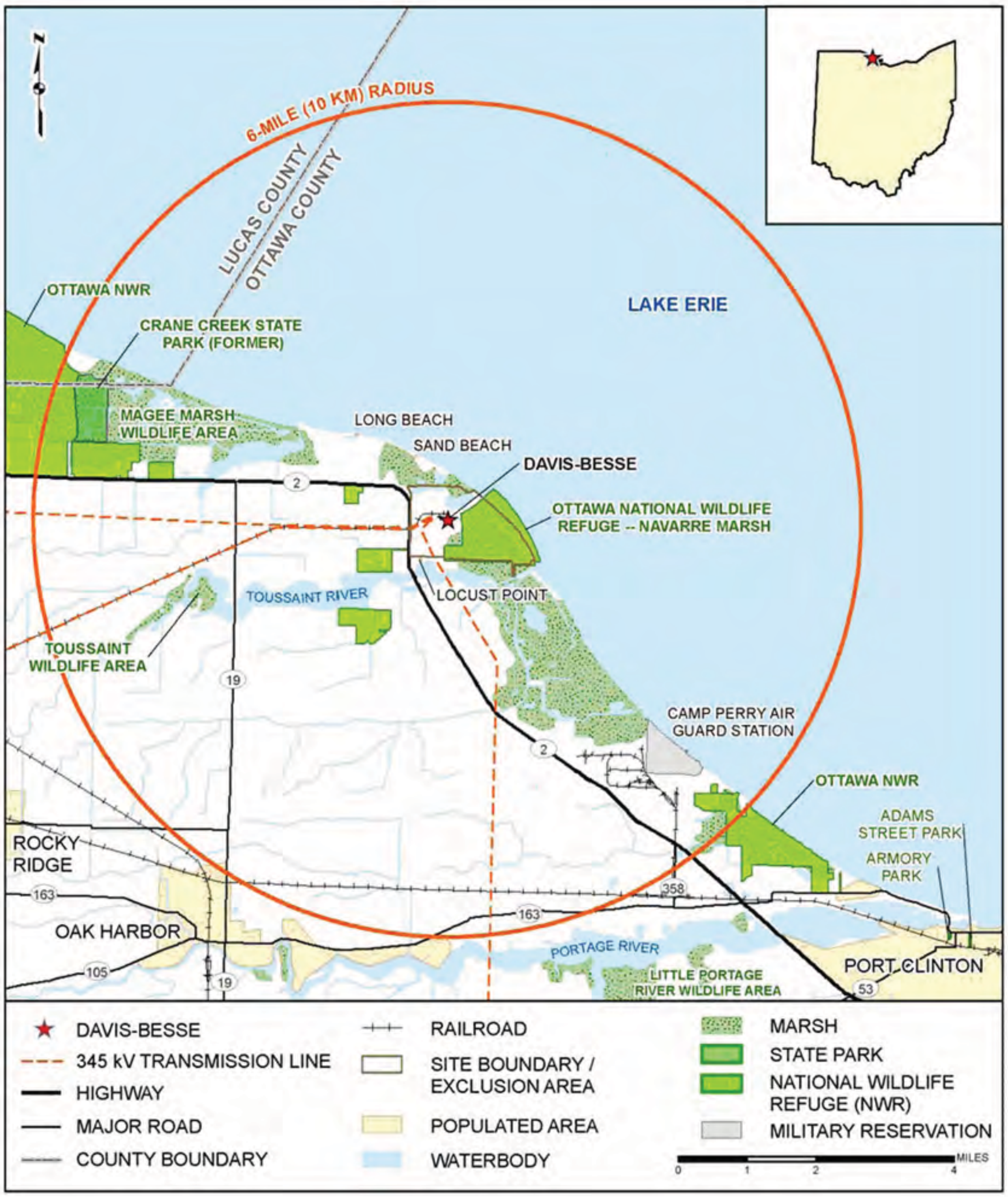

Attachment 2
L-09-295

Davis-Besse Nuclear Power Station Site Map
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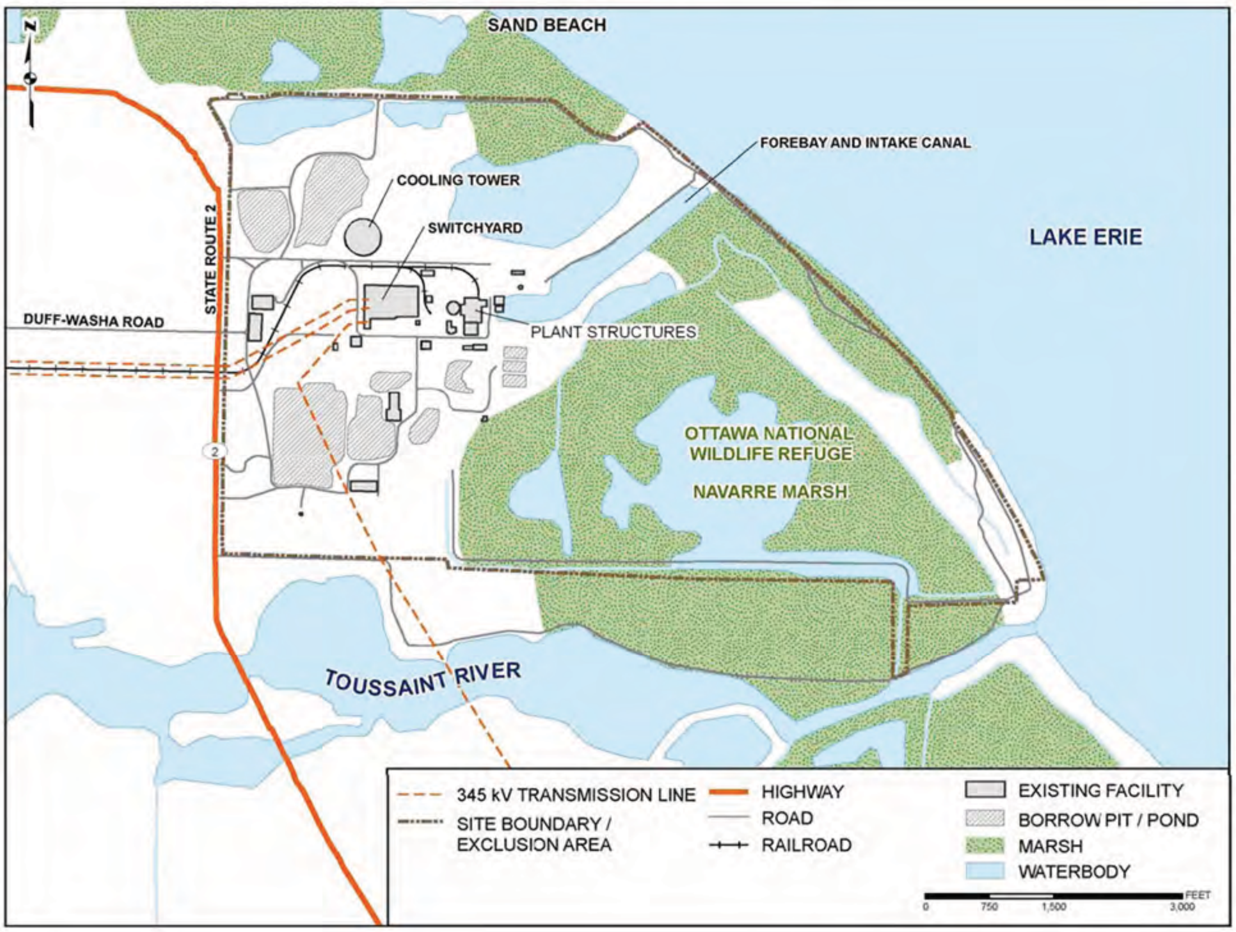

United States Department of the Interior

FISH AND WILDLIFE SERVICE

BAIC-09-0037

RECEIVED
DEC 22 2009
DBNPS

Ecological Services
4625 Morse Road, Suite 104
Columbus, Ohio 43230
(614) 416-8993 / FAX (614) 416-8994

December 16, 2009

TAILS # 31420-2010-TA-0132

Mr. Barry Allen
First Energy Nuclear Operating Company
5501 North State Route 2
Oak Harbor, OH 43449

Dear Mr. Allen:

This is in response to your November 12, 2009 letter requesting our review and comment on the proposed project. The project involves the renewal of the operating license for the Davis-Besse Nuclear Power Station, Ottawa County, Ohio for a 20 year term beginning in 2017 and ending in 2037. The site consists of 954 acres, of which approximately 733 acres are marshland that is leased to the U.S. government as part of Ottawa National Wildlife Refuge (Refuge). There are no current plans to alter the current operations of the facility or to disturb any land outside of previously disturbed areas. As part of the Nuclear Regulatory Commission renewal process, you have requested the U.S. Fish and Wildlife Service's assistance in assessing the impact of the license renewal on threatened and endangered species.

In general, we agree that the proposed renewal of the operating license will not impact federally listed species and will have minimal environmental impacts, as no change in operation or extent of the facility is proposed. Should you subsequently propose any activities that would result in ground disturbance, tree clearing, or habitat modification, further coordination with this office and the Refuges is requested.

ENDANGERED SPECIES COMMENTS: The project lies within the range of the Indiana bat, piping plover, Lake Erie Watersnake, Lakeside daisy, eastern prairie fringed orchid, and eastern massasauga, federally listed endangered, threatened and candidate species. Due to the project type, location, and onsite habitat, none of these species would be expected within the project area, and no impacts to these species are expected. This precludes the need for further action on this project as required by the 1973 Endangered Species Act, as amended.

MIGRATORY BIRD COMMENTS: The project area lies within the range of the bald eagle (**Haliaeetus leucocephalus**). The bald eagle was removed from the Federal list of endangered and threatened species in July 2007 due to recovery. This species continues to be afforded protection by the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. A bald eagle nest exists on the Davis-Besse property. In order to avoid disturbing nesting and young eagles, we request that no activity occur within 660 feet of the nest between January 1 and July 31, when the nesting eagles are most vulnerable. If this recommendation cannot be implemented, further coordination with this office will be necessary.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the Endangered Species Act of 1973 (ESA), as amended, and are consistent with the intent of the National Environmental Policy Act of 1969 and the U. S. Fish and Wildlife

Service's Mitigation Policy. Please note that consultation under section 7 of the ESA may be warranted for this project since suitable habitat for the Indiana bat may be impacted by this project. This letter provides technical assistance only and does not serve as a completed section 7 consultation document.

Thank you for the opportunity to provide comments on this project. If you have any questions, or if we may of additional assistance, please contact Biologist Megan Seymour at extension 16 in this office.

Sincerely,

for Mary M. Knapp, Ph.D.
Supervisor

cc: ODNR Division of Wildlife SCEA Unit, Columbus, OH

FENOC
FirstEnergy Nuclear Operating Company

5501 North State Route 2
Oak Harbor, Ohio 43449

Barry S. Allen
Vice President - Nuclear

419-321-7676
Fax: 419-321-7582

November 12, 2009
L-09-296

Ms. Patricia Kurkul
Regional Administrator
NOAA Fisheries Service
Northeast Regional Office
55 Great Republic Drive
Gloucester, MA 01930-2276

SUBJECT:
Request for Information on Threatened or Endangered Species

FirstEnergy Nuclear Operating Company (FENOC) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for the Davis-Besse Nuclear Power Station (Davis-Besse). If approved, the renewal term would be for an additional 20 years beyond the original Davis-Besse license expiration date in 2017.

As part of the license renewal process, the NRC requires (10 CFR 51.53(c)(3)(ii)(E)) license renewal applicants to assess the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act. The NRC also will request, under Section 7 of the Endangered Species Act (16 USC 1531), an informal consultation with your office at a later date. By contacting you early in the application process, FENOC wishes to identify any potential issues that need to be addressed or information that your office may require to expedite the NRC consultation.

Davis-Besse is located on the southwestern shore of Lake Erie in Ottawa County, Ohio (Attachment 1). Coordinates for the station are 41° 35' 49" north Latitude and 83° 05' 16" west Longitude. The site consists of 954 acres, of which approximately 733 acres are marshland that is leased to the U.S. Government as a national wildlife refuge (Attachment 2).

FENOC has no plans to alter current Davis-Besse operations over the 20-year license renewal period. In addition, maintenance activities necessary to support license renewal would be limited to previously disturbed areas on site. License renewal at Davis-Besse would require neither the expansion of existing facilities nor additional land disturbance. As a result, FENOC is confident that extending Davis-Besse operation will continue to have minimal environmental impacts.

Davis-Besse Nuclear Power Station
L-09-296
Page 2

To ensure that impacts are adequately addressed, FENOC requests information from your office regarding concerns you may have, if any, related to potential environmental impacts from continued operation of Davis-Besse. FENOC would appreciate receiving a letter in reply detailing any concerns you may have or confirmation that no concerns exist. Receipt of your reply by December 31, 2009, will provide us the time needed to evaluate and incorporate the information into our application.

Thank you for your attention to our request.

Please feel free to contact Mr. Clifford Custer, Davis-Besse License Renewal Project Manager, at 724-682-7139. Please address any questions or need for additional information about the environmental review to:

Mr. Clifford I. Custer
Davis-Besse License Renewal Project Manager
Mail Stop 3370
Davis-Besse Nuclear Power Station
5501 N. State Route 2
Oak Harbor, OH 43449

Telephone: 724-682-7139
Email: custerc@firstenergycorp.com

Sincerely,

Barry S. Allen

Barry S. Allen

Attachments:
1. Davis-Besse Nuclear Power Station Area Map, 6-Mile Radius
2. Davis-Besse Nuclear Power Station Site Map

cc: DB-1 NRC Senior Resident Inspector

Attachment 1
L-09-296

Davis-Besse Nuclear Power Station
Area Map, 6-Mile Radius
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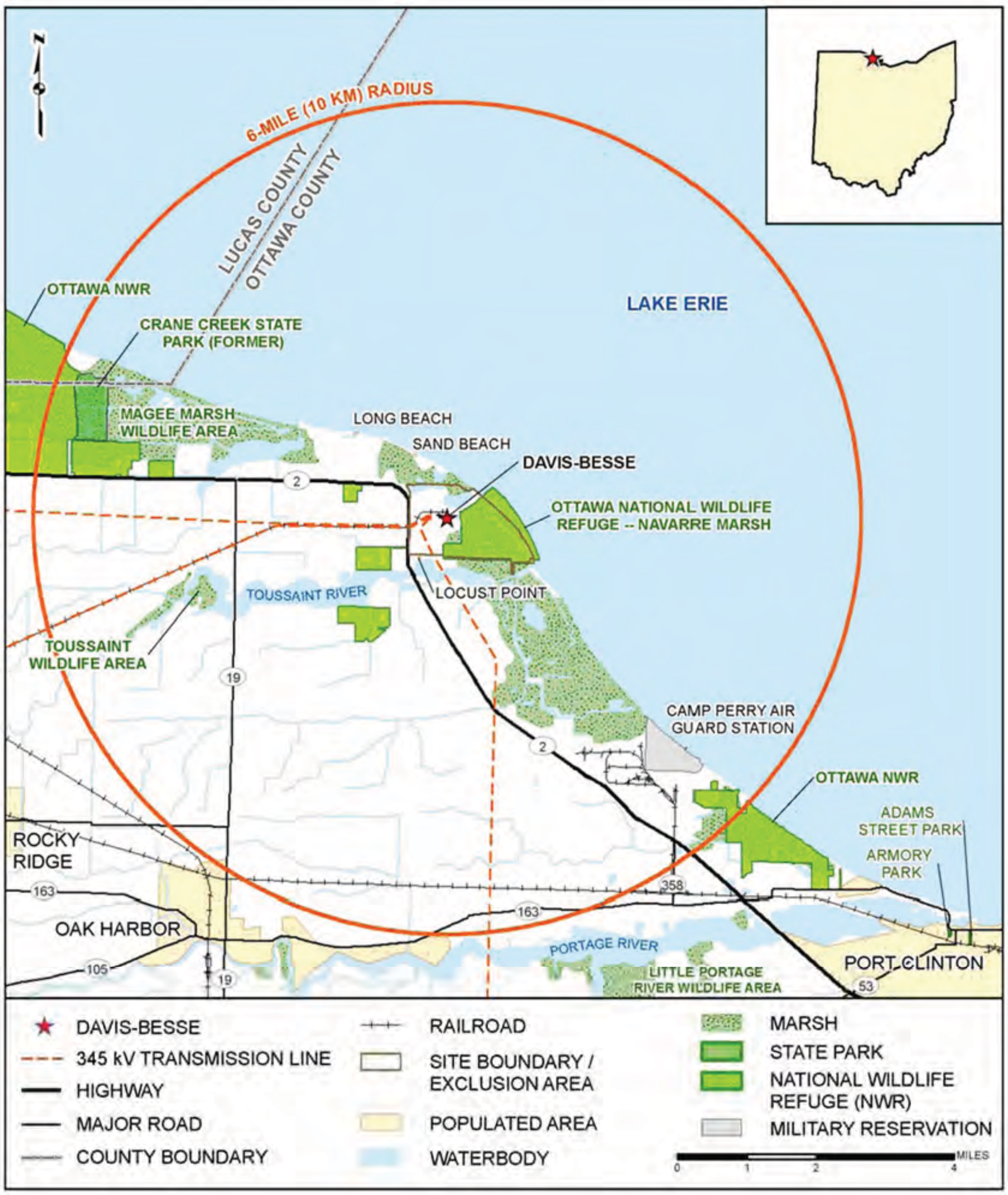

Attachment 2
L-09-296

Davis-Besse Nuclear Power Station Site Map
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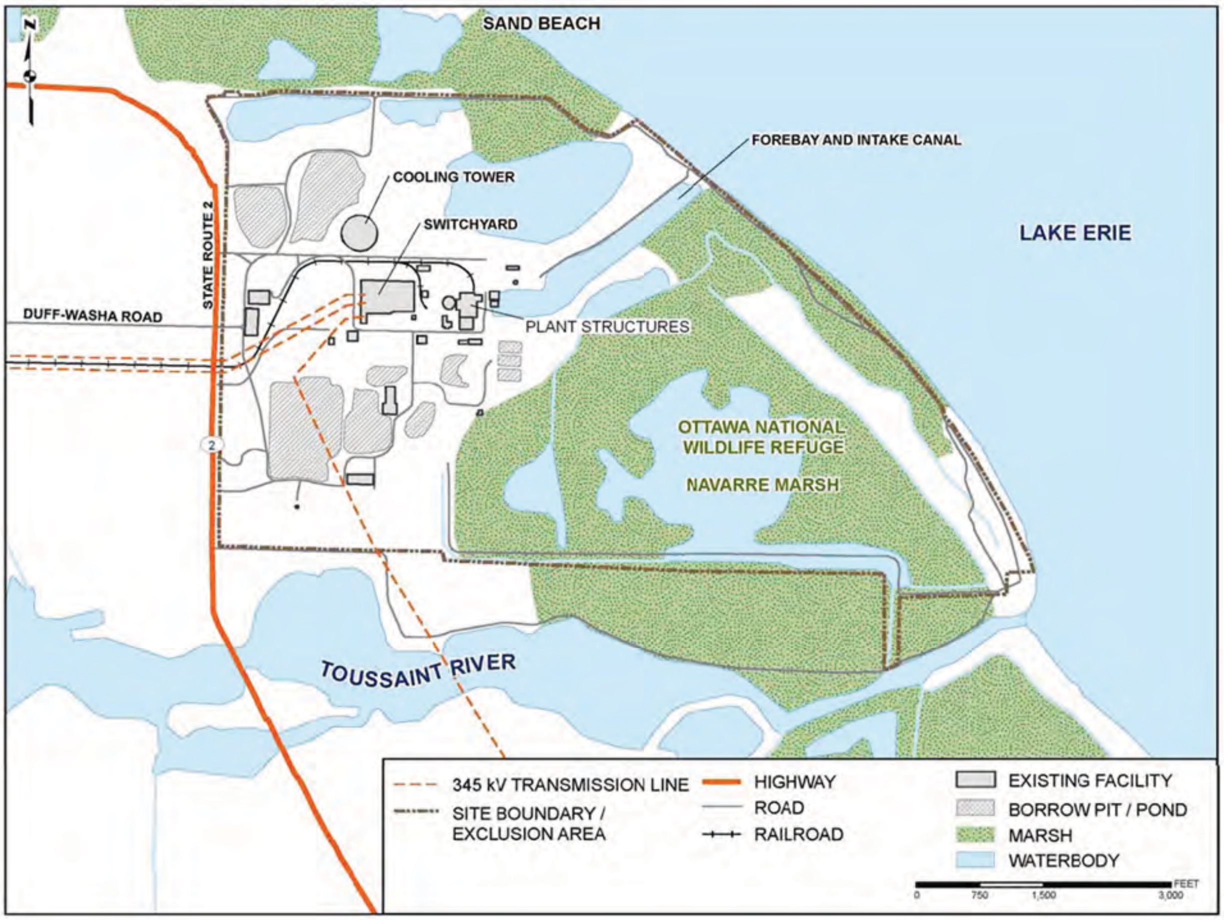


UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

JAN 15 2010

Clifford I. Custer
Davis-Besse License Renewal Project Manager
Mail Stop 3370
Davis-Besse Nuclear Power Station
5501 N. State Route 2
Oak Harbor, Ohio 43449

Dear Mr. Custer,

This is in response to a letter dated November 12, 2009 from Barry Allen regarding the preparation of an application for relicensing by the US Nuclear Regulatory Commission (NRC) for the Davis-Besse Nuclear Power Station. If approved, the renewal term would be for an additional 20 years beyond the original Davis-Besse license expiration date in 2017. Your letter requested information on the presence of species listed as threatened or endangered under the jurisdiction of NOAA's National Marine Fisheries Service (NMFS) in the vicinity of the Davis-Besse facility.

The Davis-Besse facility is located on the southwestern shore of Lake Erie in Ottawa County, Ohio. No species listed by NMFS are known to occur in Lake Erie. As such, no further coordination with NMFS on the effects of the relicensing of the facility is necessary. While not specifically requested in your letter, NMFS has also reviewed the location of the facility and has determined that no Essential Fish Habitat (EFH) as designated under the Magnuson-Steven Fisheries Management and Conservation Act occurs in the vicinity of the facility. As such, no further coordination regarding impacts to EFH is necessary.

Should you have any questions regarding this correspondence or require any additional information, please contact Julie Crocker of my staff at (978)282-8480 or by e-mail (Julie.Crocker@noaa.gov).

Sincerely,

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

Cc: Chiarella, F/NER4

File Code: sec 7 2009 – no species

FENOC
FirstEnergy Nuclear Operating Company

5501 North State Route 2
Oak Harbor, Ohio 43449

Barry S. Allen
Vice President - Nuclear

419-321-7676
Fax: 419-321-7582

November 12, 2009
L-09-298

Mr. David Graham
Chief
Division of Wildlife
Ohio Department of Natural Resources
2045 Morse Rd., Bldg. G-3
Columbus, OH 43229-6693

SUBJECT:
Request for Information on Threatened or Endangered Species

FirstEnergy Nuclear Operating Company (FENOC) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for the Davis-Besse Nuclear Power Station (Davis-Besse). If approved, the renewal term would be for an additional 20 years beyond the original Davis-Besse license expiration date in 2017.

As part of the license renewal process, the NRC requires (10 CFR 51.53(c)(3)(ii)(E)) license renewal applicants to assess the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act. The NRC also will request, under Section 7 of the Endangered Species Act (16 USC 1531), an informal consultation with your office at a later date. By contacting you early in the application process, FENOC wishes to identify any potential issues that need to be addressed or information that your office may require to expedite the NRC consultation.

Davis-Besse is located on the southwestern shore of Lake Erie in Ottawa County, Ohio (Attachment 1). Coordinates for the station are 41° 35' 49" north Latitude and 83° 05' 16" west Longitude. The site consists of 954 acres, of which approximately 733 acres are marshland that is leased to the U.S. Government as a national wildlife refuge (Attachment 2). Approximately 100 miles of transmission lines were constructed to connect the station to the regional electric grid.

FENOC has no plans to alter current Davis-Besse operations over the 20-year license renewal period. In addition, maintenance activities necessary to support license renewal would be limited to previously disturbed areas on site. License renewal at Davis-Besse would require neither the expansion of existing facilities nor additional land disturbance. As a result, FENOC is confident that extending Davis-Besse operation will continue to have minimal environmental impacts.

Davis-Besse Nuclear Power Station
L-09-298
Page 2

To ensure that impacts are adequately addressed, FENOC requests information from your office regarding concerns you may have, if any, related to potential environmental impacts from continued operation of Davis-Besse, including the associated transmission lines and corridors. FENOC would appreciate receiving a letter in reply detailing any concerns you may have or confirmation that no concerns exist. Receipt of your reply by December 31, 2009, will provide us the time needed to evaluate and incorporate the information into our application.

Thank you for your attention to our request.

Please feel free to contact Mr. Clifford Custer, Davis-Besse License Renewal Project Manager, at 724-682-7139. Please address any questions or need for additional information about the environmental review to:

Mr. Clifford I. Custer
Davis-Besse License Renewal Project Manager
Mail Stop 3370
Davis-Besse Nuclear Power Station
5501 N. State Route 2
Oak Harbor, OH 43449

Telephone: 724-682-7139
Email: custerc@firstenergycorp.com

Sincerely,

Barry S. Allen

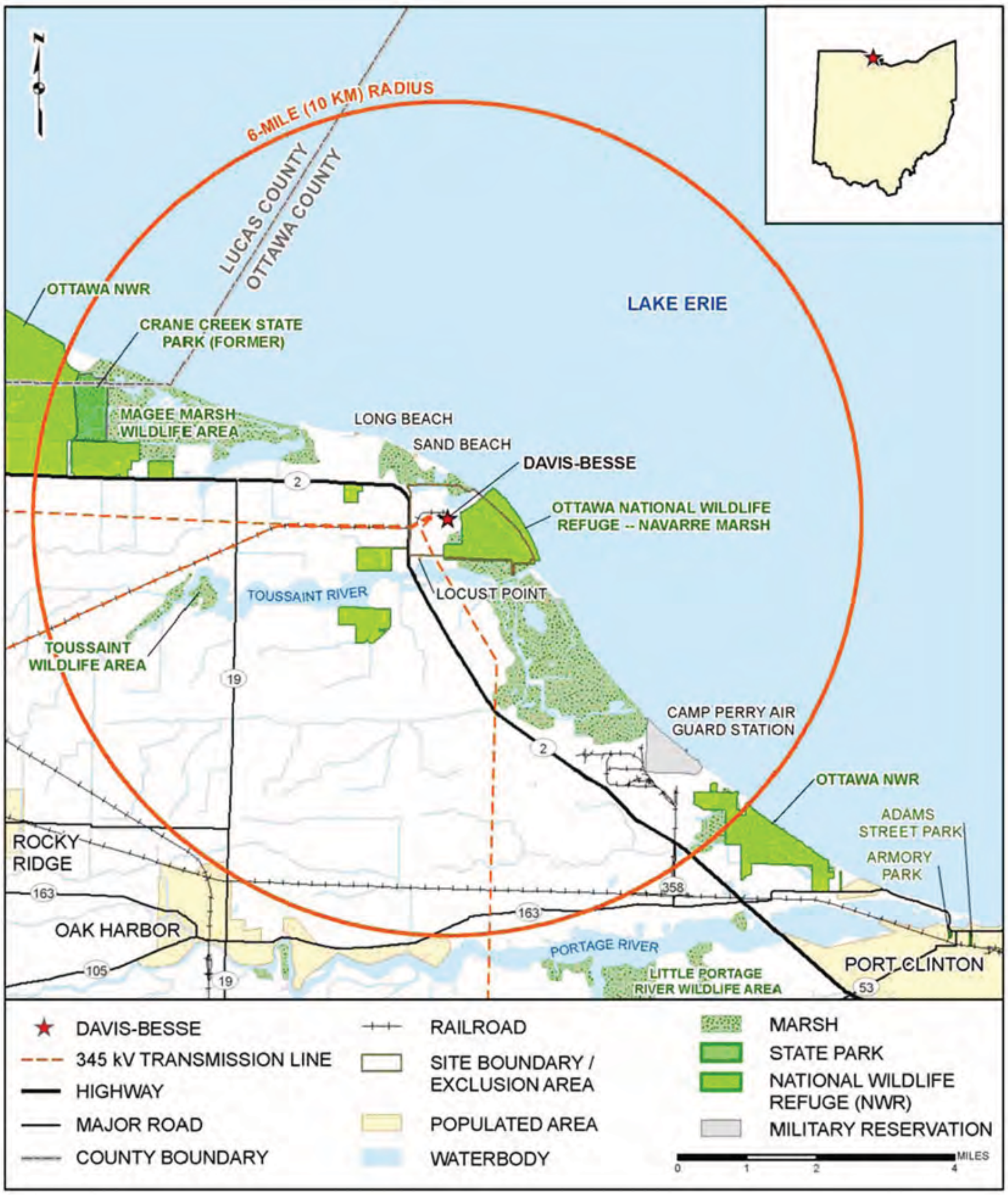
Barry S. Allen

Attachments:
1. Davis-Besse Nuclear Power Station Area Map, 6-Mile Radius
2. Davis-Besse Nuclear Power Station Site Map

cc: DB-1 NRC Senior Resident Inspector

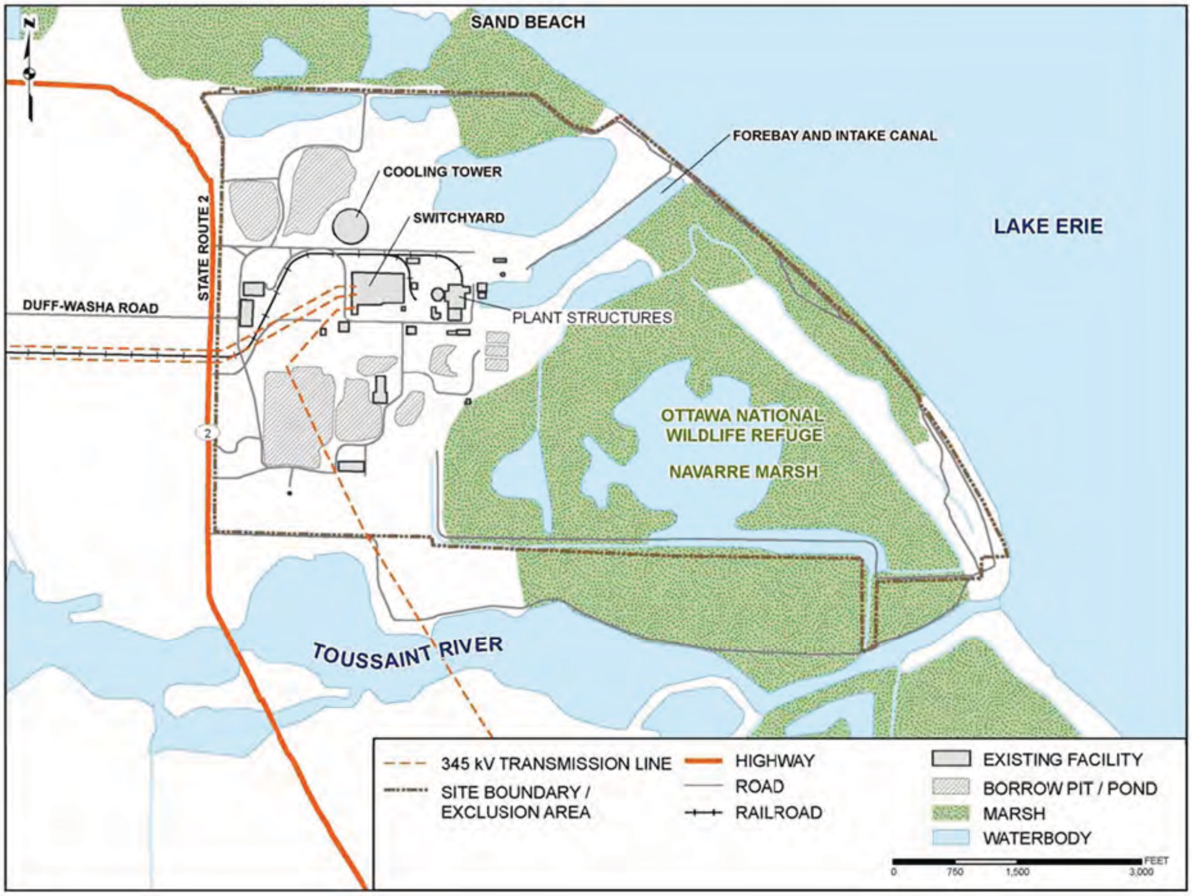
Attachment 1
L-09-298

Davis-Besse Nuclear Power Station
Area Map, 6-Mile Radius
Page 1 of 1



Attachment 2
L-09-298

Davis-Besse Nuclear Power Station Site Map
Page 1 of 1



Ohio Department of Natural Resources

TED STRICKLAND, GOVERNOR | SEAN D. LOGAN, DIRECTOR

Division of Wildlife
David M. Graham, Chief
2045 Morse Rd., Bldg. G
Columbus, OH 43229-6693
Phone: (614) 265-6300

December 22, 2009

Barry S. Allen
FENOC
5501 North State Route 2
Oak harbor, OH 43449

RE: Request for Information on Threatened or Endangered Species
Renew Operating license for the Davis-Besse Nuclear Power Station

Dear Mr. Allen:

This is in response to your letter to Chief Graham dated November 12, 2009 regarding the project referenced above. In your letter you request information regarding concerns we may have, if any, related to potential environmental impacts from continued operation of Davis-Besse, including the associated transmission lines and corridors. After reviewing the information provided, the Ohio Department of Natural Resources, Division of Wildlife (DOW) has the following comments.

The project is within the range of the Indiana bat (*Myotis sodalis*), a state and federally endangered species. The following species of trees have relatively high value as potential Indiana bat roost trees: Shagbark hickory (*Carya ovata*), Shellbark hickory (*Carya laciniosa*), Bitternut hickory (*Carya cordiformis),* Black ash (*Fraxinus nigra*), Green ash (*Fraxinus pennsylvanica*), White ash (*Fraxinus americana*), Shingle oak (*Quercus imbricaria*), Northern red oak (*Quercus rubra*), Slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), Eastern cottonwood (Populus deltoides), Silver maple (*Acer saccharinum*), Sassafras (*Sassafras albidum*), Post oak (*Quercus stellata*), and White oak (*Quercus alba*). Indiana bat habitat consists of suitable trees that include dead and dying trees of the species listed above with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees of the species listed above with exfoliating bark, cavities, or hollow areas formed from broken branches or tops. If suitable trees occur within the project area, these trees must be conserved. If suitable habitat occurs on the project area and trees must be cut, cutting must occur between September 30 and April 1. If suitable trees must be cut during the summer months of April 2 to September 29, a net survey must be conducted in May or June prior to cutting. If no tree removal is proposed, the project is not likely to impact this species.

ohiodnr.com

NR-0001

PAGE TWO
Barry S. Allen
December 22, 2009

The project is within the range of the piping plover (*Charadrius melodus*), a state and federally endangered bird species. This species does not nest in the state but only utilizes stopover habitat as they migrate through the region. Therefore, the project is not likely to have an impact on this species.

The project is within the range of the Eastern massasauga (*Sistrurus catenatus*), a state endangered and a federal candidate snake species. Due to the location of the project, the project is not likely to impact this species.

The project is within the range of the bald eagle (*Haliaeetus leucocephalus*), a state threatened species. The location of bald eagle activity frequently changes. Therefore, closer to the actual date of construction, the applicant must obtain an updated status of bald eagle activity in the area. To obtain any changes in status, contact Andrea Tibbels or Dave Sherman at the Ohio Department of Natural Resources, Division of Wildlife, Crane Creek Wildlife Research Station, for current information on the presence of bald eagles in the area. Andrea can be reached at (419) 898-0960 extension 25 and Dave at extension 24. If a nest is located within ½ mile of the project site, coordination with the DOW is required.

The project is within the range of the eastern pondmussel *(Ligumia nasuta*), a state endangered mussel, the spotted gar (*Lepisosteus oculatus*), a state endangered fish, and the blacknose shiner (*Notropis heterolepis*), a state endangered fish. Since no in-water work is proposed for this project, the project is not likely to impact these species.

The project is within the range of the American bittern (*Botaurus lentiginosus*), a state endangered bird, the black tern (*Chlidonias niger*), a state endangered bird, the cattle egret (*Bubulcus ibis*), a state endangered bird, the common tern (*Sterna hirundo*), a state endangered bird, the king rail (*Rallus elegans*), a state endangered bird, the loggerhead shrike (*Lanius ludovicianus*), a state endangered bird, the Northern harrier (*Circus cyaneus*), a state endangered bird, the snowy egret (*Egretta thula*), a state endangered species, the trumpeter swan (*Cygnus buccinator*), a state endangered bird. Due to the type of project proposed, the project is not likely to impact these species.

Otherwise, the Ohio Department of Natural Resources, Division of Wildlife, is not aware of any threatened or endangered species in the vicinity of this project. However, the Ohio Department of Natural Resources, Division of Natural Areas and Preserves maintains the Natural Heritage Database, the state's most comprehensive record of Ohio threatened and endangered species. If you have not already done so, it is recommended you contact the Division of Natural Areas and Preserves at (614) 265-6453. To process future projects more efficiently, I recommend you contact the Division of Natural Areas and Preserves prior to contacting the Division of Wildlife. To help expedite the process, please include the results of the Division of Natural Areas and Preserves' Natural Heritage Database request when contacting us regarding future projects.

PAGE THREE
Barry S. Allen
December 22, 2009

The Ohio Department of Natural Resources, Division of Wildlife is available to provide guidance on avoiding or minimizing impacts to any listed fauna and/or their habitat. If you should need further assistance, please feel free to contact Becky Jenkins at (614) 265-6631.

Sincerely,

JOHN NAVARRO
Program Administrator

JN/BJ/al

cc: Mr. Clifford I. Custer
Davis-Besse License Renewal Project manager
Mail Stop 3370
Davis-Besse Nuclear power Station
5501 N. State Route 2
Oak harbor, OH 43449

FENOC
FirstEnergy Nuclear Operating Company

5501 North State Route 2
Oak Harbor, Ohio 43449

Barry S. Allen
Vice President - Nuclear

419-321-7676
Fax: 419-321-7582

November 12, 2009
L-09-297

Mr. Greg Schneider
Group Manager
Ohio Natural Heritage Program
Ohio Department of Natural Resources
Division of Natural Areas and Preserves
2045 Morse Rd., Bldg. F-1
Columbus, OH 43229-6693

SUBJECT:
Request for Information on Threatened or Endangered Species

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Thank you for your attention to our request.

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Mr. Clifford I. Custer
Davis-Besse License Renewal Project Manager
Mail Stop 3370
Davis-Besse Nuclear Power Station
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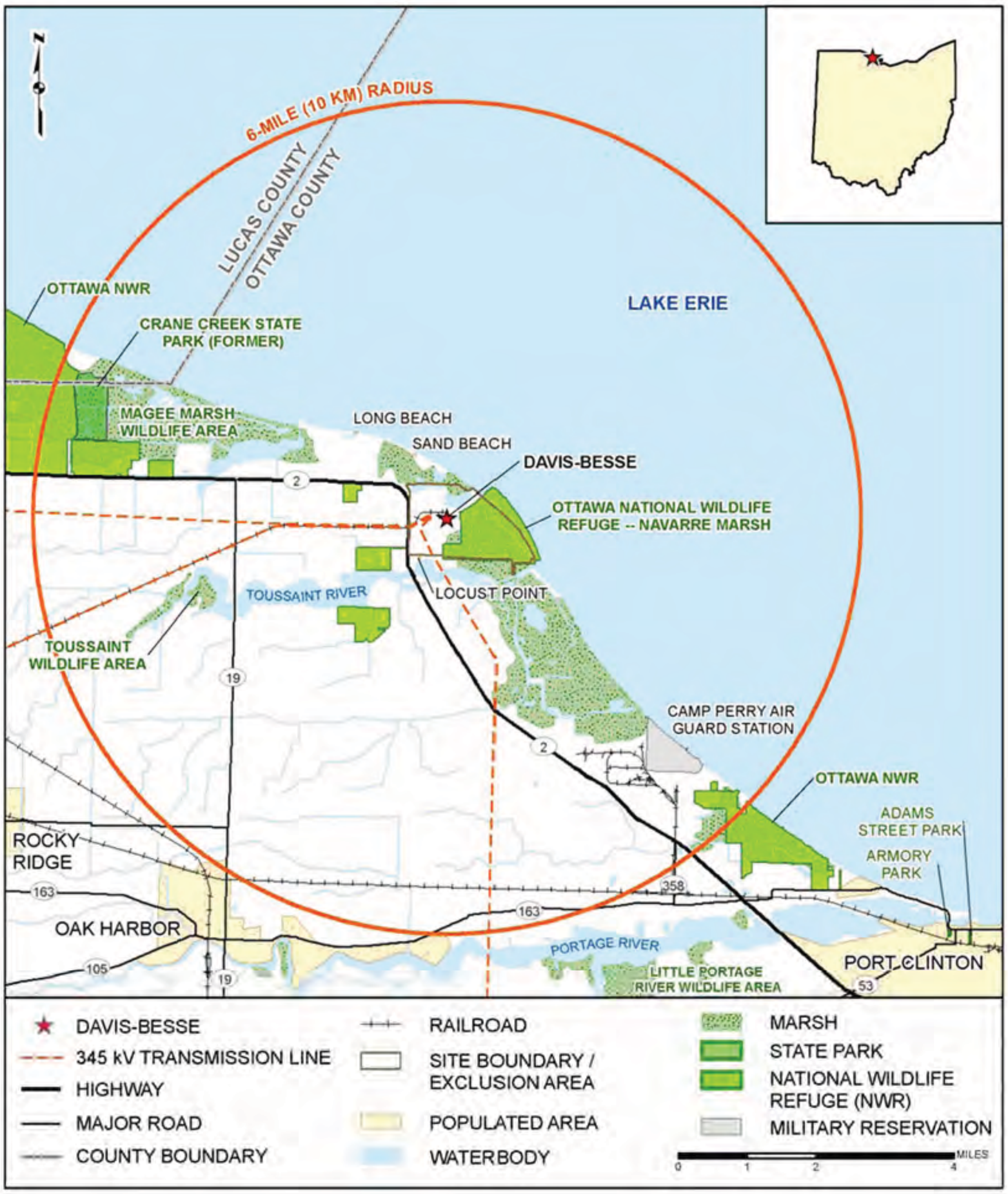
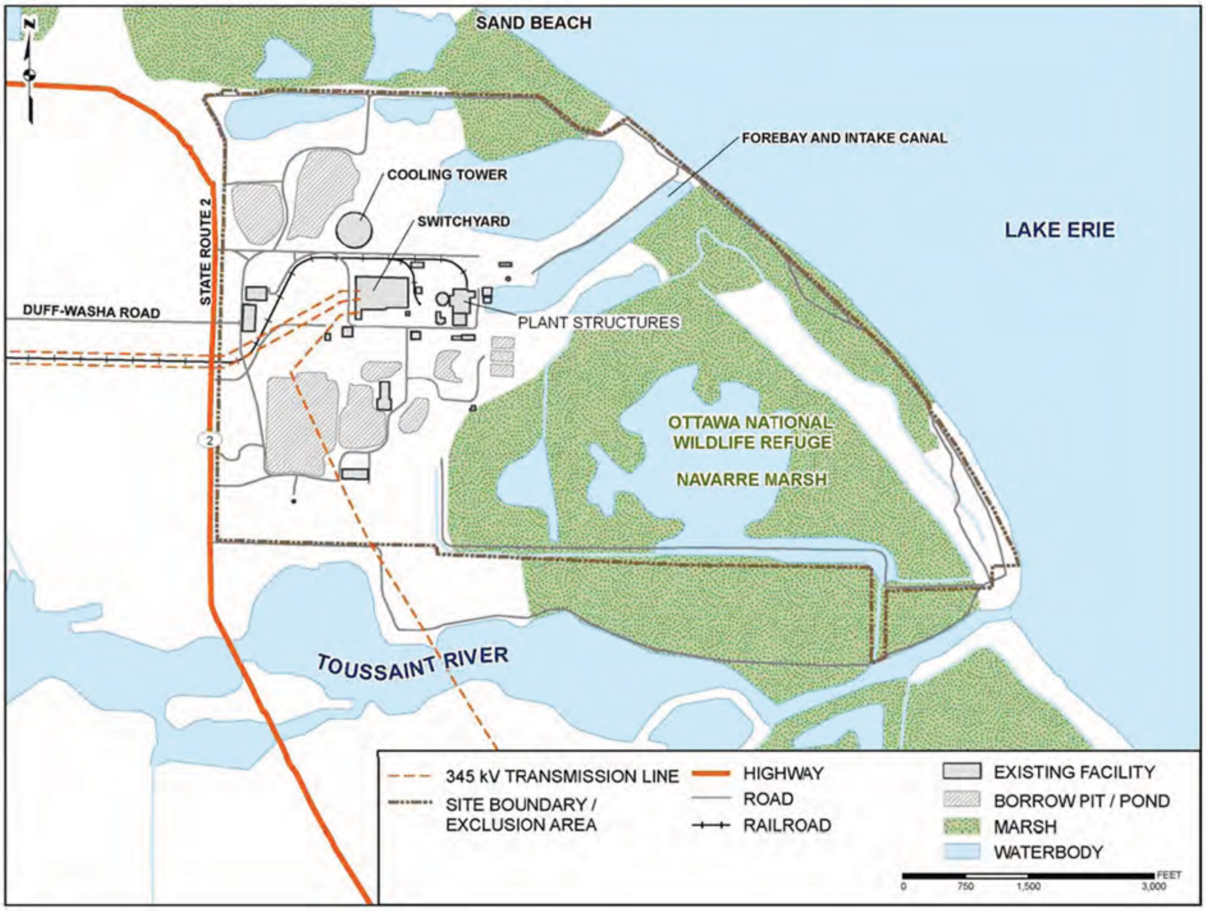
Attachment 1
L-09-297

Davis-Besse Nuclear Power Station
Area Map, 6-Mile Radius
Page 1 of 1



Attachment 2
L-09-297

Davis-Besse Nuclear Power Station Site Map
Page 1 of 1



Clifford I Custer/FirstEnergy
01/04/2010 08:14 AM

To Steven R. Dort/FirstEnergy@FirstEnergy
cc
bcc
Subject Fw: 09-0417; FENOC Davis-Besse License Renewal

"Mitch, Brian" <Brian.Mitch@dnr.state.oh.us>
12/22/2009 03:13 PM

To <custerc@firstenergycorp.com>
cc
Subject 09-0417; FENOC Davis-Besse License Renewal

ODNR COMMENTS TO Mr. Clifford I. Custer, Mail Stop 3370, Davis-Besse Nuclear Power Station, 5501 North State Route 2, Oak Harbor, Ohio

Project: The applicant, FirstEnergy Nuclear Operating Company, is preparing an application to the U.S. Nuclear Regulatory Commission to renew the operating license for the Davis-Besse Nuclear Power Station. As part of the license renewal process, the NRC requires license renewal applicants to assess the impact of the proposed action on threatened or endangered species.

Location: The site is located in sections 1, 2, and 6, Carroll Township, Ottawa County, Ohio.

The Ohio Department of Natural Resources (ODNR) has completed a review of the above referenced project. These comments were generated by an inter-disciplinary review within the Department. These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the National Environmental Policy Act, the Coastal Zone Management Act, Ohio Revised Code and other applicable laws and regulations. These comments are also based on ODNR's experience as the state natural resource management agency and do not supersede or replace the regulatory authority of any local, state or federal agency nor relieve the applicant of the obligation to comply with any local, state or federal laws or regulations.

Rare and Endangered Species: The ODNR, Division of Natural Areas and Preserves, Natural Heritage Database contains records of rare species near the site. The map included with this letter displays the locations of the records and corresponds to the attached list.

There are no state nature preserves, or scenic rivers in the vicinity of the sites. However, the site is near the Crane Creek State Park. The site is also near the Toussaint and MaGee Marsh Wildlife Areas.

Our inventory program has not completely surveyed Ohio and relies on information supplied by many individuals and organizations. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area.

Fish and Wildlife: The ODNR, Division of Wildlife (DOW) has the following comments.

The project is within the range of the Indiana bat (*Myotis sodalis*), a state and federally endangered species. Since no tree removal is proposed, the project is not likely to impact this species.

The project is within the range of the piping plover (*Charadrius melodus*), a state and federally endangered bird species. This species does not nest in the state but only utilizes stopover habitat as they migrate through the region.

Therefore, the project is not likely to have an impact on this species.

The project is within the range of the spotted gar (*Lepisosteus oculatus*), a state endangered fish, and the blacknose shiner (*Notropis heterolepis*), a state endangered fish. Since no in-water work is proposed for this project, the project is not likely to impact these species.

The project is within the range of the cattle egret (*Bubulcus ibis*), a state endangered bird, the loggerhead shrike (*Lanius ludovicianus*), a state endangered bird, the Northern harrier (*Circus cyaneus*), a state endangered bird, the snowy egret (*Egretta thula*), a state endangered species, and the trumpeter swan (*Cygnus buccinator*), a state endangered bird. Due to the type of project proposed, the project is not likely to impact these species.

The Natural Heritage Database has a record near the project area for the lake sturgeon (*Acipenser fulvescens*), a state endangered species, the Canada darner (*Aeshna canadensis*), a state endangered species, the Northern shoveler (*anas clypeata*), a state species of special interest, the green-winged teal (*Anas crecca*), a state species of special interest, the gadwall (*Anas strepera*), a state species of special interest, the redhead (*Aythya americana*), a state species of special interest, the upland sandpiper (*Bartramia longicauda*), a state threatened species, the American bittern (*Botaurus lentiginosus*), a state endangered species, the black tern (*Chlidonias niger),* a state endangered species, the sedge wren (*Cistothorus platensis*), a state species of concern, the Cisco (*Coregonus artedi*), a state endangered species, the lake whitefish (*Coregonus clupeaformis*), a state species of concern, the purple wartyback (*Cyclonaias tuberculata),* a state species of concern, the Eastern fox snake (*Elaphe vulpina gloydi*), a state species of concern, the Blanding's turtle (*Emydoidea blandingii*), a state species of concern, the bald eagle (*Haliaeetus leucocephalus*), a state threatened species, the least bittern (*Ixobrychus exilis*), a state threatened species, the Eastern pondmussel (*Ligumia nasuta*), a state endangered species, the black sandshell (*Ligumia recta*), a state threatened species, the melanistic garter snake (*Thamnophis sirtalis),* a state species of concern, the threehorn wartyback (*Obliquaria reflexa*), a state threatened species, the sora rail (*Porzana carolina*), a state species of concern, the king rail (*Rallus elegans*), a state endangered species, the Virginia rail (*Rallus limicola*), a state species of special concern, the common tern (*Sterna hirundo*), a state endangered species, the Western meadowlark (*Sturnella neglecta*), a state species of special interest, the fawnsfoot (*Truncilla donaciformis*), a state threatened species, and the deertoe (*Truncilla truncata*), a state species of concern. Since no new site disturbance is proposed, the project is not likely to impact these species.

Coastal Management: The ODNR, Office of Costal Management comments that, pursuant to the Coastal Zone Management Act of 1972, as amended, federal licenses or permits listed in the approved Ohio Coastal Management Program Document may not be issued until ODNR has determined that the activity is consistent with the program's enforceable policies. The following is listed as being subject to Federal Consistency reviews in the Ohio Coastal Management Program Document:

· Licensing and determination of the siting, construction and operation of nuclear generating stations, fuel storage, and processing centers pur-suant to the Atomic Energy Act of 1954, Title II of the Energy Reorgani-zation Act of 1974 and the National Environmental Policy Act of 1969.

In order to commence a Federal Consistency review, the following information must be received by ODNR:

1. A Federal Consistency Certification signed by the permit applicant (not an agent or representative)

2. A copy of the application for the federal license or permit and

    a. All material relevant to a State's management program provided to the Federal agency in support of the application; and

    b. To the extent not included in paragraphs (a)(1) or (a)(1)(i) of this section, a detailed description of the proposed activity, its associated facilities, the coastal effects, and any other information relied upon by the applicant to make its certification. Maps, diagrams, and technical data shall be submitted when a written description alone will not adequately describe the proposal;

3. Information specifically identified in the management program as required necessary data and information for an applicant's consistency certification. The management program as originally approved or amended (pursuant to 15 CFR part 923, subpart H) may describe data and information necessary to assess the consistency of federal license or permit activities. Necessary data and information may include completed State or local government permit applications which are required for the proposed activity, but shall not include the issued State or local permits. NEPA documents shall not be considered necessary data

and information when a Federal statute requires a Federal agency to initiate the CZMA federal consistency review prior to its completion of NEPA compliance. States shall not require that the consistency certification and/or the necessary data and information be included in NEPA documents. Required data and information may not include confidential and proprietary material; and

4. An evaluation that includes a set of findings relating the coastal effects of the proposal and its associated facilities to the relevant enforceable policies of the management program. Applicants shall demonstrate that the activity will be consistent with the enforceable policies of the management program. Applicants shall demonstrate adequate consideration of policies which are in the nature of recommendations. Applicants need not make findings with respect to coastal effects for which the management program does not contain enforceable or recommended policies.

A copy of a Federal Consistency Certification is attached.

ODNR appreciates the opportunity to provide these comments. Please contact Brian Mitch at (614) 265-6378 if you have questions about these comments or need additional information.

Brian Mitch, Environmental Review Manager
Ohio Department of Natural Resources
Environmental Services Section
2045 Morse Road, Building F-3
Columbus, Ohio 43229-6693
Office: (614) 265-6378
Fax: (614) 262-2197
brian.mitch@dnr.state.oh.us

oledata.mso Consistency Certification Statement.doc 09-0417_list.pdf 09-0417_inverts.pdf 09-0417_Verts.pdf 09-0417_plants.pdf
09-0417_ma.pdf

#09-0417 FENOC David-Besse License Renewal

Scientific Name	Common Name	State Status	Federal Status	Last Observed
Acipenser fulvescens	Lake Sturgeon	E		1997-05
Acorus americanus	American Sweet-flag	P		1971-08-03
Aeshna canadensis	Canada Darner	E		1997-09-27
Ammophila breviligulata	American Beach Grass	T		1970-09
Anas clypeata	Northern Shoveler	SI		1983-06-30
Anas crecca	Green-winged Teal	SI		1983-08-10
Anas strepera	Gadwall	SI		1983-08-10
Anas strepera	Gadwall	SI		1983-06-12
Arabis divaricarpa	Limestone Rock Cress	E		1973-05
Astragalus canadensis	Canada Milk-vetch	T		1968-08-27
Astragalus canadensis	Canada Milk-vetch	T		1979-07-11
Aythya americana	Redhead	SI		1984-07
Bartramia longicauda	Upland Sandpiper	T		1983-08
Botaurus lentiginosus	American Bittern	E		1977
Botaurus lentiginosus	American Bittern	E		1984-05
Botaurus lentiginosus	American Bittern	E		1977
Cakile edentula	Inland Sea Rocket	P		1979-09
Cakile edentula	Inland Sea Rocket	P		1997-07-15
Carex aquatilis	Leafy Tussock Sedge	P		1990-07
Carex atherodes	Wheat Sedge	P		1990-07
Carex bebbii	Bebb's Sedge	P		2004-08-26
Carex bebbii	Bebb's Sedge	P		2003-08-21
Chlidonias niger	Black Tern	E		1984-07-08
Chlidonias niger	Black Tern	E		1984-07-14
Cistothorus platensis	Sedge Wren	SC		1984-08

E=Endangered
FE=Federally Endangered
FT=Federally Threatened
P=Potentially Threatened
SC=Special Concern
SI=Special Interest
T=Threatened

Page 1 of 4

Scientific Name	Common Name	State Status	Federal Status	Last Observed
Cistothorus platensis	Sedge Wren	SC		197- (NO DATE
Coregonus artedi	Cisco	E		1976
Coregonus clupeaformis	Lake Whitefish	SC		1976 (NO DATE
Cyclonaias tuberculata	Purple Wartyback	SC		1977-06
Cyperus diandrus	Low Umbrella-sedge	P		2003-08-21
Cyperus diandrus	Low Umbrella-sedge	P		2004-08-26
Cyperus diandrus	Low Umbrella-sedge	P		1991-09-13
Cyperus schweinitzii	Schweinitz' Umbrella-sedge	T		1967-09
Cyperus schweinitzii	Schweinitz' Umbrella-sedge	T		2009-07-06
Elaphe vulpina gloydi	Eastern Fox Snake	SC		1980-06-24
Elaphe vulpina gloydi	Eastern Fox Snake	SC		1980-06
Elaphe vulpina gloydi	Eastern Fox Snake	SC		1980-08
Elaphe vulpina gloydi	Eastern Fox Snake	SC		1998-05-06
Elaphe vulpina gloydi	Eastern Fox Snake	SC		1980-07
Emydoidea blandingii	Blanding's Turtle	SC		1980-06
Emydoidea blandingii	Blanding's Turtle	SC		1997-05-16
Emydoidea blandingii	Blanding's Turtle	SC		1970-07
Emydoidea blandingii	Blanding's Turtle	SC		1980-06
Emydoidea blandingii	Blanding's Turtle	SC		1980-07
Euphorbia polygonifolia	Seaside Spurge	P		1979-09
Euphorbia polygonifolia	Seaside Spurge	P		1997-07-15
Euphorbia polygonifolia	Seaside Spurge	P		1990-08
Haliaeetus leucocephalus	Bald Eagle	T		2000-06
Haliaeetus leucocephalus	Bald Eagle	T		2000-06
Haliaeetus leucocephalus	Bald Eagle	T		2000-06
Haliaeetus leucocephalus	Bald Eagle	T		2000-06

E=Endangered FT=Federally Threatened SC=Special Concern T=Threatened
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Scientific Name	Common Name	State Status	Federal Status	Last Observed
Haliaeetus leucocephalus	Bald Eagle	T		2000-06
Haliaeetus leucocephalus	Bald Eagle	T		2000-06
Haliaeetus leucocephalus	Bald Eagle	T		2000-06
Ixobrychus exilis	Least Bittern	T		1984-06-03
Ixobrychus exilis	Least Bittern	T		1983-08-10
Ligumia nasuta	Eastern Pondmussel	E		1978-07
Ligumia nasuta	Eastern Pondmussel	E		1978-07-08
Ligumia nasuta	Eastern Pondmussel	E		1968-07
Ligumia recta	Black Sandshell	T		1978-07-17
Ligumia recta	Black Sandshell	T		1978-07
Melanistic garter snake	Thamnophis Sirtalis	SC		1980-06-24
Melanistic garter snake	Thamnophis Sirtalis	SC		1980-06
Melanistic garter snake	Thamnophis Sirtalis	SC		1980-06
Nuphar variegata	Bullhead-lily	E		2003-08-21
Nuphar variegata	Bullhead-lily	E		2004-08-26
Obliquaria reflexa	Threehorn Wartyback	T		1977-06
Obliquaria reflexa	Threehorn Wartyback	T		1968-07
Obliquaria reflexa	Threehorn Wartyback	T		1978-07-08
Oenothera oakesiana	Oakes' Evening-primrose	P		2003-08-21
Oenothera parviflora	Small-flowered Evening-primrose	P		2003-08-21
Panicum tuckermanii	Tuckerman's Panic Grass	T		1991-09-13
Panicum tuckermanii	Tuckerman's Panic Grass	T		1991-09-13
Phragmites australis ssp. americanus	American Reed Grass	T		2003-08-21
Porzana carolina	Sora Rail	SC		1984-06
Porzana carolina	Sora Rail	SC		1984-06
Potamogeton natans	Floating Pondweed	P		1980-07

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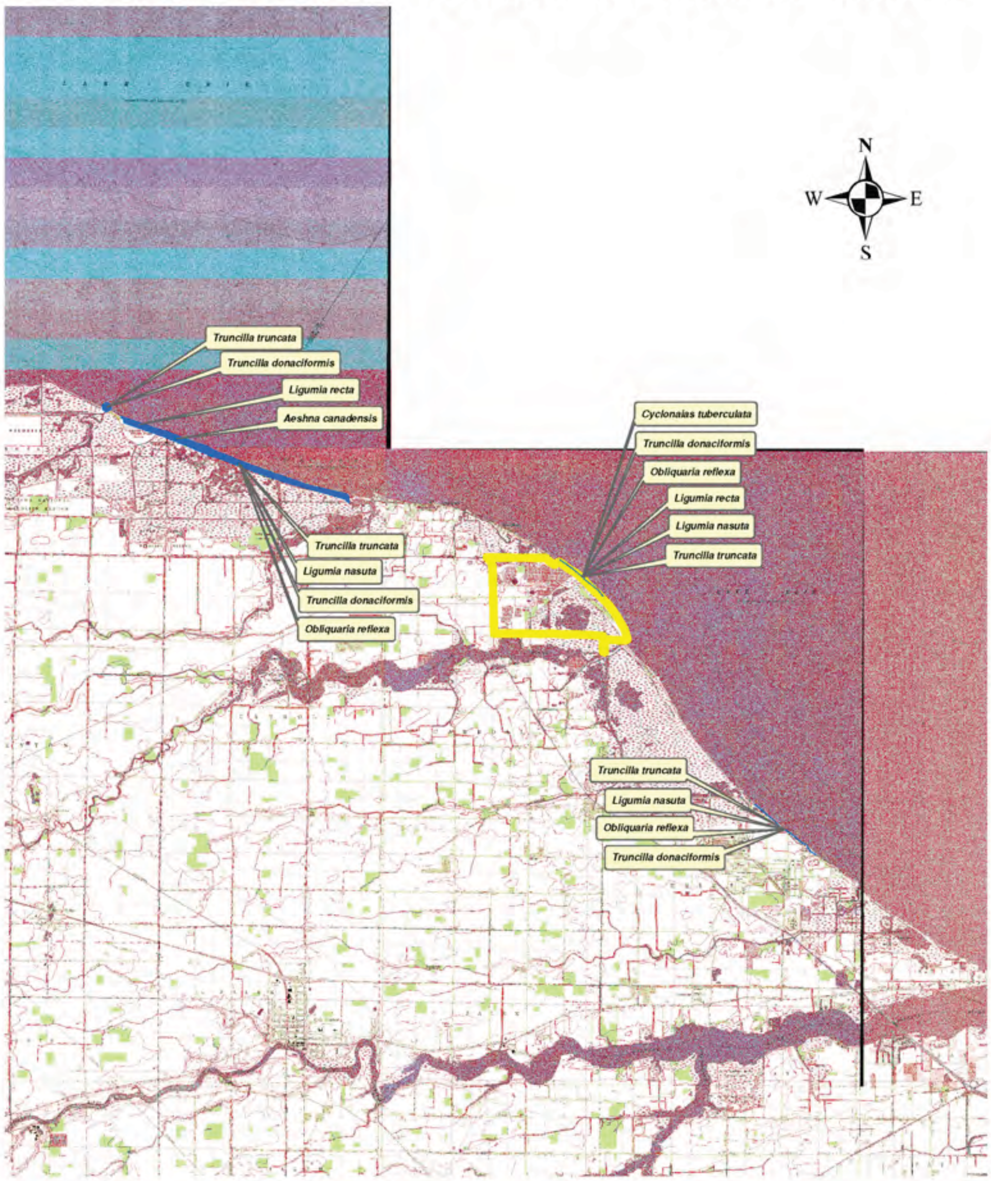
Scientific Name	Common Name	State Status	Federal Status	Last Observed
Potamogeton zosteriformis	Flat-stemmed Pondweed	P		2003-08-21
Potentilla paradoxa	Bushy Cinquefoil	T		1970-09
Rallus elegans	King Rail	E		1984-06
Rallus elegans	King Rail	E		1983-07
Rallus limicola	Virginia Rail	SC		1983-08
Sagittaria cuneata	Wapato	T		2004-08-26
Sagittaria cuneata	Wapato	T		1998-08-18
Sagittaria montevidensis	Southern Wapato	P		2005-07-27
Sagittaria montevidensis	Southern Wapato	P		1968-08-27
Sagittaria rigida	Deer's-tongue Arrowhead	P		1998-08-12
Sagittaria rigida	Deer's-tongue Arrowhead	P		1998-08-04
Sagittaria rigida	Deer's-tongue Arrowhead	P		2009-09-25
Sagittaria rigida	Deer's-tongue Arrowhead	P		2003-08-21
Sterna hirundo	Common Tern	E		2003
Sterna hirundo	Common Tern	E		2003
Sturnella neglecta	Western Meadowlark	SI		1997-05-18
Triplasis purpurea	Purple Sand Grass	P		2009-08-21
Triplasis purpurea	Purple Sand Grass	P		1968-09
Truncilla donaciformis	Fawnsfoot	T		1966-05
Truncilla donaciformis	Fawnsfoot	T		1977-06
Truncilla donaciformis	Fawnsfoot	T		1968-07
Truncilla donaciformis	Fawnsfoot	T		1978-07-08
Truncilla truncata	Deertoe	SC		1966-05
Truncilla truncata	Deertoe	SC		1977-06
Truncilla truncata	Deertoe	SC		1978-07-08
Truncilla truncata	Deertoe	SC		1968-07

E=Endangered FE=Federally Endangered FT=Federally Threatened P=Potentially Threatened SC=Special Concern SI=Special Interest T=Threatened

Page 4 of 4

#09-0417 FENOC David-Besse License Renewal



Miles
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Butch Grieszmer, Natural Heritage Program

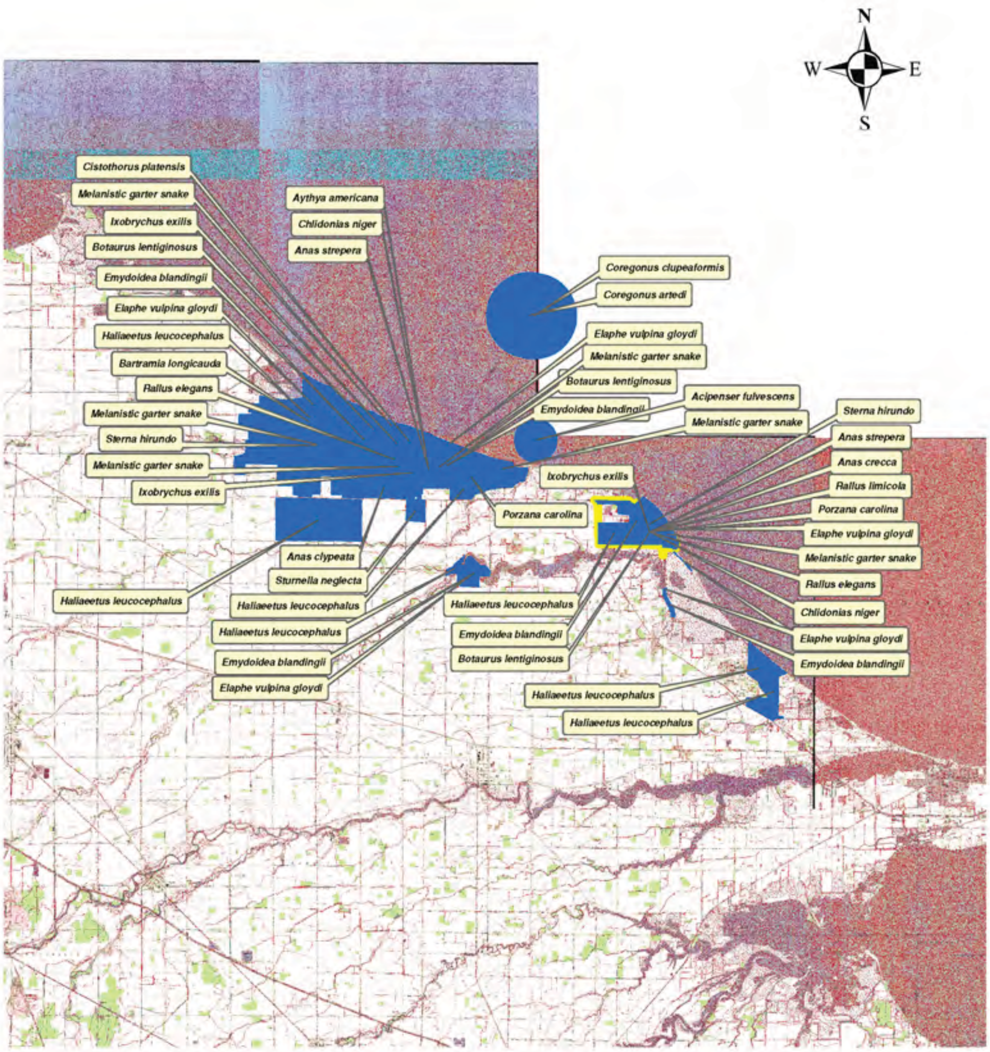
11/24/2009

Legend

Invertebrates

09-0417

#09-0417 FENOC David-Besse License Renewal



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Butch Grieszmer, Natural Heritage Program

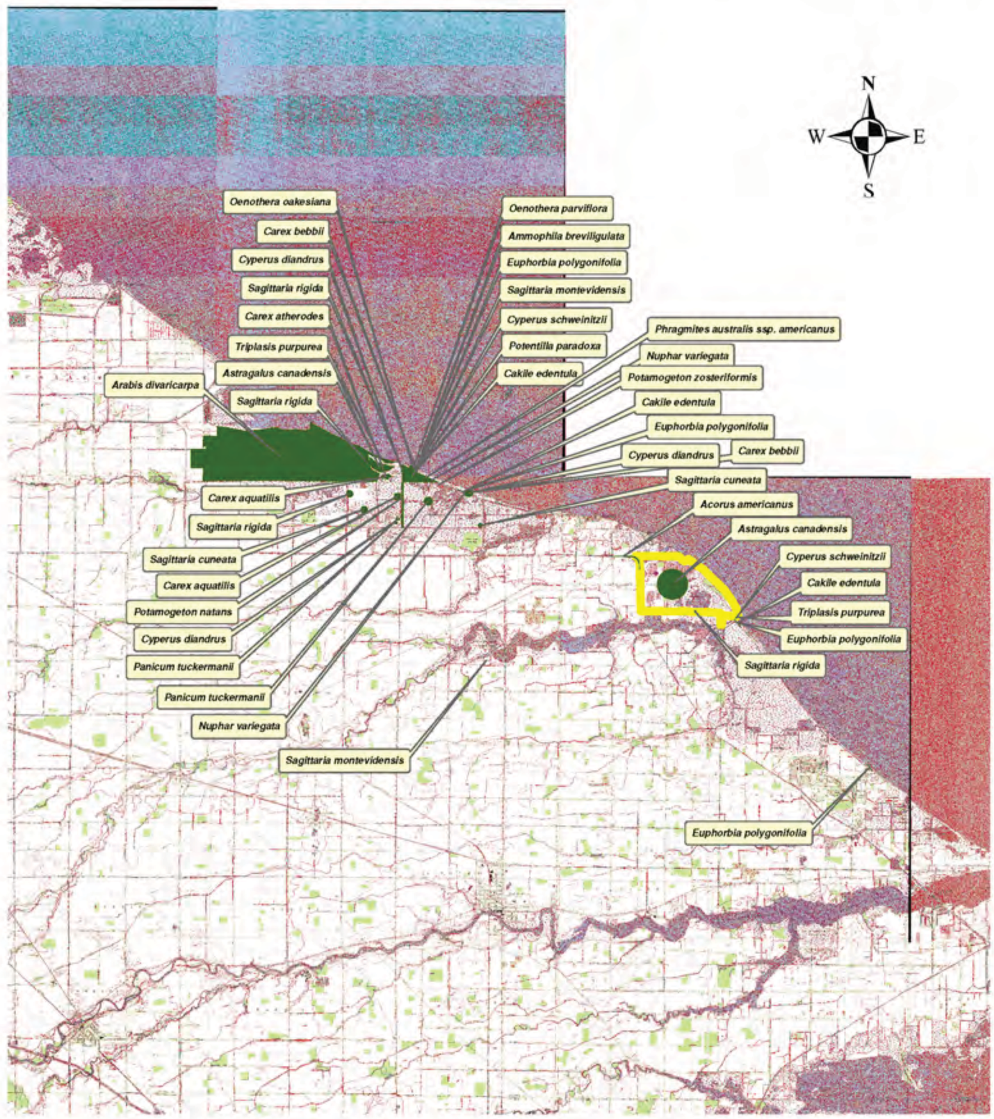
11/24/2009

Legend

Vertebrates

09-0417

#09-0417 FENOC David-Besse License Renewal



Miles
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Butch Grieszmer, Natural Heritage Program

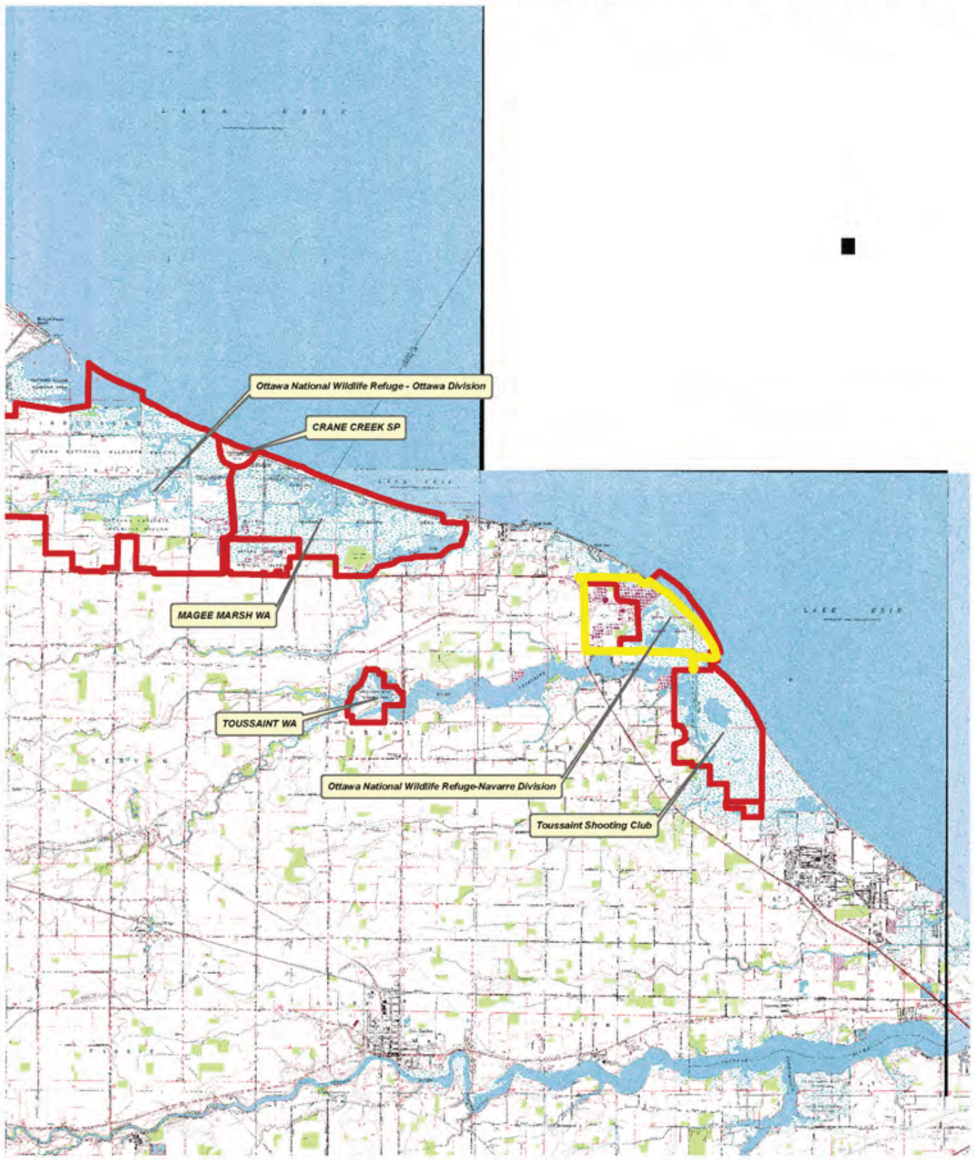
OHIO DEPARTMENT OF NATURAL RESOURCES
Natural Areas

11/24/2009

Legend

Plants
09-0417

#09-0417 FENOC David-Besse License Renewal



Miles

0 0.5 1 2 3 4

Butch Grieszmer, Natural Heritage Program

OHIO Department of Natural Resources Natural Areas

11/24/2009

Legend

09-0417

Managed Areas

Ohio Coastal Management Program Consistency Certification Statement

I, ______________________________, do certify that the proposed activity complies with the enforceable policies of Ohio's approved coastal management program and will be conducted in a manner consistent with such program (16 U.S.C. § 1456 and O.R.C. §1506.03).

Address: ______________________________

City: ____________________ State: __________ Zip Code: __________

Telephone Number: (_____) ______________________________

Applicant's Signature: ______________________________ Date: __________

Project Name/Description: ______________________________

____

Please list all local, State, and Federal permits, licenses, leases, and/or other authorizations required for this project:

1)
2)
3)
4)
5)

Please submit an original copy of this document signed by the <u>applicant</u> (not an agent or representative) with your Federal permit application or submit to:

Federal Consistency Coordinator
Ohio Department of Natural Resources
Office of Coastal Management
105 West Shoreline Drive
Sandusky, Ohio 44870

FENOC
FirstEnergy Nuclear Operating Company

5501 North State Route 2
Oak Harbor, Ohio 43449

Barry S. Allen
Vice President - Nuclear

419-321-7676
Fax 419-321-7582

November 12, 2009
L-09-300

Mr. Steven Holland, MPA
Coastal Network Section Manager
Federal Consistency Coordinator
Ohio Department of Natural Resources
Office of Coastal Management
105 W. Shoreline Drive
Sandusky, OH 44870

SUBJECT:
Coastal Zone Management (CZM) Consistency Certification

FirstEnergy Nuclear Operating Company (FENOC) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for the Davis-Besse Nuclear Power Station (Davis-Besse). If approved, the renewal term would be for an additional 20 years beyond the original Davis-Besse license expiration date in 2017.

The Federal Coastal Zone Management Act (16 USC 1451, et seq.) imposes requirements on an applicant for a Federal license to conduct an activity that could affect a state's coastal zone. The Act requires an applicant to certify to the licensing agency that the proposed action would be consistent with the state's federally approved coastal zone management program. The Act also requires the applicant to provide to the state a copy of the certification statement and requires the state, at the earliest practicable time, to notify the federal agency and the applicant whether the state concurs with, or objects to, the consistency certification (16 USC 1456(c)(3)(A)). By contacting you early in the application process, FENOC wishes to identify any potential issues that need to be addressed or information that your office may require to expedite its review.

Davis-Besse is located on the southwestern shore of Lake Erie in Ottawa County, Ohio (Attachment 1). Coordinates for the station are 41° 35' 49" north Latitude and 83° 05' 16" west Longitude. The site consists of 954 acres, of which approximately 733 acres are marshland that is leased to the U.S. Government as a national wildlife refuge (Attachment 2).

FENOC has no plans to alter current Davis-Besse operations over the 20-year license renewal period. In addition, maintenance activities necessary to support license

Davis-Besse Nuclear Power Station
L-09-300
Page 2

renewal would be limited to previously disturbed areas on site. License renewal at Davis-Besse would require neither the expansion of existing facilities nor additional land disturbance. As a result, FENOC is confident that continued operation of Davis-Besse during the license renewal period would be consistent with the policies of the Ohio CZM program.

To ensure that impacts are adequately addressed, FENOC requests information from your office regarding concerns you may have, if any, related to renewal of the Davis-Besse facility operating license. FENOC would appreciate receiving a letter in reply detailing any concerns you may have or confirmation that no concerns exist and that a renewed operating license is consistent with the policies of the CZM program. Receipt of your reply by December 31, 2009, will provide us the time needed to evaluate and incorporate the information into our application.

Thank you for your attention to our request.

Please feel free to contact Mr. Clifford Custer, Davis-Besse License Renewal Project Manager, at 724-682-7139. Please address any questions or need for additional information about the environmental review to:

Mr. Clifford I. Custer
Davis-Besse License Renewal Project Manager
Mail Stop 3370
Davis-Besse Nuclear Power Station
5501 N. State Route 2
Oak Harbor, OH 43449

Telephone: 724-682-7139
Email: custerc@firstenergycorp.com

Sincerely,

Barry S. Allen

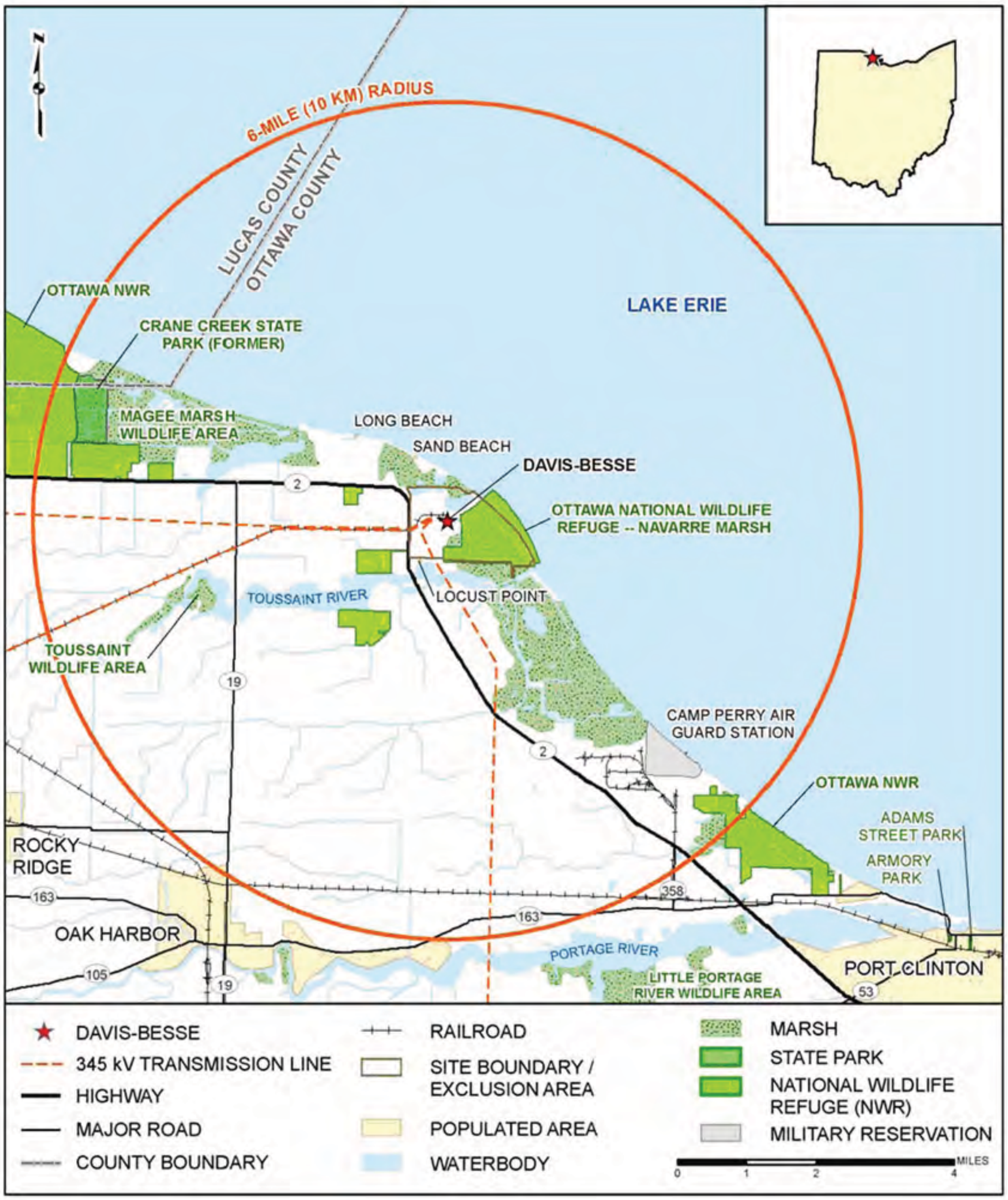
Barry S. Allen

Attachments:
1. Davis-Besse Nuclear Power Station Area Map, 6-Mile Radius
2. Davis-Besse Nuclear Power Station Site Map

cc: DB-1 NRC Senior Resident Inspector

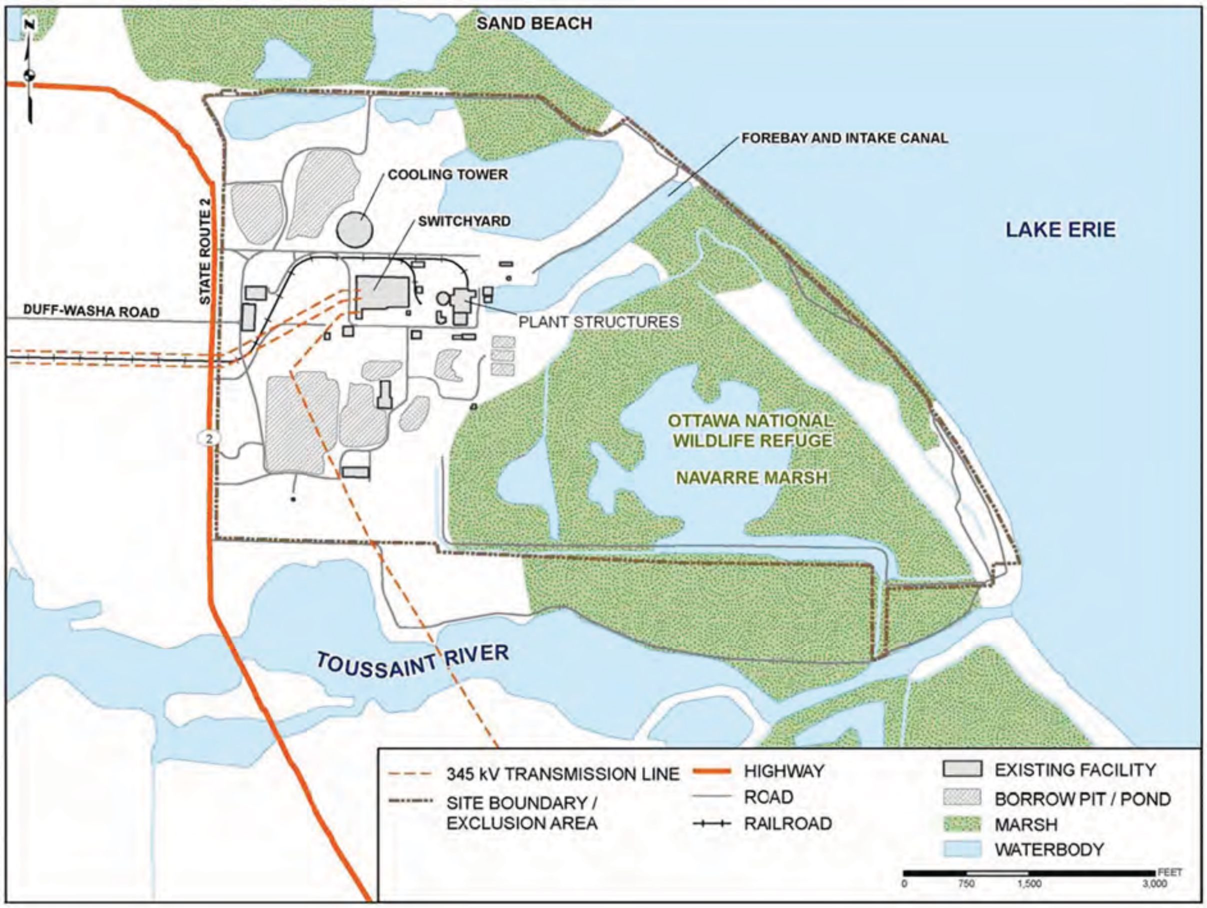
Attachment 1
L-09-300

Davis-Besse Nuclear Power Station
Area Map, 6-Mile Radius
Page 1 of 1



Attachment 2
L-09-300

Davis-Besse Nuclear Power Station Site Map
Page 1 of 1



FENOC
FirstEnergy Nuclear Operating Company

5501 North State Route 2
Oak Harbor, Ohio 43449

Barry S. Allen
Vice President - Nuclear

419-321-7676
Fax: 419-321-7582

November 12, 2009
L-09-299

Mr. Mark J. Epstein
Department Head
Resource Protection and Review
Ohio Historic Preservation Office
1982 Velma Avenue
Columbus, OH 43211-2497

SUBJECT:
Request for Information on Archaeological and Historic Resources

FirstEnergy Nuclear Operating Company (FENOC) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for the Davis-Besse Nuclear Power Station (Davis-Besse). If approved, the renewal term would be for an additional 20 years beyond the original Davis-Besse license expiration date in 2017.

As part of the license renewal process, the NRC requires (10 CFR 51.53(c)(3)(ii)(K)) license renewal applicants to assess whether any historic or archaeological properties will be affected by the proposed project. The NRC also may request, under Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470), and Federal Advisory Council on Historic Preservation regulations (36 CFR 800), an informal consultation with your office at a later date. By contacting you early in the application process, FENOC wishes to identify any potential issues that need to be addressed or information that your office may require to expedite the NRC consultation.

Davis-Besse is located on the southwestern shore of Lake Erie in Ottawa County, Ohio (Attachment 1). Coordinates for the station are 41º 35' 49" north Latitude and 83º 05' 16" west Longitude. The site consists of 954 acres, of which approximately 733 acres are marshland that is leased to the U.S. Government as a national wildlife refuge (Attachment 2). Approximately 100 miles of transmission lines were constructed to connect the station to the regional electric grid.

Based on consultation with the Ohio Historical Society prior to construction, there are no known deposits of archaeological interest on the site. A recent query of the Ohio Historic Preservation Office's Online Mapping System conducted for a 6-mile radius around the site identified 378 previously recorded cultural resources. This number includes buildings, archaeological sites, cemeteries, churches, and other structures.

Davis-Besse Nuclear Power Station
L-09-299
Page 2

Resource types range from a historic military base with many contributing structures to archaeological sites and individual architectural resources. One resource, a historic-period site (OT0025), appears to be located at the extreme southeastern corner of the station property. Only one resource was listed in the National Register of Historic Places, the Carroll Township Hall, located about 3.2 miles to the southwest of the Davis-Besse site.

FENOC has no plans to alter current Davis-Besse operations over the 20-year license renewal period. In addition, maintenance activities necessary to support license renewal would be limited to previously disturbed areas on site. License renewal at Davis-Besse would require neither the expansion of existing facilities nor additional land disturbance. As a result, FENOC is confident that continued operation of Davis-Besse during the license renewal period would have minimal impact on any archaeological or historic resources.

To ensure that impacts are adequately addressed, FENOC requests information from your office regarding concerns you may have, if any, related to potential impacts to listed archaeological and cultural resources from continued operation of Davis-Besse. FENOC would appreciate receiving a letter in reply detailing any concerns you may have or confirmation that no concerns exist. Receipt of your reply by December 31, 2009, will provide us the time needed to evaluate and incorporate the information into our license renewal application.

Thank you for your attention to our request.

Please feel free to contact Mr. Clifford Custer, Davis-Besse License Renewal Project Manager, at 724-682-7139. Please address any questions or need for additional information about the environmental review to:

Mr. Clifford I. Custer
Davis-Besse License Renewal Project Manager
Mail Stop 3370
Davis-Besse Nuclear Power Station
5501 N. State Route 2
Oak Harbor, OH 43449

Telephone: 724-682-7139
Email: custerc@firstenergycorp.com

Sincerely,

Barry S. Allen

Barry S. Allen

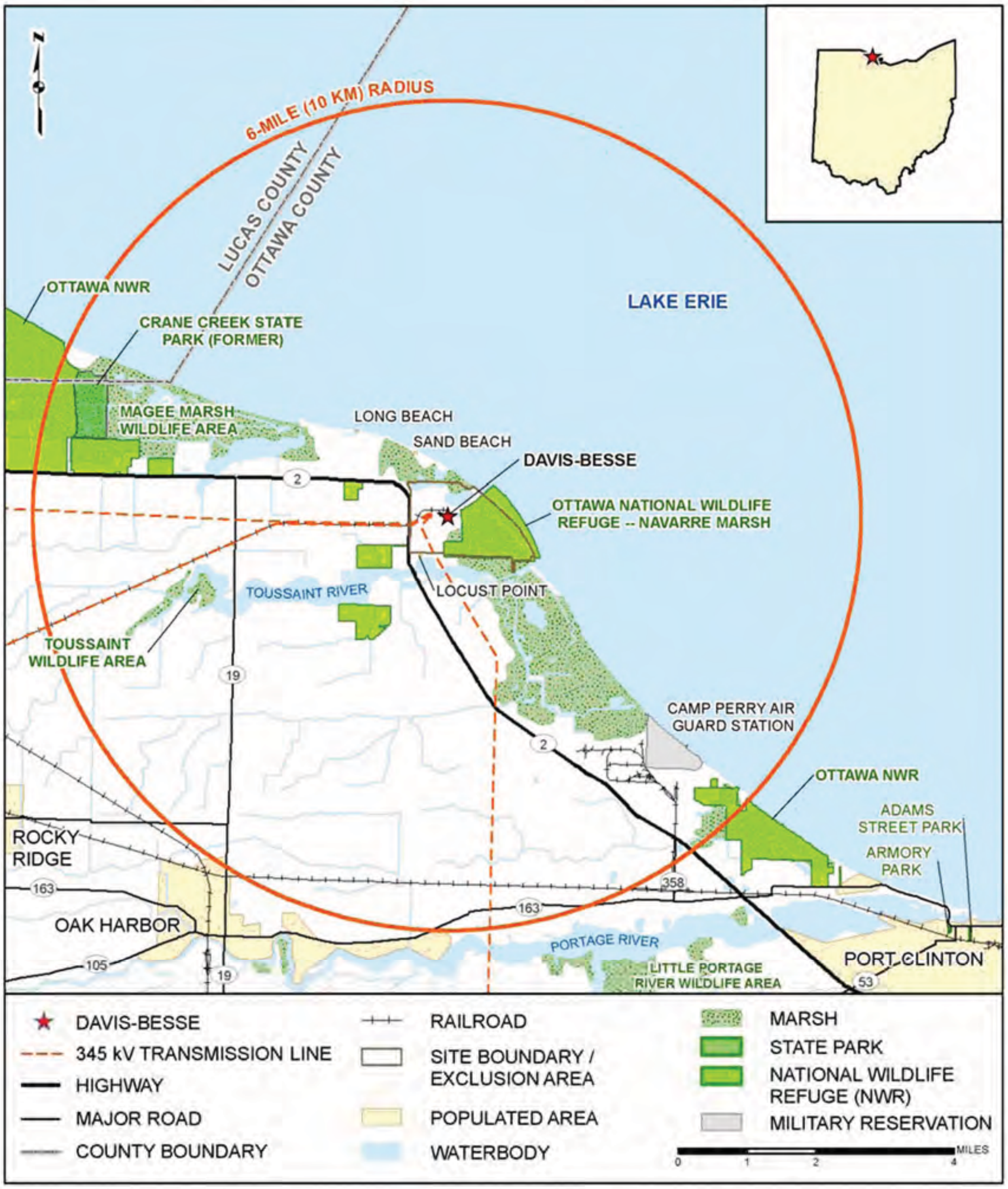
Davis-Besse Nuclear Power Station
L-09-299
Page 3

Attachments:
1. Davis-Besse Nuclear Power Station Area Map, 6-Mile Radius
2. Davis-Besse Nuclear Power Station Site Map

cc: DB-1 NRC Senior Resident Inspector

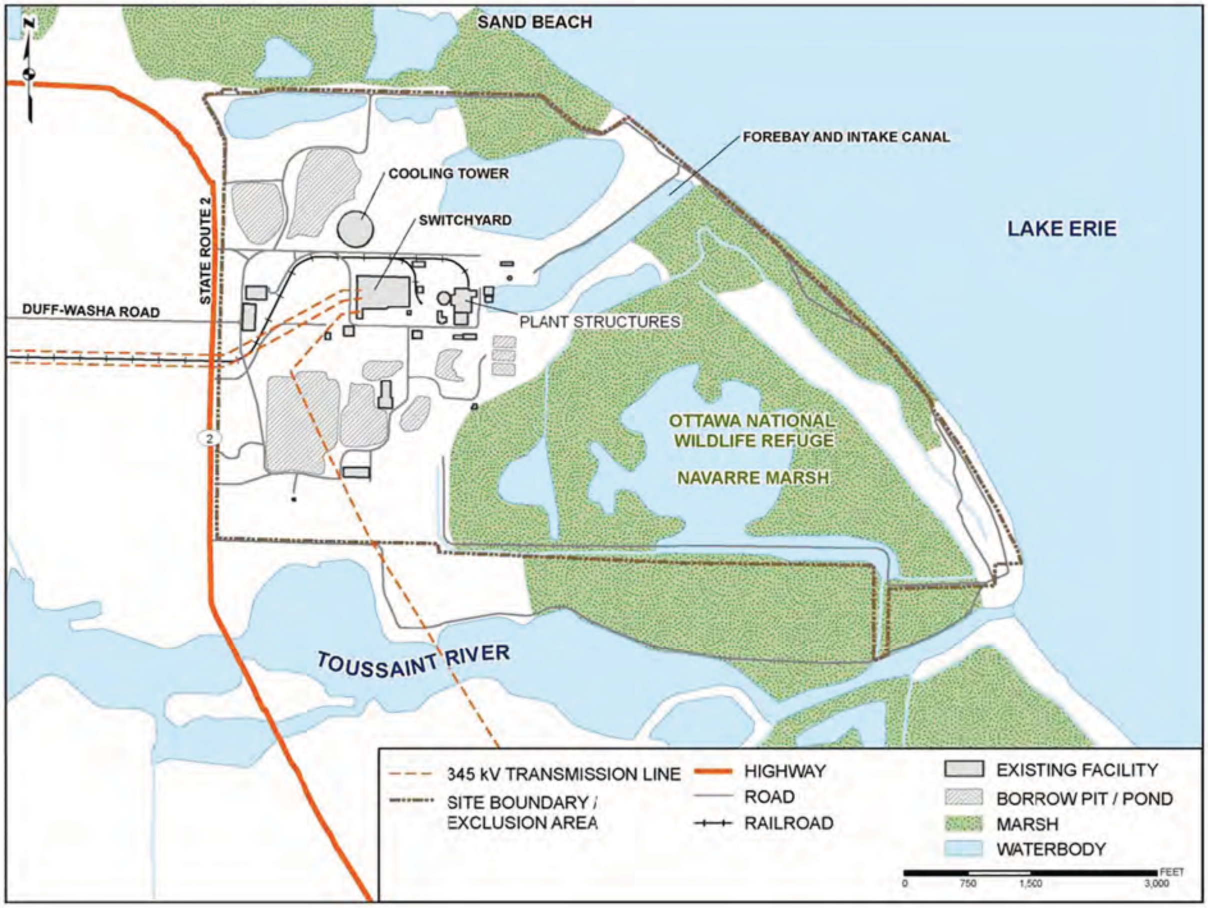
Attachment 1
L-09-299

Davis-Besse Nuclear Power Station
Area Map, 6-Mile Radius
Page 1 of 1



Attachment 2
L-09-299

Davis-Besse Nuclear Power Station Site Map
Page 1 of 1



OHIO HISTORY

March 23, 2010

Clifford I. Custer
Davis-Besse License Renewal Project Manager
Mail Stop 3370
Davis-Besse Nuclear Power Station
5501 N. State Route 2
Oak Harbor, Ohio 43449

Dear Mr. Custer:

Re: Davis-Besse Nuclear Power Station Renewal, Ottawa County, Ohio

This is in response to correspondence, received on November 16, 2009 regarding the renewal of the operating license for the Davis-Besse Nuclear Power Station in Ottawa County, Ohio. My comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, and the associated regulations at 36 CFR Part 800.

Based on the limited information included in your submission, the proposed license renewal, as the only action being reviewed, does not appear to have a high probability effecting historic properties. It is my opinion that the proposed license renewal will not affect historic properties.

No further coordination with this office is necessary unless there is a change in the project. Additionally, any future improvements or earthmoving activities at the Davis-Besse facility requiring review under the regulations at 36 CFR 800 will need to be coordinated with this office. If new or additional historic properties are discovered during implementation of this project, this office should be notified as required by 36 CFR 800.13.

If you have any questions regarding this matter, please call me, at (614) 298-2000. Thank you for your cooperation.

Sincerely,

Nathan J. Young

Nathan J. Young, Project Reviews Manager
Resource Protection and Review

OHIO HISTORICAL SOCIETY
Ohio Historic Preservation Office
1982 Velma Avenue, Columbus, Ohio 43211-2497 ph: 614.298.2000 fx: 614.298.2037
www.ohiohistory.org

1029497

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Attachment

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COA TA ONE ANA E ENT CON TENC

This certification documents the FirstEnergy Nuclear Operating Company (FENOC) determination that U.S. Nuclear Regulatory Commission (NRC) renewal of the Davis-Besse Nuclear Power Station (Davis-Besse) operating license would be consistent with enforceable policies of the approved Ohio Coastal Management Program.

FENOC has patterned this certification after the example included as Appendix E to NRC, Nuclear Reactor Regulation Office, nstruction No. L C-203, Revision 1 (N C 200). The certification describes background requirements, the proposed action, (i.e., license renewal), anticipated environmental impacts, Ohio enforceable coastal resource protection policies and Davis-Besse compliance status, and summary findings.

Ohio Coastal Management Program
Consistency Certification Statement

I, Barry S. Allen, do certify that the proposed activity complies with the enforceable policies of Ohio's approved coastal management program and will be conducted in a manner consistent with such program (16 U.S.C. § 1456 and O.R.C. §1506.03).

Address: Davis-Besse Nuclear Power Station, 5501 N. State Route 2

City: Oak Harbor State: OH Zip Code: 43449

Telephone Number: (419) 321 - 7676

Applicant's Signature: [Signature on file] Date: ____________

Project Name/Description: Davis-Besse Nuclear Power Station License Renewal / Submittal of a License Renewal Application to the U.S. Nuclear Regulatory Commission to renew the Davis-Besse Facility Operating License for an additional 20 years beyond the original license expiration date in 2017

Please list all local, State, and Federal permits, licenses, leases, and/or other authorizations required for this project:

1) Please refer to the Davis-Besse License Renewal Application, Appendix E, "Applicant's Environmental Report — Operating License Renewal Stage," Attachment D, "Coastal Zone Management Consistency," Table D-2, "Environmental Authorizations for Davis-Besse Operation."
2)
3)
4)

Please submit an original copy of this document signed by the <u>applicant</u> (not an agent or representative) with your Federal permit application or submit to:

Federal Consistency Coordinator
Ohio Department of Natural Resources
Office of Coastal Management
105 West Shoreline Drive
Sandusky, Ohio 44870

.1 NECE A ATA AN NFO AT ON

.1.1 TAT TO BAC O N

The Federal Coastal one Management Act (16 USC 1451 et seq.) imposes requirements on an applicant for a Federal license to conduct an activity that could affect a state s coastal zone. The Act requires an applicant to certify to the licensing agency that the proposed action would be consistent with the state s federally approved coastal zone management program. The Act also requires the applicant to provide to the state a copy of the certification statement and requires the state, at the earliest practicable time, to notify the federal agency and the applicant whether the state concurs with, or ob ects to, the consistency certification. See 16 USC 1456(c)(3)(A).

The National Oceanic and Atmospheric Administration (NOAA) has promulgated implementing regulations that indicate the certification requirement is applicable to renewal of federal licenses for activities not previously reviewed by the state 15 CFR 930.51(b)(1) . NOAA approved the Ohio coastal zone management program in May 1997. n Ohio, the approved program is the Ohio Coastal Management Program (OCMP), which was authorized by the Ohio General Assembly passage of the Ohio Coastal Management Law in 1988. (O N 200 b)

Ohio has a networked coastal management program, which means the program is based on several different state authorities. The Ohio Department of Natural Resources (ODNR) serves as the lead agency (O N 200 b). The Coastal Management Program Document describes the ma or components of the program and has been updated several times to reflect changes in Ohio Revised and Administrative codes, and organizational changes. The document was most recently updated and federal re-approved in April 2007. (NOAA 2007)

The OCMP does not affect all activities and pro ects in the coastal area. Only those activities considered to have a direct and significant impact on the coastal lands, waters and resources are identified as managed activities. Consequently, of the 41 policies in the OCMP, all or portions of 30 policies are enforceable. The remaining 11 polices are enhancement policies. The polices are enforced pursuant to Ohio Revised Code, Title 15, Conservation of Natural Resources, Chapter 1506, Coastal one (O.R.C. 1506).

Table D-1 lists the enforceable policies of the OCMP and discusses for each the applicability to Davis-Besse and, where applicable, the FENOC basis for certifying consistency. Table D-2 provides a list of all certifications, permits, and authorizations for current operation of Davis-Besse.

.1.2 O O E ACT ON

FENOC is applying to the NRC for renewal of the Davis-Besse license to operate for an additional 20 years beyond the current expiration date of April 22, 2017. FENOC expects Davis-Besse operations during the license renewal term to be a continuation of current operations as described in the following paragraphs, with no changes that would affect the Ohio coastal zone. FENOC certifies that license renewal complies with the enforceable program policies of the Ohio approved coastal management program and that continued plant operation will be conducted in a manner consistent with such policies.

.1. BAC O N NFO AT ON

Davis-Besse is located on the southwestern shore of Lake Erie in Ottawa County, Ohio. Nearby communities include Oak Harbor approximately 8 miles southeast, Fremont 16 miles south, and Toledo 24 miles west northwest.

The site consists of 954 acres, of which approximately 733 acres are marshland that is leased to the U.S. Government as a national wildlife refuge. To the west is the main unit of the Ottawa National Wildlife Refuge and the State of Ohio Magee Marsh Wildlife Area. On the southern boundary is the Toussaint River, which empties into Lake Erie 700 feet from the lake shoreline site boundary. The land area surrounding the site is generally agricultural with no ma or industry in the vicinity.

Davis-Besse is a single-unit plant with a pressurized water reactor and turbine generator licensed for an output of 2,817 megawatts-thermal (MWt), and an electric rating of 908 megawatts-electric (MWe) gross. The plant employs a closed-cycle circulating water system that withdraws water from and discharges water to Lake Erie in accordance with a state-issued National Pollutant Discharge Elimination System (NPDES) discharge permit. Heat is re ected from the main condenser via a natural draft hyperbolic cooling tower, whose blowdown and service water discharge to the lake via a submerged et. The discharge permit also encompasses storm water runoff and effluent from an onsite wastewater treatment plant.

Three high-voltage transmission lines were built to connect Davis-Besse to Toledo Edison (a FirstEnergy transmission company) transmission 345 k substations. The transmission lines occupy rights of way of approximately 1,800 acres, primarily flat agricultural land, with routine vegetation maintenance of the transmission line corridors approximately every five years. Maintenance includes removal or pruning of woody vegetation as necessary to ensure adequate line clearance (no less than 30 feet from the conductor for transmission lines operated above 138 k) and to allow vehicular access for maintenance.

FENOC employs approximately 885 employees and contractor employees at Davis-Besse. Approximately 88% reside in the four contiguous counties of Ottawa, Lucas, Wood, and Sandusky. During refueling outages, which occur about every two years and average about 48 days in length, site employment is supplemented with the addition of an average 1,300 temporary workers.

.2 EN ON ENTA ACT

.2.1 BAC O N NFO AT ON

The NRC has prepared a Generic Environmental mpact Statement (N C 1) on impacts that nuclear power plant license renewal could have on the environment and has codified its findings (10 CFR Part 51, Subpart A, Appendix B, Table B-1). The codification identified 92 potential environmental issues, 69 of which the NRC identified as having small impacts and termed Category 1 issues. The NRC defines SMALL as:

> *SMALL – For the issue, environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purpose of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small as the term is used in this table (10 CFR Part 51, Subpart A, Appendix B, Table B-1).*

The NRC based its assessment of license renewal impacts on its evaluations of impacts from current plant operations. The NRC codification and the Generic Environmental mpact Statement discuss the following types of Category 1 environmental issues:

- Surface water quality, hydrology, and use
- Aquatic ecology
- Groundwater use and quality
- Terrestrial resources
- Air quality
- Land use
- Human health
- Postulated accidents
- Socioeconomics
- Uranium fuel cycle and waste management
- Decommissioning

n its decision making for plant-specific license renewal applications, absent new and significant information to the contrary, the NRC relies on its codified findings, as amplified by supporting information in the Generic Environmental mpact Statement, for assessment of environmental impacts from Category 1 issues 10 CFR 51.95(c)(4) .

For plants such as Davis-Besse that are located in a coastal zone, many of these issues involve potential impacts to the coastal zone. FENOC has adopted by reference the NRC findings and Generic Environmental mpact Statement analyses for the 61[1] applicable Category 1 issues.

The NRC regulation identified 21 issues as Category 2, for which license renewal applicants must submit additional site-specific information.[2] Of these, 12 apply to Davis-Besse[3], and like the Category 1 issues, could potentially involve impacts to the coastal zone. The applicable issues and FENOC s impact conclusions are listed below.

- Aquatic ecology:
    - <u>Entrainment of fish and shellfish in early life stages</u>   This issue addresses mortality of organisms small enough to pass through the plant s circulating cooling water system. The Ohio Environmental Protection Agency (OEPA), in issuing the plant s NPDES discharge permit, has determined that the plant maintains the best available technology to minimize impact. FENOC concludes that these impacts are SMALL during current operations and has no plans that would change this conclusion for the license renewal term.
    - <u> mpingement of fish and shellfish</u>   This issue addresses mortality of organisms large enough to be caught by intake screens before passing through the plant s circulating cooling water system. The NPDES permit also addresses impingement. FENOC concludes that these impacts are SMALL during current operations and has no plans that would change this conclusion for the license renewal term.
    - <u>Heat shock</u>   This issue addresses mortality of aquatic organisms by exposure to heated plant effluent. The OEPA, in issuing the plant s NPDES discharge permit, has determined that more stringent limits on the heated effluent are not necessary to protect the aquatic environment. FENOC

[1] The remaining Category 1 issues do not apply to Davis-Besse because they are associated with design or operational features that Davis-Besse does not have, e.g., once-through cooling.

[2] 10 CFR Part 51, Subpart A, Appendix B, Table B-1 also identifies two issues as NA for which the NRC could not come to a conclusion regarding categorization. FENOC believes that these issues, chronic effects of electromagnetic fields and environmental ustice, do not affect the coastal zone as that phrase is defined by the Coastal   one Management Act 16 USC 1453(1) .

[3] The remaining Category 2 issues do not apply to Davis-Besse because they are associated with design or operational features that Davis-Besse does not have, e.g., once-through cooling.

concludes that these impacts are SMALL during current operations and has no plans that would change this conclusion for the license renewal term.

- Threatened or endangered species: This issue addresses effects that Davis-Besse operations potentially could have on species that are listed under federal law as threatened or endangered. n analyzing this issue, FENOC has also considered species that are listed under Ohio law. Table D-3 lists the threatened and endangered animal and plant species whose range is known to occur in the vicinity of Davis-Besse. FENOC has identified no adverse impacts to these species and consultation with cognizant state and Federal agencies has identified no impacts of concern (O N 200 a b; N F 2010; F 200). FENOC concludes that Davis-Besse impacts to these species are SMALL during current operations and has no plans that would change this conclusion for the license renewal term.

- Human health: Electromagnetic fields, acute effects (electric shock) This issue addresses the potential for shock from induced currents, similar to static electricity effects, in the vicinity of transmission lines. Because this strictly human-health issue does not directly or indirectly affect natural resources of concern within the Coastal one Management Act definition of coastal zone 16 USC 1453(1) , FENOC concludes that the issue is not sub ect to the certification requirement.

- Socioeconomics:

  - Housing This issue addresses impacts that Davis-Besse employees required to support license renewal could have on local housing availability. The NRC concluded, and FENOC concurs, that impacts would be SMALL for plants located in high population areas with no growth control measures. Using the NRC definitions and categorization methodology, Davis-Besse is located in a high population area and locations where additional employees would probably live do not have growth control measures. n addition, as FENOC does not intend to add additional permanent employees to the Davis-Besse workforce, FENOC concludes that impacts during the Davis-Besse license renewal term would be SMALL.

  - Public services; public utilities This issue address impacts that adding license renewal workers could have on public water supply systems. FENOC has analyzed the availability of public water supplies in candidate locales and has found no limitations that would suggest that additional Davis-Besse workers would cause impacts. As FENOC does not intend to add additional permanent employees to the Davis-Besse workforce, FENOC concludes that impacts during the Davis-Besse license renewal term would be SMALL.

- Offsite land use   This issue addresses impacts that local government spending of plant property tax dollars can have on land use patterns. Davis-Besse property tax payments are less than 10% of the regional tax revenue and nearly 20% of the local tax revenue. FENOC expects this tax revenue distribution to remain generally unchanged during the license renewal term. The NRC concluded, and FENOC concurs, that impacts to offsite land use would be small if tax payments are less than 10% percent of total revenue and moderate if payments are 10-20%. FENOC concludes that regional impacts during the Davis-Besse license renewal term would be SMALL and that local impacts would be MODERATE, but positive.

- Public services; transportation   This issue addresses impacts that adding license renewal workers could have on local traffic patterns. As FENOC does not intend to add additional employees to the permanent workforce for the license renewal term, this would result in SMALL impacts

- Historic and archaeological resources   This issue addresses impacts that license renewal activities could have on resources of historic or archaeological significance. Although a number of archaeological or historic sites have been identified near the Davis-Besse site or associated transmission lines, FENOC is not aware of any adverse or detrimental impacts to these sites from current operations and FENOC has no plans for license renewal activities that would disturb these resources. FENOC correspondence with the Ohio Historic Society, State Historic Preservation Officer, identified no issues of concern. .

- Severe accidents   The NRC determined that the license renewal impacts from severe accidents would be small, but that applicants should perform site-specific analyses of ways to further mitigate impacts. Results from the FENOC severe accident mitigation alternatives (SAMA) analysis have not identified any cost-beneficial enhancements to further mitigate risk to public health and the economy in the area of the plant, including the coastal zone, due to potential severe accidents at Davis-Besse.

.2.2 F N N

1. The NRC has found that the environmental impacts of Category 1 issues are SMALL. FENOC has adopted by reference NRC findings for Category 1 issues applicable to Davis-Besse.

2. For Category 2 issues applicable to Davis-Besse, FENOC has determined that the environmental impacts are SMALL or if larger have a positive benefit.

3. To the best of FENOC s knowledge, Davis-Besse is in compliance with Ohio licensing and permitting requirements and is in compliance with its state-issued licenses and permits (Table D-2).

4. FENOC s license renewal and continued operation of Davis-Besse would be consistent with the enforceable provisions of the Ohio Coastal one Management Program.

. TATE NOT F CAT ON

By this certification that Davis-Besse license renewal is consistent with the Ohio Coastal Management Program, the State of Ohio is notified that, pursuant to 15 CFR 930.63(a), it has six months from the receipt of this letter and accompanying information in which to concur with or ob ect to the FENOC certification. However, pursuant to 15 CFR 930.63(b), if Ohio has not issued a decision within three months following commencement of State agency review, it shall notify the contacts listed below of the status of the matter and the basis for further delay. The State s concurrence, ob ections, or notification of review status shall be sent to the following contacts:

Ms. Paula E. Cooper
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
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Table -1. Ohio Coastal ana ement ro ram En orceable olices

O C	CON TENC T F CAT ON
Coastal Erosion and Floodin 1-	
POL C 1 − LA E ER E COASTAL EROS ON AREA MANAGEMENT Minimize threats to human safety and property due to Lake Erie-related erosion while protecting the functions of natural shore features. Pursuant to O.R.C. 1506.06 and 1506.07, ODNR administers a permit system for construction, erection and redevelopment of permanent structures within Lake Erie coastal erosion areas.	FENOC is unaware of any impacts to coastal erosion from Davis-Besse operations. n addition, license renewal will not include any construction-related pro ects.
POL C 2 − SHORE EROS ON CONTROL Promote sound decisions regarding control of shore erosion. Pursuant to O.R.C. 1521.22, any person planning to construct a beach, groin or other structure that will arrest or control erosion, wave action or inundation along or near the Ohio shore of Lake Erie must first submit plans and specifications to ODNR for review.	Not applicable This policy applies to land-disturbing activities that FENOC has no plans to undertake at Davis-Besse for the purpose of license renewal.
POL C 3 − FLOODPLA N MANAGEMENT: Minimize future flood damages and prevent potential loss to existing development in coastal floodplains. O.R.C. 1506.04 mandates that all communities with coastal flood hazard areas designated under the Flood Disaster Protection Act of 1973 (P.L. 93-234) must either participate in the NF P or enact regulations that meet or exceed the standards required for such participation.	Not Applicable - Davis-Besse is a privately owned facility. n addition, license renewal will not include any construction-related pro ects.
POL C 4 − FLOOD PROTECT ON AND M T GAT ON Promote effective flood protection. Pursuant to O.R.C. 1521.06 et seq., the ODNR Division of Water requires construction	Not Applicable This policy applies to land-disturbing activities, such as construction of dams, dikes, and levees, that FENOC has no plans to undertake at Davis-Besse for the purpose of license renewal.

Table -1. Ohio Coastal ana ement ro ram En orceable olices (continued)

O C	CON TENC T F CAT ON
permits for new dams, dikes and levees and makes periodic inspections of existing dams, dikes and levees	
ater alit 7 11	
POL C 6 − WATER UAL T Maintain and improve the quality of the state s coastal waters for the purpose of protecting the public health and welfare and to enable the use of such waters for public water supply, industrial and agricultural needs, and propagation of fish, aquatic life and wildlife. Water quality standards set forth in O.A.C. Chapter 3745-1, which establish minimum requirements for all surface waters of the state, have been approved by the U.S. Environmental Protection Agency (USEPA), as well as the enforcement procedures and authorities of OEPA.	Davis-Besse operations are consistent with its NPDES permit requirements, which are based on federally approved water quality standards, and FENOC has no plans that would change this practice for the license renewal term.
POL C 7 − EN RONMENTAL CONTAM NANTS: PRE ENT ON AND EMERGENC RESPONSE Prevent and/or minimize to the greatest extent possible, damages to the public health, safety and welfare, and to the environment from contaminants. Pursuant to O.R.C. 3745.01, OEPA administers the laws pertaining to chemical emergency planning, community right-to-know, and toxic chemical release reporting.	Davis-Besse has a spill prevention control and countermeasure (SPCC) plan and related emergency response procedures. n addition, Davis-Besse s storm water runoff is covered by its NPDES permit, which is evidence of state water quality (401) certification.
POL C 9 − POTABLE WATER SUPPL Ensure that a safe supply of water is available for private, community, industrial, agricultural and commercial uses along Lake Erie. OEPA s Division of Drinking and Ground Waters ensures that a safe supply of water is available per P.L. 93-523, the Safe Drinking	Davis-Besse receives its potable water from an off-site public water supply system, the Carroll Township Water System.

Table -1. Ohio Coastal ana ement ro ram En orceable olices (continued)

O C	CON TENC T F CAT ON
Water Act and its Amendments 42 U.S.C. 300(f) et seq.	
POL C 11 − GROUND WATER Promote the protection and management of Ohio s ground water resources. Ohio s Department of Health, OEPA, and State Fire Marshal administer the state s ground water programs relating to water quality concerns, including implementation of permits, monitoring and planning activities. and technical assistance to local governments per O.R.C 1509, 3701, 3718, 6109, 6111 and O.A.C. 3701 and 3745.	Davis-Besse operations do not use ground water and FENOC has no plans that would change this process for the license renewal term. n addition, Davis-Besse has a ground water monitoring network to detect potential contaminantes.
Ecolo icall ensitive eso rces 12 1 1	
POL C 12 − WETLANDS Protect, preserve and manage wetlands with the overall goal to retain the state s remaining wetlands, and, where feasible, restore and create wetlands to increase the state s wetlands. All coastal area wetlands fall within the urisdiction of the U.S. Army Corps of Engineers (COE) in regulating activities under the Rivers and Harbors Act of 1899 (Section 10) and/or the Clean Water Act (CWA), Section 404. The scope of Ohio s authority under Section 401 of the CWA and Ohio water pollution control laws (O.R.C. 6111 and O.A.C. 3745) is coterminous with that of the COE and covers all surface waters within the coastal area, including wetlands.	Davis-Besse s associated Navarre Marsh site wetlands are protected habitat that is managed cooperatively by FENOC and the Ottawa National Wildlife Refuge. FENOC has no plans that would change this practice for the license renewal term. n addition, Davis-Besse s storm water runoff is covered by its NPDES permit, which is evidence of state water quality (401) certification.
POL C 14 − RARE AND ENDANGERED SPEC ES Preserve and protect rare, threatened and endangered plant and animal species to prevent their possible extinction. ODNR s Division of Wildlife protects fish and	FENOC has identified no adverse impacts to these species from Davis-Besse operation and consultation with cognizant state and Federal agencies has identified no impacts of concern related to Davis-Besse license renewal.

Table -1. Ohio Coastal ana ement ro ram En orceable olices
(continued)

O C	CON TENC T F CAT ON
wildlife species threatened with statewide extinction per O.R.C. 1531.25.	
POL C 15 − EXOT C SPEC ES Prevent introduction of and control exotic species to preserve the balance and diversity of natural ecosystems of Ohio s Lake Erie region. ODNR s Division of Wildlife and Division of Natural Areas and Preserves prevent introduction of and control exotic species to preserve the balance and diversity of natural ecosystems per to O.R.C. 927 and O.A.C. 1501.	Not Applicable Davis-Besse is an electric generating facility that neither sells nor imports exotic species and FENOC has no plans during license renewal that would change this practice.
orts and hore Area evelo ment 1 17	
POL C 16 − PUBL C TRUST LANDS Protect the public trust held waters and lands underlying the waters of Lake Erie, protect public uses of Lake Erie and minimize the occupation of public trust lands for private benefit. ODNR protects the public trust held waters and lands underlying the waters of Lake Erie per O.R.C. 1506.11 and O.A.C. 1501-6-01 through 1501-6-06 .	Davis-Besse license renewal will not include any construction-related pro ects that would affect public trust lands.
POL C 17 − DREDG NG AND DREDGED MATER AL D SPOSAL Provide for the dredging of harbors, river channels and other waterways and to protect the water quality, public right to navigation, recreation and natural resources associated with these waters in the disposal of the dredged material. OEPA regulates discharges of dredged materials into Ohio waters through a state water quality certification that the discharge will comply with the Clean Water Act per O.R.C. 6111.03(P).	Davis-Besse license renewal will not include any construction-related pro ects. Dredging to maintain the intake canal, if needed, is coordinated through the OEPA, which would include a 401 certification.

Table -1. Ohio Coastal ana ement ro ram En orceable olices (continued)

O C	CON TENC T F CAT ON
ecreational and C lt ral eso rces 21 2 2 2	
POL C 21 − LA ESHORE RECREAT ON AND ACCESS Provide lakeshore recreational opportunities and public access and encourage tourism along Lake Erie. ODNR s Division of Parks and Recreation is charged with the development, operation and maintenance of a system of state parks in Ohio for the recreational use of the citizens of Ohio (O.R.C. Chapter 1541)	Due to the heightened national security situation and at the direction of the U.S. Nuclear Regulatory Commission, Davis-Besse has closed its lakeshore area to public access for recreation. However, adequate lakeshore access is available nearby and will remain available during license renewal.
POL C 23 − RECREAT ONAL BOAT NG Satisfy and serve the public interest for recreational boating opportunities and watercraft safety in the coastal area ODNR s Division of Watercraft is responsible for the enforcement of the state watercraft laws and pursuant regulations (O.R.C. Chapter 1547).	Due to the heightened national security situation and at the direction of the U.S. Nuclear Regulatory Commission, Davis-Besse has closed its lakeshore area to public access for recreational boating. However, adequate lakeshore access for recreational boating is available nearby and will remain available during license renewal.
POL C 24 − F SH NG AND HUNT NG Provide expanded sport fishing and safe hunting opportunities in the coastal area. ODNR s Division of Wildlife issues hunting, trapping, and fishing licenses per O.R.C. 1533 and conducts related safety programs.	Due to the heightened national security situation and at the direction of the U.S. Nuclear Regulatory Commission, Davis-Besse has closed its lakeshore area to public access to fishing and hunting. However, adequate lakeshore access for fishing and hunting is available nearby and will remain available during license renewal.

Table -1. Ohio Coastal ana ement ro ram En orceable olices (continued)

O C	CON TENC T F CAT ON
POL C 26 − PRESER AT ON OF CULTURAL RESOURCES Provide for the preservation of cultural resources to ensure that the knowledge of Ohio s history and pre-history is made available to the public and is not willfully or unnecessarily destroyed or lost. The Ohio Historic Preservation Office (OHPO) within the Ohio Historical Society (OHS) coordinates cultural resource protection per O.R.C. 149 and 1506.	FENOC is unaware of any Davis-Besse impacts on designated or registered historic districts or sites and license renewal will not alter this belief. FENOC has been in contact with the Ohio Historic Preservation Office, which is in agreement that license renewal for Davis-Besse is unlikely to affect historic sites or districts.
Fish and ildli e ana ement 27 2	
POL C 27 − F SHER ES MANAGEMENT Assure the continual en oyment of the benefits received from the fisheries of Lake Erie and to maintain and improve these fisheries. ODNR s Division of Wildlife regulates fish habitats, including protection, preservation, propagation, and management per O.R.C. 1531.	FENOC is unaware of any Davis-Besse impacts on the fisheries of Lake Erie and consultation with cognizant state and Federal agencies has identified no impacts of concern related to Davis-Besse license renewal.
POL C 29 − W LDL FE MANAGEMENT Provide for the management of wildlife in the coastal area to assure the continued en oyment of benefits received from wildlife. ODNR s Division of Wildlife regulates wildlife habitats, including protection, preservation, propagation, and management per O.R.C. 1531.	FENOC promotes wildlife management through the lease of 733 acres of Davis-Besse property to wildlife preservation, including the Navarre Marsh and Ottawa National Wildlife Refuge.
Environmental alit 0 1 2	
POL C 30 − A R UAL T Attain and maintain air quality levels that protect public health and prevent in ury to plant and animal life and property by surveying and monitoring air quality; enforcing national ambient air quality standards through permits and variances; and restricting open burning. (O.R.C. Chapters 3745, 3706 and 5709).	Davis-Besse operations are in compliance with its air pollution control permit application (Table D-2) and FENOC has no plans that would change this practice for the license renewal term. n addition, Davis-Besse promotes cleaner air in Ohio by avoiding emissions of greenhouse gases.

Table -1. Ohio Coastal ana ement ro ram En orceable olices (continued)

O C	CON TENC T F CAT ON
OEPA implements and enforces Ohio s State mplementation Plan (S P), which is approved by USEPA, to control state-wide air pollution.	
POL C 31 − HA ARDOUS, SOL D AND NFECT OUS WASTE MANAGEMENT Ensure that the generation of solid, infectious and hazardous waste is reduced as much as possible. OEPA s Division of Hazardous Waste Management implements and enforces the management, transportation, treatment, storage and disposal of hazardous waste (O.R.C. Chapter 3745)	Davis-Besse operations are in compliance with OEPA s solid and hazardous waste management requirements (Table D-2) and FENOC has no plans that would change this practice for the license renewal term.
POL C 32 − MAR NA FAC L T ES Assure that marinas will provide adequate sanitary facilities for the watercraft using the marina, and that such marinas will be constructed, located, maintained, and operated in a sanitary manner so as not to create a nuisance or cause a health hazard (O.R.C. 3733.21 through 3733.30 and O.A.C. 3701-35). Ohio Department of Health and local health departments regulate marina construction to assure proper sanitary facilities.	Not Applicable - Davis-Besse is an electric generating facility that does not include a marina.
POL C 33 − SUAL AND AESTHET C UAL T Protect the visual and aesthetic amenities of Lake Erie and its shoreline to enhance the recreational, economic, cultural and environmental values inherently associated with the coastal area. O.R.C. 3767.32, prohibits litter deposit on any public property, on private property not owned by that individual, or in or on waters of the state; O.R.C. 1531.29 prohibits the disposal of any litter into watercourses of the state or onto banks thereof.	Davis-Besse operations are consistent with its environmental protection authorizations (Table D-2) and FENOC has no plans that would change this condition for the license renewal term.

Table D-1. Ohio Coastal Management Program Enforceable Polices
(continued)

POLICY CON	SISTENCY JUSTIFICATION
Energy and Mineral Resources (34,35,36,37,38)	
POL C 34 − ENERG FAC L T S T NG Provide for environmentally sound siting of ma or electric energy generating and transmission facilities in the coastal area, and to regulate the siting of these facilities to protect the health, safety, and welfare of Ohio s citizens and the natural resources of the state. Per O.R.C. Chapter 4906, the Ohio Power Siting Board (PSB) within the Public Utilities Commission (PUCO) is the lead agency to implement a one-stop process for all permits involving the construction, operation, and maintenance of a ma or utility facility.	Not applicable - Davis-Besse is an existing facility and FENOC has no plans for construction of additional electric generation facilities on the Davis-Besse site as part of license renewal.
POL C 35 − ENERG RESOURCE STORAGE AND TRANSSH PMENT Regulate the storage of energy related resources (coal, oil and gas) in the coastal area through planning assistance and permit review to assure the safe and efficient use of these resources; and to ensure that air, water and other environmental standards are met (O.R.C. 4906.06 and O.A.C. 4906-13-02). The Ohio Power Siting Board (PSB), as a part of the certification process described in Policy 34, reviews the location and layout of all storage areas for proposed ma or utility facilities per O.R.C. 4906.01(B) .	Davis-Besse operations are in compliance with its diesel storage underground tank registration, air pollution control permit, and NPDES permit (Table D-2).
POL C 36 − O L AND NATURAL GAS DR LL NG Protect public safety and welfare and the environment and assure wise management. ODNR, Division of Mineral Resources Management (DMRM), requires a permit for any oil or natural gas drilling, including plugging and abandonment per O.R.C. 1509.05 and 1509.13 .	Not Applicable - Davis-Besse is an electric generating facility that does not conduct onshore or offshore oil or natural gas drilling.

Table -1. Ohio Coastal ana ement ro ram En orceable olices
(continued)

O C	CON TENC T F CAT ON
POL C 37 − OFFSHORE M NERAL EXTRACT ON Provide for and regulate the extraction of minerals and other substances from and from under the bed of Lake Erie, through the issuance of Ohio Department of Natural Resources mineral leases and permits, to protect the public safety and welfare, and to minimize adverse environmental impacts, including adverse impacts on littoral owners rights (O.R.C. 1505.07). ODNR requires a lease or permit before removing sand, gravel, stone or other minerals or other substances from or from under the bed of Lake Erie per O.R.C. 1505.07.	Not Applicable - Davis-Besse is an electric generating facility that does not conduct the extraction of mineral or other substances.
POL C 38 − SURFACE M N NG Regulate surface mining activities to minimize adverse environmental impacts, prevent damage to ad oining property, ensure reclamation of all affected areas through the issuance of Ohio Department of Natural Resources permits and see to the health and safety of all persons within the mining facility (O.R.C. 1514.02, 1514.021, 1561, 1563, 1565 and 1567). ODNR, Division of Mineral Resources Management (DMRM), requires a permit prior to any surface mining activity per O.R.C. 1514.02(A) .	Not Applicable Davis-Besse is an electric generating facility that does not conduct surface mining.
ater antit 1	
POL C 39 − WATER D ERS ON Manage diversion of Lake Erie and tributary waters. ODNR regulates diversions in excess of 100,000 gallons per day out of and into the Lake Erie Basin per O.R.C. 1501.32 and O.A.C. 1501-2-01 through 1501-2-12 .	Davis-Besse operations are in compliance with its water withdrawal registration and NPDES permit (Table D-2).

Table -1. Ohio Coastal ana ement ro ram En orceable olices
(continued)

O C	CON TENC T F CAT ON
POL C 41 − WATER MANAGEMENT Collect and analyze water resources information to promote water resources planning and management. ODNR administers a water withdrawal facility registration program for water withdrawal facilities with a capacity of more than 100,000 gallons per day, a well closure program, and collects and analyzes data and develops governmental water supply plans per O.R.C. 1521 et seq.	Partially Applicable - Davis-Besse operations are in compliance with its water withdrawal registration and well monitoring program (Table D-2). Otherwise, FENOC is a privately owned, non-governmental company that does not conduct water resources planning and management.

Table -2 Environmental A thori ations or avis-Besse O eration

A enc	A thorit	e irement	N mber	ss e or E iration ate	Activit A thori ed
Federal A thori ations					
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011, et seq.), 10CFR50.10	License to operate	NPF-3	ssued: 4/22/1977 Expires: 4/22/2017	Operation of Davis-Besse
U.S. Nuclear Regulatory Commission	10 CFR Part 72	Requirements to store spent nuclear fuel and high-level radioactive waste	Certificate Number 1004	ssued: 1/23/ 1995 Expires: 1/31/2015	Use of radioactive waste cask Model Number NUHOMS-24P
U.S. Department of Transportation	49 CFR Part 107, Subpart G	Hazardous material registration	042009 450 002RT	ssued: 5/19/2009 Expires: 6/30/2012 (Renewed Triennially)	Transportation of hazardous materials
U.S. Environmental Protection Agency	RCRA 42 U.S.C. s/s 321 et seq. (1976)	Notification of regulated waste activity	EPA D OHD000720508	ssued: -- Expires: ndefinite	Generation and accumulation of hazardous waste
tate and ocal A thori ations					
Ohio Environmental Protection Agency, Division of Surface Water	Federal Water Pollution Control Act, as amended (33 U.S.C Section 1251 et seq.); Ohio Water Pollution Control Act (Ohio Revised Code Section 6111)	National Pollutant Discharge Elimination System (NPDES) Permit	Ohio Permit No. 2 B00011 D	ssued: 9/1/2006 Expires: 4/30/2011 (every 5 years)	Treatment of wastewater and effluent discharge to surface receiving waters (Toussaint River and Lake Erie)

Table -2 Environmental A thori ations or avis-Besse O eration
(continued)

A enc	A thorit	e irement	N mber	ss e or E iration ate	Activit A thori ed
Ohio Environmental Protection Agency, Division of Surface Water	Federal Water Pollution Control Act, as amended (33 U.S.C Section 1251 et seq.); Ohio Water Pollution Control Act (Ohio Revised Code Section 6111)	NPDES construction stormwater permit	Ohio Permit No. 2GC02563 AG	ssued: 12/21/ 2009 Expires: Upon pro ect completion	Construction of Switchyard pro ect and control-discharge of stormwater in Ottawa County, Carroll Township
Ohio Environmental Protection Agency, Division of Air Pollution Control	Clean Air Act, 40 U.S.C. 1857 et seq.; Ohio Air Pollution Control Act (Ohio Administrative Code Chapter 3745-31)	Permit to operate an air contaminant source	Permit Application No. 0362000091B001	ssued: Annual reporting Expires: ndefinite	Operation of station auxiliary boiler
Ohio Environmental Protection Agency, Division of Hazardous Waste Management	Ohio Administrative Code Chapter 3745-52-41	Report of regulated waste activity	EPA D OHD000720508	ssued: Annual reporting Expires: ndefinite	Generation, accumulation, and off-site disposal of hazardous waste
Ohio Department of Natural Resources, Division of Wildlife	Ohio Revised Code Section 1531.08	Scientific collection permit	Permit 10-21	ssued: Annually Expires: 3/15/2011	Collection of wildlife specimens for Radiological Environmental Monitoring Program (REMP)

Table -2 Environmental A thori ations or avis-Besse O eration (continued)

A enc	A thorit	e irement	N mber	ss e or E iration ate	Activit A thori ed
Ohio Department of Natural Resources, Division of Water Resources	Ohio Revised Code Section 1521.16	Water withdrawal and use registration and file annual report	Registration 00598	ssued: 1/1/1990 Expires: ndefinite	Withdraw and use of more than 100,00 gallons of water daily from all sources
Ohio Department of Health	Ohio Administrative Code 3701: 1-38-03(C); Ohio Revised Code 3748.06 and 3748.07	X-Ray generating equipment registration	Registration 17-M-07181-005	ssued: Biennially Expires: 5/31/2010	Operation of X-ray generation equipment
Ohio Department of Commerce, Division of State Fire Marshal	Ohio Administrative Code 1301: 7-9-04	Underground storage tank registration	Certificate 62000072	ssued: Annually Expires: 6/30/2011	Registration of underground diesel storage tanks T00001, T00002, and T00003
Tennessee Department of Environment and Conservation	Tennessee Code Annotated 68-202-206	License to deliver radioactive waste	Tennessee Delivery License T-OH003-LO9	ssued: Annually Expires: 12/31/2010	Shipment of radioactive material to a licensed disposal-processing facility within the State of Tennessee

Table - tate and Federal isted Endan ered and Threatened ecies otentiall Occ rrin in the avis-Besse ite icinit

Common Name	cienti ic Name	tate tat s	Federal tat s
lants			
alpine rush	*Juncus alpinus*	P	
American beach grass	*Ammophila breviligulata*	T	
American sweet flag	*Acorus americanus*	P	
American water milfoil	*Myriophyllum sibiricum*	T	
balsam poplar	*Populus balsamifera*	E	
baltic rush	*Juncus balticus*	P	
bearded wheat grass	*Elymus trachycaulus*	T	
Bebb s sedge	*Carex bebbii*	P	
bullhead-lily	*Nuphar variegata*	E	
bushy cinquefoil	*Potentilla paradoxa*	T	
Canada milk-vetch	*Astragalus canadensis*	T	
Caribbean spike-rush	*Eleocharis geniculata*	E	
deer s-tongue arrowhead	*Sagittaria rigida*	P	
Drummond s rock cress	*Arabis drummondii*	E	
prairie fringed orchid	*Platanthera leucophaea*	T	T
flat-stemmed pondweed	*Potamogeton zosteriformis*	P	
floating pondweed	*Potamogeton natans*	P	
Garber s sedge	*Carex garberi*	E	
golden fruited sedge	*Carex aurea*	T	
lakeside daisy	*Tetraneuris herbacea*	E	T
little green sedge	*Carex viridula*	P	
low umbrella sedge	*Cyperus diandrus*	P	
narrow-leaved blue-eyed grass	*Sisyrinchium mucronatum*	E	
ovate spike-rush	*Eleocharis ovata*	E	
Philadelphia panic grass	*Panicum philadelphicum*	E	
Pursh s bulrush	*Schoenoplectus purshianus*	P	
Richardson s pondweed	*Potamogeton richardsonii*	P	
rock elm	*Ulmus thomasii*	P	
Smith s bulrush	*Schoenoplectus smithii*	E	

Table - tate and Federal isted Endan ered and Threatened ecies otentiall Occ rrin in the avis-Besse ite icinit
(continued)

Common Name	cienti ic Name	tate tat s	Federal tat s
Smith s bulrush	*Scirpus smithii*	E	
southern wapato	*Lophotocarpus (=Sagittaria) calycinus*	P	
Sprengel s sedge	*Carex sprengelii*	T	
variegated scouring-rush	*Equisetum variegatum*	E	
wapato	*Sagittaria cuneata*	T	
wheat sedge	*Carex atherodes*	P	
wild rice	*Zizania aquatica*	T	
nvertebrates			
nsects			
Canada darner	*Aeshna canadensis*	E	
elfin skimmer	*Nannothemis bella*	E	
frosted elfin	*Incisalia irus*	E	
arner blue	*Lycaeides melissa samuelis*	E	E
marsh bluet	*Enallagma ebrium*	T	
persius dusky wing	*Erynnis persius*	E	
plains clubtail	*Gomphus externus*	E	
purplish copper	*Lycaena helloides*	E	
silver-bordered fritillary	*Boloria selene*	T	
tiger beetle	*Cicindela hirticollis*	T	
unexpected cycnia	*Cycnia inopinatus*	E	
ssels			
black sandshell	*Ligumia recta*	T	
deertoe	*Truncilla truncata*	SC	
eastern pondmussel	*Ligumia nasuta*	E	
fawnsfoot	*Truncilla donaciformis*	T	
purple wartyback	*Cyclonaias tuberculata*	SC	
rayed bean	*Villosa fabalis*	E	C
snuffbox	*Epioblasma triquetra*	E	
threehorn wartyback	*Obliquaria reflexa*	T	
wavy-rayed lampmussel	*Lampsilis fasciola*	SC	

Table - tate and Federal isted Endan ered and Threatened ecies otentiall Occ rrin in the avis-Besse ite icinit (continued)

Common Name	cienti ic Name	tate tat s	Federal tat s
Fish			
burbot	*Lota lota*	SC	
channel darter	*Percina copelandi*	T	
cisco	*Coregonus artedii*	E	
eastern sand darter	*Ammocrypta pellucida*	SC	
lake sturgeon	*Acipensar fulvescens*	E	
lake whitefish	*Coregonus clupeaformis*	SC	
spotted gar	*Lepisosteus oculatus*	E	
e tiles			
Blanding s turtle	*Emydoidea blandingi*	SC	
box turtle	*Terrapene Carolina*	SC	
eastern massasauga swamp rattler	*Sistrurus catenatus catenatus*	E	C
irtland s water snake	*Natrix kirtlandii*	T	
Lake Erie water snake	*Natrix sipedon insularium*	E	T
spotted turtle	*Clemmys guttata*	T	
Birds			
American bittern	*Botaurus lentiginosus*	E	
bald eagle	*Haliaeetus leucocephalus*	T	
black tern	*Chlidonias niger*	E	
Canada warbler	*Wilsonia canadensis*	S	
golden-winged warbler	*Vermivora chrysoptera*	E	
hermit thrush	*Catharus guttatus*	T	
king rail	*Rallus elegans*	E	
irtland s warbler	*Dendroica kirtlandii*	E	E
least bittern	*Ixobrychus exilis*	T	
least flycatcher	*Empidonax minimus*	T	
loggerhead shrike	*Lanius ludovicianus*	E	
magnolia warbler	*Dendroica magnolia*	S	
mourning warbler	*Oporornis philadelphia*	S	
northern harrier	*Circus cyaneus*	E	
osprey	*Pandion haliaetus*	T	

Table - tate and Federal isted Endan ered and Threatened ecies otentiall Occ rrin in the avis-Besse ite icinit
(continued)

Common Name	cienti ic Name	tate tat s	Federal tat s
peregrine falcon	*Falco peregrinus*	T	
sandhill crane	*Grus canadensis*	E	
sharp-shinned hawk	*Accipiter striatus*	SC	
sora rail	*Porzana carolina*	SC	
irginia rail	*Rallus limicola*	SC	
yellow-bellied sapsucker	*Sphyrapicus varius*	E	
ammals			
star-nosed mole	*Condylura cristata*	SC	

Table Captions:

tate tat s

E: ENDANGERED - A native species or subspecies threatened with extirpation from the state.

T: THREATENED - A species or subspecies whose survival in Ohio is not in immediate eopardy, but to which a threat exists.

SC: SPEC ES OF CONCERN - A species or subspecies which might become threatened in Ohio under continued or increased stress. Also, a species or subspecies for which there is some concern but for which information is insufficient to permit an adequate status evaluation.

S : SPEC AL NTEREST - A species that occurs periodically and is capable of breeding in Ohio. t is at the edge of a larger, contiguous range with viable population(s) within the core of its range. These species have no federal endangered or threatened status, are at low breeding densities in the state, and have not been recently released to enhance Ohio s wildlife diversity.

P: POTENT ALL THREATENED - A native Ohio plant species may be designated potentially threatened if one or more of the following criteria apply:

1. The species is extant in Ohio and does not qualify as a state endangered or threatened species, but it is a proposed federal endangered or threatened species or a species listed in the Federal Register as under review for such proposal.

2. The natural populations of the species are imperiled to the extent that the species could conceivably become a threatened species in Ohio within the foreseeable future.

Table - tate and Federal isted Endan ered and Threatened ecies otentiall Occ rrin in the avis-Besse ite icinit
(continued)

3. The natural populations of the species, even though they are not threatened in Ohio at the time of designation, are believed to be declining in abundance or vitality at a significant rate throughout all or large portions of the state.

Federal tat s

E: ENDANGERED An animal or plant species in danger of extinction throughout all or a significant part of its range.

T: THREATENED - Likely to become endangered within the foreseeable future throughout all or a significant part of its range.

C: CAND DATE - Sufficient information exists to support listing as endangered or threatened

Attachment E:

Severe Accident Mitigation Alternatives Analysis

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E ec tive mmar

The purpose of the analysis is to identify severe accident mitigation alternative (SAMA) candidates at Davis-Besse Nuclear Power Station (Davis-Besse) that have the potential to reduce severe accident risk and to determine if implementation of each SAMA candidate is cost beneficial. The cost-benefit evaluation is required by the Nuclear Regulatory Commission regulations governing the license renewal process.

A summary of the Davis-Besse Level 1 PRA and Level 2 PRA is provided. A Level 3 PRA model was developed to support the SAMA analysis. The development of the Level 3 PRA input files, execution of the base case, and execution of sensitivity cases are described. Dose and economic consequence metrics from the Level 3 PRA, combined with the release category frequency vector (from the Level 1 PRA and Level 2 PRA), have been used as input to the SAMA cost-benefit analysis.

A set of SAMA candidates was developed using industry and Davis-Besse-specific information. ualitative screening criteria (not applicable to Davis-Besse, already implemented at Davis-Besse, low benefit, high costs) were applied. For the SAMA candidates screened as considered for further evaluation, PRA cases were run to estimate the delta core damage frequency and an expert panel was convened to estimate the implementation costs. Several input parameters were sub ect to sensitivity analysis.

The cost-benefit evaluation of SAMA candidates performed for Davis-Besse provides significant insight into the continued operation of Davis-Besse. The results of the evaluation of 167 SAMA candidates indicate no enhancements to be cost-beneficial for implementation at Davis-Besse.

However, the sensitivity cases performed for this analysis found one SAMA candidate (AC/DC-03) to be cost-beneficial for implementation at Davis-Besse under the assumptions of three of the sensitivity cases (lower discount rate, replacement power, and multiplier). SAMA candidate AC/DC-03 considered the addition of a portable diesel-driven battery charger for the DC system. While the identified SAMA candidate is not related to plant aging and therefore not required to be resolved as part of the relicensing effort, FENOC will, nonetheless, consider implementation of this candidate through normal processes for evaluating possible changes to the plant.

The cost-benefit evaluation performed used several modeling conservatisms. These conservative assumptions, combined with the results of several sensitivity cases, demonstrate the robustness of the SAMA analysis results.

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Acron ms and Abbreviations

AC	Alternating Current
AFW	Auxiliary Feedwater
AMSAC	ATWS Mitigation System Actuation Circuitry
AOC	Averted Off-site Property Damage Cost
AOE	Averted Occupational Exposure
AOSC	Averted On-site Cost
AO	Air-Operated alve
APE	Averted Public Exposure
ATWS	Anticipated Transient Without Scram
BWR	Boiling Water Reactor
B W	Babcock Wilcox
BWST	Borated Water Storage Tank
CAFTA	Computer-Aided Fault Tree Analysis
CCF	Common Cause Failure
CCW	Component Cooling Water
CDF	Core Damage Frequency
CET	Containment Event Tree
C	Containment solation alve
CST	Condensate Storage Tank
CWRT	Clean Waste Receiver Tank
DC	Direct Current
DHR	Decay Heat Removal
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EOP	Emergency Operating Procedure
EPR	Electric Power Research nstitute
EP	Emergency Planning one
FC A	Fire Compartment nteraction Analysis
F E	Fire nduced ulnerability Evaluation
FSAR	Final Safety Analysis Report

Acron ms and Abbreviations
contin ed

FTREX	Fault Tree Reliability Evaluation eXpert
F-	Fussell- esely
GL	Generic Letter
HEP	Human Error Probability
HP	High Pressure n ection
HRA	Human Reliability Analysis
H AC	Heating, entilation, and Air Conditioning
CS	ntegrated Control System
PE	ndividual Plant Examination
PEEE	ndividual Plant Examination External Events
SLOCA	nterfacing Systems Loss of Coolant Accident
LERF	Large Early Release Frequency
LOCA	Loss of Coolant Accident
LOOP	Loss of Off-site Power
LP	Low Pressure n ection
LPR	Low Pressure Recirculation
MAAP	Modular Accident Analysis Program
MACCS2	MELCOR Accident Consequence Code System
MCC	Motor Control Center
MDFP	Motor-Driven Feedwater Pump
MFW	Main Feedwater
MGL	Multiple Greek Letter
MS	Main Steam solation alve
MSS	Main Steam Safety alve
NFPA	National Fire Protection Association
NN	Non-Nuclear nstrumentation
NRC	Nuclear Regulatory Commission
PAMS	Post Accident Monitoring System
PCA R	Potential Condition Adverse to uality Report
PDS	Plant Damage State

Acron ms and Abbreviations
contin ed

POR	Power Operated Relief alve
PRA	Probabilistic Risk Assessment
PWR	Pressurized Water Reactor
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RP	Reactor Pressure essel
RRW	Risk Reduction Worth
SAMG	Severe Accident Management Guideline
SAMA	Severe Accident Mitigation Alternative
SBO	Station Blackout
SER	Safety Evaluation Report
SGTR	Steam Generator Tube Rupture
SMA	Seismic Margin Assessment
SPDS	Safety Parameter and Display System
S UG	Seismic ualifications Utility Group
SR	Safety Relief alve
SS E	Support System nitiating Event
TDAFW	Turbine-Driven Auxiliary Feedwater
USAR	Updated Safety Analysis Report

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E.1 NT O CT ON

E.1.1 O E

The purpose of the analysis is to identify severe accident mitigation alternative (SAMA) candidates at Davis-Besse Nuclear Power Station (Davis-Besse) that have the potential to reduce severe accident risk and to determine if implementation of each SAMA candidate is cost-beneficial. The cost-benefit evaluation is required by the Nuclear Regulatory Commission (NRC) regulations governing the license renewal process.

E.1.2 E E ENT

As part of the Environment Report prepared to support the Davis-Besse License Renewal Application, 10 CFR Part 51 contains the requirements to perform a SAMA analysis, as noted below.

<u>10 CFR 51.53(c)(3)(ii)(L)</u>

The environmental report must contain a consideration of alternatives to mitigate severe accidents

> *if the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environment assessment ...*

<u>10 CFR 51, Subpart A, Appendix B, Table B-1, ssue 76 (Severe Accidents)</u>

> *The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives .*

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E.2 ET O O O

The SAMA analysis approach used for the Davis-Besse assessment consisted of the following steps:

- etermine evere Accident is

  Level 1 and 2 Probabilistic R sk Assessment (PRA) Model

  The results of the Davis-Besse Level 1 PRA and Level 2 PRA models were used as input to a Level 3 PRA. The Level 2 PRA defined release categories that have been characterized using the Modular Accident Analysis Program (MAAP) computer code. Output from MAAP was used to generate input for the Level 3 PRA. n addition, the release category frequency vector from the Level 2 PRA was used as input to the SAMA analysis. Davis-Besse PRA models are only available for internal events and high winds.

  Level 3 PRA Model

  The results of the Level 1 PRA and the Level 2 PRA, and Davis-Besse-specific meteorological, demographic, land use, and emergency response data were used as input for a Level 3 PRA. One set of consequence results (i.e., off-site dose and economic impacts of a severe accident) were used to estimate the maximum benefit achievable.

- etermine Cost o evere Accident is a im m Bene it

  The NRC regulatory analysis techniques in NUREG/BR-0184 (Reference 1) were used to estimate the cost of severe accident risk. The maximum benefit that a SAMA candidate could achieve if it eliminated all risk, i.e., the maximum benefit, was also estimated.

- A A Candidate denti ication

  Potential SAMA candidates (that prevent core damage and that prevent significant releases from containment) were identified from the PRA models, ndividual Plant Examination (PE) and PE External Events (PEEE) recommendations, and industry documentation. The list of potential SAMA candidates in the Pressurized Water Reactor (PWR) Table 14 of NE 05-01 (Revision A) (Reference 2) was the initial list and was supplemented with insights from the Davis-Besse PRA model. As has been demonstrated by past SAMA analyses, SAMA candidates are not likely to prove cost-beneficial if they only mitigate the consequences of events that present a low risk to the plant.

Therefore, risk importance analyses play a key role in the SAMA candidate identification process.

- reliminar creenin hase A A Anal sis

  Potential SAMA candidates were screened out that were not applicable to the Davis-Besse plant design, were already implemented at Davis-Besse, were identified as having extreme cost, or were identified as having very little (risk) benefit. Some SAMA candidates were subsumed into other identified SAMA candidates. Those SAMA candidates that were not screened out were considered for further evaluation.

- Final creenin hase A A Anal sis

  The benefit of severe accident risk reduction to each remaining SAMA candidate was estimated and compared to an implementation cost estimate to determine net cost-benefit. The PRA was modified to determine the core damage frequency (CDF) and release category frequency vector for each remaining SAMA candidate. To determine the benefit, the delta CDF and change in the release category frequency vector between the base case and enhanced case were compared. To estimate the cost of implementation, costs associated with adopting the SAMA candidate were considered; these included costs related to design, engineering, safety analysis, installation, long-term maintenance, calibrations, and training.

- ensitivit Anal sis

  A number of assumptions and input parameters used in the Level 3 PRA and SAMA analysis were sub ected to a sensitivity analysis to determine the cost-benefit sensitivity.

- denti Concl sions

  The results of the cost-benefit analysis were summarized. There were no potential SAMA candidates for which the cost-benefit analysis showed that the SAMA candidates were cost beneficial. However, the sensitivity analysis identified one SAMA candidate that was potentially beneficial when considered in the context of the sensitivity analysis.

E. A -BE E A O E A

Davis-Besse models use PRA techniques to:

- develop an understanding of severe accident behavior;
- understand the most likely severe accident consequences, fission product releases; and
- evaluate hardware and procedure changes to assess the overall probabilities of core damage and fission product releases.

The PRA was initiated in response to Generic Letter (GL) No. 88-20 (Reference 3), which resulted in PE and PEEE analyses. The current models are separate Level 1 PRA and Level 2 PRA models including internal and some external initiating events for power operation. Severe accident sequences have been developed from internal and external initiated events, including internal floods and high winds.

E. .1 E E 1 A A

E. .1.1 nternal Events

E.3.1.1.1 Description of Level 1 nternal Events PRA Model

The updated PRA model, used to determine CDF, is the SAMA Analysis Model. The SAMA Analysis Model was created by modifying the Davis-Besse Revision 4 PRA model to address some existing gaps identified in an internal peer review and gap assessment. The SAMA Analysis Model contains the Level 1 PRA for internal events. The software used to update the model is CAFTA (Computer-Aided Fault Tree Analysis) (Reference 4). The Level 1 PRA presents the risk for core damage. For the SAMA Analysis Model, core damage is defined as MAAP-calculated maximum core node temperature exceeding 1800° F for a period of 60 seconds. The 60-second time delay is used to prevent short-lived temperature transients from defining core damage.

The Davis-Besse Level 1 PRA internal events CDF is estimated to be 9.2E-06/yr and when including high winds, and internal flooding, CDF was estimated at 9.8E-06/yr. Table E.3-1 provides a breakdown of CDF by initiating event, and Table E.3-2 provides Level 1 importance measures. The quantification was calculated using a truncation cutoff frequency of 5.0E-13/yr.

Note: The results presented in this report are based on an updated PRA model (SAMA Analysis Model), which had a freeze date of uly 9, 2009, for the plant configuration, and a freeze date of August 1, 2006, for component failure data and initiating event data. Equipment unavailabilities based on Maintenance Rule availability have freeze dates of April 30, 2007, and anuary 1, 2006, for non-Maintenance Rule unavailability.

E.3.1.1.2 Level 1 PRA Model Changes since PE Submittal

The ma or Level 1 PRA changes incorporated into each revision of the Davis-Besse PRA model are discussed below.

Revision Change Summary

The Davis-Besse PE was issued in February, 1993 (Reference 5). The PE examined risk from internal events, including internal flooding. The PE Level 1 CDF was 6.6E-05/yr. The sum of the release categories for the Level 2 PRA was 6.5E-05/yr. No large early release frequency (LERF) was issued for the PE.

The Davis-Besse PRA was dormant from 1993 to 1999. Following the issuance of PRA model Revision 0, successive PRA model Revisions 1 and 2 occurred throughout 1999 to recover the Davis-Besse PRA. These successive revisions would be considered a single revision by today s standards.

Davis-Besse PRA, Revision 0 CDF = 1.4E-05/yr to Revision 2 CDF = 1.7E-05/yr and LERF = 7.3E-08/yr

- Performed plant-specific data update for failure rates, unavailability, common cause, initiating event frequency, and human reliability analysis.
- Modified the PRA model to encompass all plant modifications to date to reflect the as-built, as-operated plant including changes to plant operating procedures. This included adding the station blackout (SBO) diesel generator, removal of a start-up feed pump that was abandoned, improvements to modeling of component cooling water (CCW) and service water systems, update of the steam generator tube rupture (SGTR) event tree to reflect changes in emergency procedures, and internal flooding model improvements.
- mproved model documentation to comport with draft PRA standard requirements.

- The Level 2 PE model information was also updated in October of 1999, but due to software limitations, the Level 2 model was evaluated in a back end analysis using various software and spreadsheets. This back end analysis quantified frequencies of various types of containment failure, fraction of core damage frequency that results in each of the containment failure modes, frequency of release categories and frequency of large early release.

The site conducted an industry peer review of PRA internal events Level 1 and LERF model on November 8, 1999 as a pilot for the B W fleet using draft standards and processes. Areas for improvement were associated with PRA guidance, success criteria documentation, thermal-hydraulic analysis documentation, basis for HRA timing, more detailed dependency tables, no uncertainty analysis performed, and lack of plant walk down and system engineer reviews. This peer review resulted in 18 supporting requirements at B level of significance, and no A level issues.

Following the industry peer review, Davis-Besse then conducted a revision 3 PRA model update, to close gaps to the draft standard and explicitly model LERF with the PRA model.

Davis-Besse PRA, Revision 3, effective date 5/16/2001 CDF = 1.3E-05/yr and LERF = 3.8E-08/yr at a cutoff frequency of 1E-11/yr.

- Added an explicit LERF model to the PRA.
- Addressed all B level significant findings resulting from peer review.
- Performed a complete update due to incorporation of RELMCS quantification software.
- Reorganized the PRA UANT file to combine all sequences into a single run.
- Reduced truncations to a minimum of 2.0E-10.
- Deleted sequence for interfacing systems LOCA (SLOCA) due to premature opening of the reactor coolant system (RCS) drop line isolation valves (DH11 and DH12). This sequence was udged to not be credible.
- Deleted reactor vessel rupture event A . A frequency for this event was not published in NUREG/CR-5750 (Reference 6), so this event lacks a ustifiable frequency. Based on the large LOCA frequencies in NUREG/CR-5750, this event should be a negligible contributor to the total CDF. (Note this was put back in the SAMA analysis model.)
- Added events to model conditional probability that a reactor trip will occur due to loss of either 4160 bus C or D.

- Revised logic for loss of start-up feedwater pump due to circulating water flooding.
- Revised large and medium LOCAs to require one of two core flood tanks.
- mproved model documentation to comply with draft PRA standard requirements.

<u>Davis-Besse PRA, Revision 4, effective 9/28/2007 nternal CDF = 4.7E-06/yr and Total CDF = 5.3E-06/yr. No LERF quantified or updated.</u>

- Performed a complete update due to new quantification software.
- ncreased the amount of time that operators have to trip the reactor coolant pumps (RCPs) following a loss of CCW from ten minutes to one hour since the high pressure in ection (HP) pumps can run for one hour without CCW cooling.
- Added tornado initiating events to the model (only high wind effects are considered). The tornado events are divided into six categories corresponding to the tornado intensity classes F0 through F5 (TF0, TF1, TF2, TF3, TF4, and TF5).
- Changed modules that contained house event(s) or dependent events to basic events.
- Reduced truncations to a minimum of 5.0E-13.
- Made all initiators CAFTA initiating events.
- Reduced the number of modules, but all common-cause modules were retained.
- Updated database and converted database from Btrieve to Access.

Following PRA model Revison 4, on April 7, 2008 a gap self-assessment was conducted using a team of industry peers and internal staff. This assessment was specifically targeted at meeting Capability Category 2 for all high level requirements and supporting requirements in Reference 7. Therefore, some A and B level findings would meet Capability Category 1, but not Capability Category 2, and the gap is associated with what would be required to meet Capability Category 2. n this assessment, internal flooding was not reviewed as it was clear it would not meet the requirements of the standard for Capability Category 2. There were four A level findings and 23 B level findings. These areas for improvement related to the following:

- Need to put back into the PRA model reactor pressure vessel rupture event.
- Correct common cause modeling inconsistencies, missing common cause within support system initiators, and perform generic data update.
- Document control and verification of PRA thermohydraulic calculations used to support the PRA model for medium LOCA success criteria.

- Correct missing information in system modeling documentation.
- Correct logic error in SFAS system fault tree for HRA actuation versus automatic actuation and permissives and lockouts incorrectly modeled.
- Correct support system dependency inconsistencies in modeling and documentation.
- Plant-specific data documentation should add consideration of service condition when grouping components when assessing failure rates. There is also inconsistent use of time in denominator for some failure rates when Bayesian update performed. There is also a recommendation to use only plant-specific data for certain failure rates where sufficient data exists.
- Need more rigorous SGTR analysis to meet Category 2.
- Need to improve on model convergence to verify truncation value.
- Need to improve PRA model update process and control of documentation including analysis used to support PRA.
- Need to perform HRA update and improve HRA documentation. For example, LERF review did not include determining if engineering analysis can support continued operation or operator action that could reduce CDF, current analysis meets Capability Category 1.

Following the self-assessment, Davis-Besse proceeded to close the A and B level findings in the next model update. Due to implementing new processes for controlling PRA model update and supporting analysis, the next model revision would be referred to as PRA-DB1-AL-R05. The Davis-Besse SAMA analysis model is a clone of the PRA-DB1-AL-R05 Working Model, which is effectively the Revision 4 model with all A and B level findings addressed, but full model update not yet complete, hence the term Analysis Model. Due to the number of changes being made, the Working Model was considered to be the best representation of the as-built, as operated plant and would be frozen mid-update as an Analysis Model. The Davis-Besse SAMA analysis model was documented in accordance with plant processes and retained in plant records. The Davis-Besse Level 1 PRA internal event CDF is estimated to be 9.2E-06/year and when including high winds and internal flooding, the CDF is estimated at 9.8E-06/year. The quantification was performed using a truncation cutoff frequency of 5.0E-13/year. The results presented in this report are based on a freeze date of uly 9, 2009, for the plant configuration, and a freeze date of August 1, 2006, for component failure data and initiating event data. Equipment unavailabilities based on Maintenance Rule availability have freeze dates of April 30, 2007, and anuary 1, 2006, for non-Maintenance Rule unavailability. The release category frequencies are the same as the Containment Systems State frequencies calculated by the Level 2 PRA model, and the sum is slightly different than the CDF calculated by the Level 1 PRA due to the delete term approximation and the additional systems included in the Level 2 PRA models.

Davis-Besse SAMA Analysis Model, Effective 7/9/2009 CDF = 9.8E-06/yr and LERF = 6.6E-07/yr

- Reviewed all system fault trees for component dependencies (air, heating, ventilation, and air conditioning (H AC), power, cooling water, water source, actuation logic, permissives/interlocks), and updated the fault trees with missing dependencies, where necessary.
- Added the reactor vessel rupture initiating event, which directly leads to core damage in the model.
- Changed the core flood tank success criteria for large LOCAs from one required to two required to match the criteria specified in the Updated Safety Analysis Report (USAR).
- Restructured the CCW and service water system fault trees to correct errors in the CCW and service water trees with regard to system lineups, to correctly model dependencies, and to move the model from a single assumed alignment to a model that uses split fractions to model all alignments simultaneously.
- Ad usted all system trees that had assumed a particular alignment to use split fractions to model all alignments simultaneously. Affected systems: CCW, service water, Turbine Plant Cooling Water, nstrument Air, Containment Air Coolers, and the Makeup System.
- Revised the common cause failure (CCF) modeling to use the CAFTA common cause tool and the Multiple Greek Letter (MGL) methodology. Updated the MGL data to currently acceptable values where applicable. Reviewed components for inclusion in common cause groups and groups created where appropriate.
- Updated the Human Reliability Analysis (HRA) events using the Electric Power Research nstitute (EPR) HRA Calculator software. Replaced all Revision 4 combination events with combination events generated by the HRA Calculator.
- Restructured support system initiating events (SS Es) to comply with EPR 1013490, Support System nitiating Events: dentification and uantification Guideline. (Reference 8)
- Removed most modules from the fault trees. The individual events under the former module gate now appear in cutsets.
- Developed the National Fire Protection Association (NFPA) 805 PRA fire model in con unction with the analysis model. As such, added gates to the model to

accommodate the fire modeling functionality. Since the fire modeling is not complete, the fire logic is tied to a single fire initiating event (EF REDUMM) that has a frequency of zero; therefore, the fire logic currently has no effect on the solution to the fault trees.

- Developed new processes for PRA model update and associated analysis.

Davis-Besse SAMA Analysis Model (Level 1 uantification)

- Addressed sequence success gates by PRA UANT in Revision 4. The success gates are now incorporated into the sequence fault tree so that the quantifier (FTREX) will perform the DELTERM function.
- ncluded many mutually exclusive events under the gate MUX016. This change does not alter CDF, but does increase the efficiency of the quantification process.
- Performed quantification in two steps. The first quantification is performed at a truncation of 5.0E-09 with the post-initiator HRA events set to one. The second quantification is performed at 5.0E-13 with the post-initiator HRA events set to their nominal values. The cutsets are then merged and recovery rules applied. The 5.0E-09 cutsets preserve cutsets that contain combination events, and the 5.0E-13 cutsets capture those cutsets that are above the desired 5.0E-13 truncation limit and do not contain post-initiator HRA combinations.

E. .1.2 E ternal Events

E.3.1.2.1 nternal Fires

To evaluate fire risk for the PEEE, Davis-Besse used the EPR F E methodology (Reference 9) supplemented by PRA analyses. Since the F E methodology was intended for plants built more recently than Davis-Besse, the F E methodology allowed few of the Davis-Besse fire compartments to be screened. Therefore, modification of the F E process was employed to include more detailed analysis of affected circuits, improved fire initiation frequency quantification, inclusion of fire effects evaluations, and accrediting of fire prevention and suppression activities at the site. These modifications were primarily taken from the EPR Fire PRA mplementation Guide (Reference 10).

The F E process consisted of several phases. Fire compartments of potential risk significance were identified using the initial qualitative and quantitative screening steps of F E. The first phase of the F E process included identification of safe shutdown equipment and the route of supporting electrical cables in the plant. This information was qualitatively evaluated to determine if there were any plant locations which could be screened out due to the absence of any safe shutdown equipment or cables. The fire barriers of the plant were also evaluated to ensure that any screened out compartments could not cause a fire in any ad acent compartment that could not be screened out. The results of the Fire Compartment nteraction Analysis (FC A) were used by the F E program in the detailed fire analyses of each compartment.

The second phase of the F E process used PRA for plant areas that did not pass the initial screening criteria. n this phase, equipment failures beyond those caused by the fire were considered. Plant areas that had a fire-induced core damage frequency below 1E-06/yr were screened from further evaluation.

The third phase of the F E process involved a detailed fire analysis of the unscreened compartments. This work entailed incorporation of the Fire PRA mplementation Guide information, detailed evaluation of the potential for fire damage due to specific fires within an area, and detailed evaluation of the function of individual cables within the safe shutdown equipment circuitry. The results of these evaluations permitted modification of the fire induced equipment failure lists and allowed more compartments to be screened.

Following completion of the detailed fire anlaysis, there were four fire areas identified with an estimated bounding CDF value above the screening criteria of 1.0E-06/yr. The compartments and the resulting CDF included:

1) .01, High oltage Switchgear Room B, CDF of 8.2E-06/yr
2) S.01, High oltage Switchgear Room A, CDF of 6.5E-06/yr
3) X.01, Low oltage Switdcgear Room, CDF of 5.9E-06/yr
4) FF.01, Control Room Cabinets, CDF of 4.3E-06/yr

The total CDF for the four areas was approximately 2.5E-05/yr.

Based on the identification of fire compartments with CDF values above the screening criteria, Davis-Besse committed to having Severe Accident Management Guidelines in place by December 31, 1997 with emphasis on the prevention/mitigation of core damage or vessel failure, and containment failure of these compartments. The F E model has not been updated since the PEEE.

E.3.1.2.2 Seismic Events

To evaluate seismic risk for the PEEE, Davis-Besse performed a Seismic Margin Assessment (SMA) (Reference 11). As a consequence of using an SMA, Davis-Besse did not quantitatively estimate the seismic CDF contribution.

Davis-Besse was classified as a 0.3g focused-scope plant for the PEEE. However, Davis-Besse decided a 0.15g reduced scope SMA was more appropriate. Nevertheless, the seismic margin analysis indicated that the overall high confidence of low probability of failure (HCLPF) of plant capacity was great than 0.26g.

Davis-Besse expanded its US A-46 program to include all equipment and components on the PEEE safe shutdown list. This list was developed using the EPR SMA methodology for both the primary and secondary shutdown paths. The SMA indicated an overall high confidence of a low probability of failure of plant capacity.

As stated in Section 2.4 of the Davis-Besse PEEE (Reference 12), no actions beyond those previously identified for the Seismic ualification Utility Group (S UG) program were identified from the seismic analysis. The SMA model has not been updated since the PEEE.

E.3.1.2.3 Other External Events

For the assessment of applicable external phenomena, a progressive screening approach was used as recommended in Section 5 of NUREG-1407 (Reference 13). Based on the results in the Davis-Besse PEEE, it was concluded that the plant structures and facilities at the site are well designed to withstand high winds, external floods, extreme rainfall, and transportation and nearby facility accidents. No events were found to exceed the screening criteria.

As discussed previously, since the PEEE, Davis-Besse has added a tornado high winds model to the plant PRA. The model can be used to quantify the effects of tornadic winds on the structures of the Davis-Besse site; the model does not include tornado-generated missiles.

As stated in Section 2.4 of the Davis-Besse PEEE (Reference 12), the analysis of high winds, floods and other external events were found to screen below the applicable screening criteria. Several actions were taken, however, to further reduce the plant risk to postulated significant external events as follows: (1) Potential Condition Adverse to uality Report (PCA R) 96-0186 was initiated to address the issue of onsite hazards from hazardous material; (2) USAR Change Notice 96-58 was initiated to revise the description of the hazards from chemicals stored or transported onsite; (3) the controlled materials program was revised so that new materials approved for use onsite will be evaluated for control room habitability; and (4) PCA R 96-0956 was initiated to document plugged roof drains and standing water on the 643 foot elevation of the Auxiliary Building roof.

n the SER on the Davis-Besse PEEE, the NRC concluded that the PEEE process was capable of identifying the most likely severe accidents and severe accident vulnerabilities, and that the results were reasonable. (Reference 14)

E.3.1.2.4 External Event Severe Accident Risk

This section describes the method used to address external events risk.

As discussed in Section E.3.1.2.2, Davis-Besse used the SMA to evaluate the risk from seismic events. While this methodology does not provide a quantitative result, the resolution of outliers ensures that the seismic risk is low and further cost-beneficial seismic improvements are not expected. Also, as discussed in Section E.3.1.2.3, no other external events were found to exceed the screening criteria. Therefore, the F E results were used as a measure of total external events risk.

As discussed in Section E.3.1.2.1, using the EPR F E methodology, Davis-Besse conservatively estimated the Fire CDF to be 2.5E-05/yr. Since the F E methodology contains numerous conservatisms, a more realistic assessment could result in a substantially lower fire CDF. As noted in NE 05-01 (Reference 2), the NRC staff has accepted that a more realistic fire CDF may be a factor of three less than the screening value obtained from a F E analysis.

Based on the Davis-Besse F E CDF of 2.5E-05/yr, a factor of three reduction would result in a fire CDF of approximately 8.3E-06/yr. This value is the same order of magnitude as the internal events CDF of 9.2E-06/yr. Therefore, this ustifies use of an external events multiplier of three to the averted cost estimates (for internal events) to represent the additional SAMA benefits in external events.

E. .2 E E 2 A A

The Level 2 PRA model determines release frequency, severity, and timing of a release based on the Level 1 PRA, accident progression analysis, and containment performance.

E. .2.1 escri tion o the evel 2 A odel

The Level 2 PRA model addresses the effects on containment of the core damage accidents evaluated in the front-end analysis, and determines the potential for and severity of radionuclide releases that might result.

Level 1 PRA accident sequences that lead to core damage are grouped into core damage bins according to similarities in their impact on subsequent containment response. These bins help ensure that the sequences are developed in sufficient detail to permit them to be properly tracked in the containment event tree (CET).

The core damage bins are quantified through a containment systems bridge tree to evaluate the status of various containment systems (e.g., containment air coolers, containment spray, containment isolation). The status of these systems helps define the capability of containment to prevent a release. The core damage bins, together with the states of containment systems, comprise the plant damage states (PDSs).

The CET provides the framework for evaluating containment failure modes and conditions that would affect the magnitude of the release. The probabilities of the CET end states were quantified for each PDS. Finally, the PDS frequencies are combined with the conditional probabilities of containment failure to provide the frequencies of the release category end states.

Each combination of PDS and CET outcome is assigned to one of nine general release categories: 1) Containment Bypass SGTR; 2) Containment Bypass SLOCA; 3) Large solation Failure; 4) Small solation Failure; 5) Early Containment Failure; 6) Sidewall Containment Failure; 7) Late Containment Failure; 8) Basemat Metlthrough; and 9) No failure. Table E.3-3 provides a matrix showing the mapping of the Level 1 accident sequences into the Level 2 release categories.

As shown in Table E.3-4, the the release categories are subdivided to account for additional release characteristics (e.g., fission product scrubbing). The release categories characterize the release of fission products to the environment in terms of release fractions for ma or fission product groups, release start time, release duration, and location. The release fraction represents the fraction of the initial core inventory from a particular radionuclide, or group of radionuclide s, that is released to the environment. Table E.3-5 provides a general description of the representative release sequences. Table E.3-6 and Table E.3-7 provide descriptions of the release severity source term release fraction, and release timing classification scheme.

The Level 2 PRA model used for the SAMA analysis was the most current model (updated in con unction with revision 3 of the PRA). The Level 2 SAMA model also included the following enhancements:

- Added 14 additional plant-damage states to better define the status of certain containment systems. This was done to support quantification of the CET.
- Further automated the framework in which the containment systems (e.g., containment air coolers, containment spray) bridge tree was quantified. Success logic was added to perform the DELTERM function, and top logic was added so that all contributors to each plant-damage state could be solved at once.

- uantification of the Level 2 PRA model was performed twice (as described in the Level 1 PRA), and the full Level 2 PRA model was quantified.
- All Level 1 PRA model changes (PRA revision 4).

The SAMA analysis model calculated a LERF of 6.6E-07/year. Table E.3-8 ranks the top 30 components for Level 2 PRA based on Fussell- esely importance measure. Table E.3-9 provides the top ten operator actions for Level 2 PRA ranked by Fussell- esely importance measure.

E. .2.2 evel 2 A odel Chan es since E bmittal

Following the PE, a ma or update of the Davis-Besse PRA was performed in 1999 (PRA Revisions 0-2). This included an update to the Level 2 analysis. n addition to the Level 1 changes, the Level 2 added PDSs, and enhanced the manner in which the frequencies were calculated. This update included nearly 500 PDSs to accommodate the core-damage bins and the various combinations of systems that could affect containment response. A framework was also established to allow all of the PDS frequencies to be calculated in a manner that could be readily repeated. n this update, the LERF was calculated to be 7.3E-08/yr. LERF sequences included early containment failures, bypass failures and containment sidewall failures. This update concluded that containment would retain its integrity for approximately 93% of the core damage sequences. The PE concluded that containment would retain its integrity for approximately 84% of the core damage sequences.

Another update to the Level 2 PRA was performed after the industry peer review in con unction with Revision 3 to the PRA. n addition to the Level 1 changes, the Level 2 included simplifying LERF quantification. n this update, the LERF was calculated to be 3.8E-08/yr. Of the 500 PDSs, five contributed 85% of the LERF: 1) SLOCA; 2) SGTR; 3) SBO; 4) loss of feedwater with induced SGTR; and 5) RCP seal LOCA.

E. . A -BE E A O E E E A

Regulatory Guide 1.174, Revision 1 (Reference 15), Section 2.2.3 states that the quality of a PRA used to support an application is measured in terms of its appropriateness with respect to scope, level of detail and technical acceptability, and that these are to be commensurate with the application for which it is intended.

The PRA technical acceptability of the model used in the development of this SAMA application has been demonstrated by a peer review process. The peer review was completed in March 2000, by the former B W Owner s Group. The overall conclusions of the peer review were:

> *During the peer review, all parts of the PRA elements identified as part of the peer review process were included in the PRA. Each technical element was assessed as sufficient to support applications requiring risk ranking determination supported by deterministic insight, but in one case this assessment was contingent upon enhancing some specific aspect of the PRA. Furthermore, of the 11 technical elements, nine were assessed as sufficient to support risk significant applications supported by deterministic insights, but in one case this assessment was contingent upon enhancing some specific aspects of the PRA.*

There were no Category A observations identified by the peer reviewers.

The Category B observations were as follows:

OB E AT ON A -

The sequence analysis success criteria appear to be a mixture of Final Safety Analysis Report (FSAR), Babcock Wilcox (B W) memos, hand calculations, and poorly documented RELAP analysis. The level of documentation is not adequate to determine the validity of the success criteria. Additionally, the references that are included do not always support the criteria being used. Also, many of the references are over ten years old, raising concerns that they may not be consistent with the current plant operation.

C O E

The success criteria in the PRA that differ from the Design Basis success criteria are primarily for transients such as feed and bleed cooling and for small break LOCA. Transients and small break LOCA make use of the make-up pumps in combination with the HP pumps for inventory control and heat removal. Make-up pumps are not credited for accident mitigation in the Design Basis. The completed calculations provide the basis for the success criteria for feed and bleed cooling and small break LOCA. These calculations generally verify the PRA existing success criteria of the PRA and provide additional flexibility.

OB E AT ON A -

In the sequence analysis notebook, the success criteria for large and medium LOCAs reference a RELAP5 calculation as the basis for the core flood tank requirements. The reference was available for review, but there was no evidence of any technical review associated with this calculation.

C O E

This observation is a specific example of the issue addressed for AS-3. The success criteria for the large and medium LOCA only credit one core flood tank. The PRA SAMA update resolved this issue by crediting both core flood tanks for the large LOCA. This change turns out to have a small effect on large LOCA, but no impact on overall CDF.

OB E AT ON -

The Davis-Besse Probabilistic Assessment Program Guidelines, which includes guidance for maintenance and update of the PRA, is weak in the discussion of evaluation and interpretation of results in Section .5.

C O E

The Davis-Besse Probabilistic Assessment Program Guidelines have been replaced by the following Nuclear Operating Business Practices: Probabilistic Risk Assessment Model Management, Revision 0, and Probabilistic Risk Assessment Applications Management, Revision 0. Both of these Business Practices became effective anuary 19, 2009, and provide a rigorous basis for the maintenance and upgrade of the existing PRA models and the application of the PRA model for risk-informed applications and assessments.

OB E AT ON -

There was no evidence of sensitivity studies other than those done for the valve ranking calculations. Sensitivity studies should be performed on the base model to investigate the sensitivity of the results to modeling assumptions. For example, the CDF could be significantly affected by the RCP seal LOCA model assumptions.

O EN

FENOC plans to include a Sensitivity Analysis Notebook in Revision 5 of the PRA.

OB E AT ON -

Basic event EB EF15F is in two different modules EMM0EF15 and EMM EF15.

O EN

This case corresponds to failure of the same motor control center (MCC) but in two mutually exclusive service water system alignments. Therefore, there is no impact on the PRA results. n Revision 5 of the PRA, FENOC plans to change EMM0EF15 and EMM2EF15 to be OR gates instead of modules. FENOC also plans to include basic event EB3EF15F under each OR gate.

E. . A -BE E A O E E E A N T

E. . .1 ntrod ction

This section describes the development of the inputs needed to perform a Level 3 PRA for Davis-Besse. For the SAMA analysis, the cost-benefit analysis required comparison of comparable quantities; dose results from the Davis-Besse Level 3 PRA were converted into dollars for the purpose of comparison.

The Level 3 PRA relied on the results of the severe accident consequence code MELCOR Accident Consequence Code System (MACCS2) (References 16, 17). ersion 1.12 of MACCS2 was used for this analysis. MACCS2 simulates the impact of severe accidents at nuclear power plants on the surrounding environment. The principal phenomena considered are atmospheric transport, mitigative actions (based on dose thresholds), dose accumulation via a number of pathways (e.g., food and water ingestion), early and latent health effects, and economic costs.

The scope of a Level 3 PRA is generally driven by the nature of the release categories, which are the end states of a Level 2 PRA. The release categories are viewed as the initiating events of a Level 3 PRA. Accordingly, to use the output results of MACCS2 on a comparative basis, the release category consequence parameters were weighted by the likelihood of that release category to create a consequence. The risk metric was created by using the results of the Level 1 PRA and the Level 2 PRA, in the form of a release category frequency vector, containing the release frequency of each release category and the Level 3 PRA consequence parameters for each release category. Release category frequency vectors were only available for initiating events. As with the initiating events and CDF for a Level 1 PRA, the risk results of a Level 3 PRA were summed over all of the release categories.

The Level 3 PRA analysis considered a base case and eleven sensitivity cases to account for variation in data and assumptions. The following list describes the sensitivity cases, which are discussed in Section E.8:

- Case S1 Use estimated 2060 site population data (with an escalation rate of 4.7%/decade); the same escalation rate for the base case population to 2040
- Case S2 Use a less conservative escalation rate of 1.5% to estimate the 50-mile population around Davis-Besse in 2040

- Case S3 Set all watershed indices to 1
- Case M1 Use 2007 meteorological data
- Case M2 Use meteorological data from circa late-1990s
- Case A1 Use an alternative method to estimate PLHEAT
- Case A2 Use conservative meteorological boundary conditions
- Case A3 Use a longer OALARM value to better reflect operator s ability to react
- Case E1 Use a more realistic (higher) speed of evaluation (ESPEED)
- Case E2 Set sheltering shielding factors based on brick house (versus wood housing used in the base case)

E. . .2 o lation ata

The population data were extracted using SECPOP2000 (Reference 18) with 2000 census data for Davis-Besse sited at latitude of 41 degrees, 35 minutes, 50 seconds, and longitude of 83 degrees, 5 minutes, 11 seconds. The population data were ad usted to account for the transient population within 10 miles of Davis-Besse. The transient population segment, includes seasonal residents, transient population, and boating population. The population escalation factor was developed considering different sets of population data, e.g., state-wide versus within a 50-mile radius of the plant.

The year 2040 was selected as the year to estimate the population since a 20-year license renewal for Davis-Besse will extend its operating license from 2017 to 2037. For the Level 3 PRA model, the estimated population for 2040 overestimated the population at the end of the extended operating license, and therefore generated conservative results because the population dose and economic impact costs are a function of increasing population. The escalated population estimate is conservative for a second reason, since an accident could only occur between now and 2037, the actual population would be less than what is used in the Level 3 PRA model, and the benefit of each SAMA candidate evaluated is over-estimated.

Ohio State census data are provided in Table E.3-10. Population of the counties surrounding Davis-Besse has been reasonably constant until 2004, after which the population declines (Reference 19).

To be conservative, the state-wide data were used to estimate an escalation factor for the population. Despite the decreasing population rate trend indicated for the population within the 50-mile radius of the plant, a constant escalation rate (per decade) was assumed based on the state-wide data presented in Table E.3-10. A constant escalation rate of 4.7%/decade was used to estimate the population for 2040 (base case) and for 2060 (sensitivity case).

The population used in the base case was conservative, since the transient population was included and escalated in a manner similar to the resident population. Table E.3-11 shows the 2040 population used in the base case.

E. . . eteorolo ical ata

Meteorological data were obtained for the years 2006 through 2008 recorded at the Davis-Besse permanent on-site meteorological tower located within a fenced compound in the southwest corner of the plant (Reference 20, Section 2.3.3). The meteorological tower is located approximately a half-mile southwest of the containment building. Meteorological data included wind speed, wind direction, delta-temperature, and precipitation for each hour of the year.

An initial review identified long sequences of unusable meteorological data for 2008. As it was not reasonable to replace such a long sequence using the data substitution strategy, the 2008 meteorological data were deemed to be not viable as MACCS2 input. Accordingly, only the data for years 2006 and 2007 were reviewed. t was determined which of these years contained the least number of unusable meteorological data entries. This was the criterion used to determine which year would be the base case meteorological data. The second best year was used for a sensitivity case.

The meteorology data from 2006 were found to have the least amount of unusable data, therefore the 2006 meteorological data were used as the base case and the meteorological data from 2007 were used as a sensitivity case. Results of the sensitivity cases confirmed that the 2006 meteorological data were representative and typical.

The mixing height values were estimated from Figures 2-5 (morning), and Figures 7-10 (afternoon) from Reference (21), as shown in Table E.3-12. The values were provided as real numbers in 100s of meters in the MET file.

E. . . Other ite Characteristics

Other site characteristics include land fraction, region index, watershed index, crop and season share, and building dimensions, which are discussed below.

The land raction is the fraction of land in each section. Using maps (see Figures 2.1-1 and 2.1-2 in the body of the Environmental Report), the land fraction in each grid sector was estimated by visual inspection.

The re ion inde equates the counties for which economic data have been specified for each section of the grid. The region index block was developed from Figures 2.1-1 and 2.1-2 in the body of the Environmental Report. These figures show the ten concentric rings and 16 wind directions overlaid on the Ohio and Michigan State counties, Lake Erie, and Canada. Each section was evaluated to determine which county occupied the most land in the sector; this was then used as the region index.

The atershed inde is assigned either a 1 or a 2. Using Figures 2.1-1 and 2.1-2 in the body of the Environmental Report, any region (sector) that contained some land was assigned a watershed index of 1 (run-off possible). An index of 2 was assigned for the segment if there was no runoff to a public water supply. Any region that was exclusively water (i.e., Lake Erie) was assigned a watershed index of 2. The sensitivity of these assignments were tested with a sensitivity case assigning a 1 to all the sectors.

The ro in season used was the default growing season specified by MACCS2. The default growing season for pasture is March 1 to August 30; for all other crops, the growing season is April 30 to uly 30.

The raction o armland devoted to specific crops was estimated from the total acres of farmland in the region and acres devoted to each crop. This input was generated using the 2007 Census of Agriculture Data for Ohio (Reference 22) and Michigan (Reference 23). The total farm land in the region was summed from the acres of farmland in each county.

Seven categories of crops were accounted for: pasture, forage, grains, vegetables, other food crops, legumes and seeds, and roots and tubers. To calculate the other food crops harvested, the crops mentioned above less the pasture was subtracted from the total farmland harvested. This difference was assumed to be other crops that were not accounted for in the six categories.

The ATMOS file also required reactor b ildin dimensions to determine the parameters S G N T (σ_y) and S G N T (σ_z). Building dimensions were taken from Figure 1.2-1 (height) and Figure 3.8-3 (width) (Reference 20) for the MACCS2 base case. The reactor building width is approximately 44 meters; the building height is approximately 73 meters.

E. . . elease Cate ories Characteristics rom AA

Each release category was processed in the MACCS2 code. Over 30 accident sequences involving a spectrum of LOCAs, transients, and SGTRs were analysed using MAAP. n addition, several sensitivity study runs were performed to further define the potential impact of uncertainties in release categories associated with phenomenological modeling in MAAP. The input that differentiates each release category is the information that is extracted from the MAAP run (for each release category). One of the outputs of the Level 2 PRA is the definition of the release categories and their frequencies. Each release category with a non-zero frequency is characterized by a MAAP run. The definition of each release category and the correspondence to a MAAP run are presented in Table E.3-4.

There are some differences in how radioisotopes are grouped in MAAP and MACCS2. The MAAP grouping is as follows:

ro	escri tion
1	Nobles nert Gases
2	Cs , Rb
3	TeO_2
4	SrO
5	MoO_2
6	CsOH, RbOH
7	BaO
8	La_2O_3, Nd_2O_3, $_2O_3$, Pr_2O_3, Sm_2O_3
9	CeO_2
10	Sb
11	Te
12	NpO_2, PuO_2

The MACCS2 grouping is as follows:

ro	escri tion
1	Xe, r
2	
3	Cs
4	Te, Sb
5	Sr

ro	escri tion
6	Ru, Co, Mo, Tc, Rh
7	La, , r, Nb, Am, Cm, Pr, Nd
8	Ce, Pu, Np
9	Ba

Based on these groups, the following mapping was used between the MAAP and MACCS2 radioisotopic groups:

MAAP	1	2	6	3, 10, 11	4	5	8	9, 12	7
MACCS2	1	2	3	4	5	6	7	8	9

Table E.3-13 summarizes the data extracted from MAAP. The data were collected and simple calculations were performed to support the base case and some of the sensitivity cases.

Table E.3-13 shows the correspondence between the MAAP runs and the release categories (as identified in Table E.3-4). The warning time (MACCS2 variable OALARM) was extracted from MAAP as the time to core uncovery. The heat of release (MACCS2 variable PLHEAT) was calculated using information extracted from MAAP. The height of release (MACCS2 variable PLH TE) was extracted from MAAP and used directly as input to MACCS2. The release fractions (MACCS2 variable RELFRC(x)) were mapped from twelve radioisotopic groups defined for MAAP to the nine radioisotopic groups defined for MACCS2. For MACCS2 group 4, the maximum of MAAP groups 3, 10, and 11 was used; for MACCS2 group 8, the maximum of MAAP groups 9 and 12 was used. The duration of the release (MACCS2 variable PLUDUR) was used as input to MACCS2.

The time to core uncovery for a number of release categories (2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 7.1, 7.2, 7.5, 7.6, 8.1, 8.2, 9.1, 9.2) is about 300 seconds (five minutes). This may be an unrealistically short time to expect Davis-Besse to declare a General Emergency. A sensitivity case was performed extending the OALARM parameter to 1200 seconds (20 minutes); there was little or no change in the consequence metrics used to support the SAMA analysis. Accordingly, the SAMA analysis results were not sensitive to this parameter and the MAAP value of 300 seconds remained in the base case.

E. . . Evac ation odel arameters

E.3.4.6.1 Weighting Fraction

A weighting fraction of 95% of the people was used, i.e., 95 percent of the people are evacuated and five percent of the population remains within the emergency planning zone (EP) during the entire problem time.

E.3.4.6.2 Evacuation Speed

The travel speed can be defined during the three phases of the evacuation: initial, middle, and late (MACCS2 variable ESPEED). The evacuees are presumed to move from a spatial element when they cross the boundary dividing the two elements (MACCS2 variable TRA ELPO NT using the BOUNDAR option). When the BOUNDAR option is used all three values of ESPEED are identical. To determine the speed of evacuation, the time to evacuate the EP (ten-mile radius) was estimated. Time-to-clear-affected-population data for a variety of scenarios were used. The most conservative (longest time) scenario was selected: summer, midday, weekend, rain. The time to evacuate from the EP area around the plant (ten-mile radius) was estimated as 7 hours, 45 minutes. This is equivalent to a constant evacuation speed of 0.58 meters/second. This value is slow compared to a more typical evacuation speed of 1.0 or 2.0 meters/second; accordingly, a sensitivity case with an evacuation speed of 1.0 meters/second was performed.

E.3.4.6.3 Evacuation Delay Time

The results of the evacuation time analysis for Summer, Midday, Midweek, was used since these conditions were close to the conditions used to estimate the evacuation speed. For evacuation areas 1 to 12 (which corresponds to the EP), the clear time relative to the siren alert was used to estimate the delay time from the siren alert to when individuals take shelter (MACCS2 variable DLTSHL). The clear time related to the order to evacuate was used to estimate the delay time from sheltering to evacuation (MACCS2 variable DLTE A). DLTSHL was set at 10800 seconds (three hours), and DLTE A was set at 17700 seconds (four hours, 55 minutes).

E.3.4.6.4 Shielding Factors

The groundshine and cloudshine shielding factors used in the base case are presented in Table E.3-14. The basis for the values used in the base case is wooden houses. As a sensitivity case, values based on brick houses were used, as presented in Table E.3-15. The cloudshine and groundshine shielding factors, protection factors, and breathing rate for normal activities, evacuation, and sheltering are presented in Table E.3-16.

E. . .7 Core nventor

The Davis-Besse core inventory is defined as full core inventory at 24-month end-of-cycle (177 fuel assemblies). The core inventory was calculated using OR GEN-2 (Reference 24) . Table E.3-17 shows the core inventories as provided in curies and in becquerels, to be used as input into MACCS2.

E. . . Economic ata

Using the 2007 Census of Agriculture Data of References (22) and (23), Table PD-30 from Reference (25) (Ohio property values), Exhibit 22 from Reference (26) (Michigan property values), and 2007 census data from Reference (27)[1] , the following site-specific (averaged per county) inputs in Table E.3-18 were generated: fraction of land devoted to farming, fraction of dairy farm sales, total annual farm sales, farmland property value, and non-farmland property value. The last two values were averaged to provide input to the CHRONC file.

Additional site-specific economic parameters are given below. While many of the parameters were obtained from a government website (extracted in uly 2009 and October 2009), these values are considered to be a snapshot in time to perform this analysis. The source of this information does not imply that these values need to be updated as the websites are revised.

E AC T The daily cost of compensation for evacuees and short-term relocatees who are removed from their homes as a result of radiation exposure during the emergency-phase relocation period. This value includes the following components: food, housing, transportation, and lost income.

The daily cost was calculated by using the 2000 census economic data of per capita income for each state (Reference 28) and the per-county per-diem rate for meals, expenses and lodging (Reference 29). The per capita income was found in the quickfacts section of the website: 21,003 (Ohio) and 22,168 (Michigan). The per-diem rate for Ohio of 147/day was based on the maximum per-diem rate in Erie and Huron counties; the per-diem rate for Michigan of 156/day was based on the maximum per-diem rate in Wayne County.

[1] The population data used for this analysis were extracted from the 2007 Population Estimates.

For Ohio State, E AC T is 204.54/person-day; for Michigan State, E AC T is 216.73/person-day. The average of the Ohio and Michigan E ACST values was used as input in the CHRONC file.

E C T The daily cost of compensation for evacuees and short-term relocatees who are removed from their homes as a result of radiation exposure during the intermediate-phase relocation period. This value includes the following components: food, housing, transportation, lost income, and replacement of personal property.

RELCST was estimated using the evacuation costs plus the average property cost per person. The average property cost per person was calculated from the total property value in the state, which can be found on the individual state s Department of Revenue websites:

- 256,088,369,000 for Ohio (Reference 25, Table PD-30)
- 340,545,761,049 for Michigan (Reference 26, Exhibit 22)

The total property cost was divided by the total population (11,353,140 for Ohio and 9,938,444 for Michigan) (Reference 27).

For Ohio State, E C T is 266.34/person-day; for Michigan State, E C T is 310.61/person-day. The average of the Ohio and Michigan RELCST values was used as input in the CHRONC file.

Other economic input parameters used in the CHRONC file are provided in Table E.3-19.

E. . A -BE E A O E E E A E T

The results are presented via a set of two output parameters that are used to support the SAMA analysis. These parameters are described as followed:

Whole Body Dose (person-rem) (population dose) this is defined as the sum of the whole body dose received by the population within x miles of the site, where x=1, 10, and 50 miles. (MACCS2 parameter L-EDEWBOD from T PE5OUT)

Economic impact ( ) this risk is defined as the sum of the population- and farm-dependent costs; because of the uncertainties associated with the cost input parameters, the economic impact results were only used in a relative manner (never considered as an absolute dollar amount) for the SAMA analysis to compare the cost of an alternative to the base case. (MACCS2 parameter defined as T P10OUT)

To estimate risk, each consequence parameter was weighted by the frequency of the release categories in which the consequence was manifested. These risk results are presented on a per-release category basis, on a rolled-up release category basis, or as a total risk (the sum over all the release categories). Typically, the risk is presented for each parameter from zero to 50 miles summed over all of the release categories.

The Level 1 and Level 2 PRA results are summarized in the release category frequency vector, which contains the frequency (from initiating event) of an individual release category occurring. The frequency vector is presented in Table E.3-20. alues for the base case output parameters were manually extracted from the MACCS2 output file, and then a weighting of the consequences per release category was performed by multiplying by the release category frequency and summing the products. The results from the sensitivity cases were also processed similarly to the base case. For the sensitivity cases, the further step of comparison against the base case was performed.

E. . .1 Base Case

The results for the base case are presented in Table E.3-21. The results show the estimated population dose (whole body dose in person-rem/year) and the economic impact in dollars/year. While there are a variety of other consequence metrics that are estimated by MACCS2, these two consequence metrics are the ones used in the SAMA cost-benefit analysis.

Table E.3-22 gives the consequences for each release category for whole body dose and economic impact at 50 miles. These data were used as input into the SAMA analysis.

E. . .2 ensitivit Cases

The sensitivity cases presented in this subsection were performed to demonstrate the robustness of the input parameters selected to support the MACCS2 model developed for the Level 3 PRA. There is no guidance in NE 05-01 (Reference 2) on the nature of location of these sensitivity cases in the SAMA analysis documentation. Discussion of these sensitivity cases immediately follows the discussion of the Level 3 PRA model and is deemed the most appropriate location in the documentation. There are other sensitivity cases recommended by NE 05-01 (Reference 2) that deal specifically with the cost-benefit evaluation. As recommended in NE 05-01 (Reference 2), discussion of the cost-benefit sensitivity studies can be found in Section E.8.

E.3.5.2.1 Site

Case 1 The population used in the base case was for the year 2040. Case S1 used the 2060 population, which is population of the site in a 50-mile radius around the plant more than 20 years after the extended license would expire. Thus, this sensitivity case represents the most conservative estimate of population around the plant.

The results in Table E.3-23 show the expected uniform increase in all parameters as a result of the increased in the population. The model shows the appropriate sensitivity to an increase in the population.

Case 2 The population used in the base case was 2000 population data from SECPOP2000 escalated to 2040 using an escalation factor of 4.7% per decade derived from census data. Case S2 uses a less conservative escalation factor of 1.5% (using population increase estimate for the 2000 to 2010 decade). This sensitivity case provides more realistic, less conservative consequence estimates.

The results in Table E.3-24 show the expected, uniform decrease in the consequences as reflected in the reduction of the population in this sensitivity case. The model shows the appropriate sensitivity to an increase in the population.

Case The base case was run with two watershed indexes. This sensitivity case determines the impact of assuming all the watershed indices are set to 1, i.e., maximum runoff consequences.

The results in Table E.3-25 show there is a minimal impact on the consequences when all the watershed indices are set to 1.

E.3.5.2.2 Meteorological

Case 1 The base case was performed with Davis-Besse weather data from 2006, which had the least number of unusable meteorological data points. A sensitivity case was performed to demonstrate the typical nature of any particular year s worth of meteorological data. Data from 2007 were chosen as being the second best with respect to the number of unusable meteorological data points.

The results in Table E.3-26 show that there is minor variability in the results, which is due to the Monte Carlo meteorological model. This sensitivity case supports the typical nature of any particular year s worth of meteorological data.

Case 2 An additional sensitivity case was performed to further demonstrate the typical nature of any particular year s worth of meteorological data. These data are circa late-1990s, but no specific year could be identified, and therefore are only to be used as a second sensitivity case.

The results in Table E.3-27 are similar to sensitivity case M1, with some minor variability in the consequence, demonstrating the representativeness of any year s worth of meteorological data.

E.3.5.2.3 ATMOS

Case A1 A different approach was taken in the Davis-Besse Level 3 PRA for estimating the energy of release from the MAAP output data for each of the release categories. Accordingly, this sensitivity case, A1, provides a comparison to the simpler method of estimating the heat of release. The energy of release was obtained from MAAP by multiplying the flow rate of the break unction by the enthalpy of the release gas.

The results in Table E.3-28 show that the method used to determine the heat of release in the base case generates more conservative results than the method used in sensitivity case A1.

Case A2 A sensitivity case was run with more extreme values of the meteorological boundary parameters, i.e., mixing height (BNDMXH), stability class (BDSTB), rain rate (BNDRAN), wind speed (BNDWND). n general, the sensitivity case considered all of these boundary parameters collectively (i.e., all considered in one case). The rain rate boundary condition was set at 0.0 mm/hour for the base case; there is no value more conservative than that. The conservative boundary parameters had no impact on the results as shown in Table E.3-29.

Case A With some warning time (MACCS2 variable OALARM) values at about 300 seconds, there is a question about the operator s ability to react in such a short period of time. Accordingly, this sensitivity case was performed using 20 minutes (for those release categories with an OALARM value of about 300 seconds); this approach is consistent with the time to oxidation for those release categories.

The results in Table E.3-30 show virtually no impact with the change in OALARM values. Accordingly, the OALARM values as derived from the MAAP time to uncovery will be maintained as the base case.

E.3.5.2.4 EARL

Case E1 The base case was performed with an evacuation speed of 0.58 meters/second, based on Davis-Besse-specific evaluation information. This evacuation speed is among the slowest used (in other models), although it includes the most adverse evacuation conditions. Accordingly, a sensitivity case was performed with a faster evacuation speed to gauge the sensitivity of this parameter.

This increase in the evacuation speed results in a minor decease in the consequence values, as shown in Table E.3-31. This result is expected, as faster evacuation should remove the population from the radiological damage more quickly.

Case E2   The base case was performed with the shielding factors assuming wood housing. This sensitivity case sets the sheltering shielding factors based on brick housing. The results in Table E.3-32 show that brick provides greater shielding (as indicated by the shielding factors), which results in less consequence to the population. However, the decrease is minor, suggesting that the use of shielding factors based on wood housing, while conservative, is appropriate.

E. CO T OF E E E ACC ENT

The SAMA candidates placed in the *Considered for Further Evaluation* category in Section E.5 required a cost-benefit evaluation. The cost-benefit evaluation of each SAMA candidate was based on the comparison of the cost of implementing a specific SAMA candidate (in U.S. dollars) with the benefit of the averted on-site and off-site risk (in U.S. dollars) from the implementation of that particular SAMA candidate. The methodology used for this evaluation was based on regulatory guidance for a cost-benefit evaluation as described in Section 5 of Reference (1). This regulatory guidance determines the net value for each potential SAMA candidate according to Equation E.4-1:

$$\text{Net alue} = (APE + AOC + AOE + AOSC) - COE \qquad \text{(E.4-1)}$$

where,

APE = present value of the averted public exposure ( )

AOC = present value of the averted off-site property damage costs ( )

AOE = present value of the averted occupational exposure ( )

AOSC = present value of the averted on-site costs ( )

COE = cost of the enhancement ( )

The purpose of this section is to quantitatively determine the maximum benefit for Davis-Besse. The maximum benefit was defined as the maximum benefit a SAMA candidate could achieve if it eliminated all risk. f the estimated cost of implementation of a specific SAMA candidate was greater than the maximum benefit, then the alternative was not considered economically viable and was eliminated from further consideration. This section shows the maximum benefit evaluation for internal events[2].

E. .1 OFF- TE E O E CO T

The term used for off-site exposure cost is designated as averted public exposure (APE) cost. The off-site dose within a 50-mile radius of the site was determined using the MACCS2 model developed for the Davis-Besse Level 3 PRA in Section E.3.4.

[2] The Davis-Besse internal events PRA model also includes the risk impact from high winds; reference to the internal events PRA model or the CDF therefore includes the risk contribution from high winds.

Table E.3-21 provides the off-site dose for each release category obtained for the base case of the Davis-Besse Level 3 PRA weighted by the release category frequency. The total off-site dose for internal events (D_t) was estimated to be 2.0 person-rem/year. The APE cost was determined using Equation E.4-2 (Reference 1, Section 5.7.1).

$$APE = W_{pha} = (C)(\quad_{pha}) \qquad \text{(E.4-2)}$$

where,

W_{pha} = monetary value of public health risk after discounting (APE) ( )

C = present value factor (yr)

Z_{pha} = monetary value of public health risk per year before discounting (/year)

The present value factor (C) was determined using Equation E.4-3, which was obtained from Section 5.7.1 of Reference (1).

$$C = \frac{1 - e^{-rt}}{r} \qquad \text{(E.4-3)}$$

where,

r is the discount rate (%/yr) = 7%/yr = 0.07/yr

t is the time to expiration of the renewed Davis-Besse license = 28 years (2009-2037)

The present value factor was calculated in Equation E.4-4, and was used throughout the document.

$$C = \frac{1 - e^{-\left(\frac{0.07}{yr}\right)(28yrs)}}{\left(\frac{0.07}{yr}\right)} = 12.27yr \qquad \text{(E.4-4)}$$

The monetary value of public health risk per year before discounting ($_{pha}$) was determined using Equation E.4-5 (Reference 2, Section 4.1).

$$_{pha} = (R)(D_t) \qquad \text{(E.4-5)}$$

where,

R = monetary equivalent of unit dose (/person-rem)

D_t = total off-site dose for internal events (person-rem/yr)

The conversion factor used to establish the monetary value of a unit of radiation exposure was 2,000 per person-rem averted. This monetary value was used for the year in which the exposure occurs and then discounted to the present value to evaluate the values and impacts. The monetary value of public health risk per year before discounting ($_{pha}$) for Davis-Besse was calculated using Equation E.4-6.

$$_{pha} = \left(2{,}000 \frac{}{\text{person} - \text{rem}}\right)\left(2.0 \frac{\text{person} - \text{rem}}{\text{yr}}\right) = \ 4000/\text{yr} \qquad \text{(E.4-6)}$$

where,

R = 2,000/person-rem

D_t = 2.0 person-rem/year

The values for the base case are:

C = 12.27 yr

Z_{pha} = 4,000/yr

$$\text{APE} = (12.27\text{yr})\left(\frac{4000}{\text{yr}}\right) = \ 49{,}080 \qquad \text{(E.4-7)}$$

E. .2 OFF- TE ECONO C CO T

The term used for off-site economic cost is designated as averted off-site property damage costs (AOCs). The off-site economic loss for a 50-mile radius of the site was determined using the MACCS2 model developed for the Davis-Besse Level 3 PRA in Section E.3.4. Table E.3-21 provides the economic loss for each release category obtained for the base case of the Level 3 PRA weighted by the release category frequency. The total economic loss from internal events (I_t) was estimated to be 1,600 per year. The averted cost was determined using Equation E.4-8 from Reference (1), Section 5.7.5.

$$AOC = (C)(_t) \qquad \text{(E.4-8)}$$

where,

AOC = off-site economic costs associated with a severe accident ( )

C = present value factor (yr)

I_t = monetary value of economic loss per year from internal events before discounting (/yr)

The values for the base case are:

C = 12.27 yr

I_t = 1,600/yr

$$AOC = (12.27yr)\left(1600 \frac{}{yr}\right) = 19,632 \qquad \text{(E.4-9)}$$

E. . ON- TE E O E CO T

The term used for on-site exposure cost is designated as averted occupational exposure (AOE). The NRC methodology used to estimate the AOE consists of two components: (1) the calculation of immediate dose cost (short-term) and (2) long-term dose cost (Reference 1, Section 5.7.3). The development of the two contributors is discussed in Sections E.4.3.1 and E.4.3.2.

E. . .1 mmediate ose Cost

The immediate doses were those doses received at the time of the accident and during the immediate management of the accident. The immediate on-site dose cost was determined using Equation E.4-10.

$$W_O = (R)(F)(D_O)(C) \qquad \text{(E.4-10)}$$

where,

W_{IO} = monetary value of accident risk avoided from immediate doses, after discounting ( )

R = monetary equivalent of unit dose (/person-rem)

F = CDF (events/yr)

D_{IO} = immediate occupational dose (person-rem/event)

C = present value factor (yr)

The values for the base case are:

R = 2,000/person-rem

F = 1.0E-05 events/yr Table E.3-20 (internal events)

D_{IO} = 3,300 person-rem/event

C = 12.27 yr

$$W_O = \left(2{,}000 \frac{}{\text{person}-\text{rem}}\right)\left(1.0\text{E-}05 \frac{\text{events}}{\text{yr}}\right)\left(3{,}300 \frac{\text{person}-\text{rem}}{\text{event}}\right)(12.27\text{yr}) = 810 \qquad \text{(E.4-11)}$$

E. . .2 on -Term ose Cost

The long-term doses were those doses received during the process of cleanup and refurbishment or decontamination. The long-term on-site dose cost was determined using Equation E.4-12.

$$W_{LTO} = (R)(F)(D_{LTO})(C)\left(\frac{1-e^{-rm}}{rm}\right) \quad \text{(E.4-12)}$$

where,

W_{LTO} = monetary value of accident risk avoided from long-term doses, after discounting ( )

R = monetary equivalent of unit dose (/person-rem)

F = CDF (events/yr)

D_{LTO} = long-term occupational dose (person-rem/event)

r = discount rate (%/yr)

m = on-site cleanup period (yrs)

The values for the base case are:

R = 2,000/person-rem

F = 1.0E-05 events/yr Table E.3-20 (internal events)

D_{LTO} = 20,000 person-rem/event

C = 12.27 yr

r = 7%/yr = 0.07/yr

m = 10 yrs

$$W_{LTO} = \left(2{,}000\,\frac{}{\text{person}\cdot\text{rem}}\right)\left(1.0\text{E-}05\,\frac{\text{events}}{\text{yr}}\right)\left(20{,}000\,\frac{\text{person}\cdot\text{rem}}{\text{event}}\right)(12.27\text{yr})\left(\frac{1-e^{-\left(\frac{0.07}{\text{yr}}\right)(10\text{yrs})}}{\left(\frac{0.07}{\text{yr}}\right)(10\text{yrs})}\right) \quad \text{(E.4-13)}$$

$$W_{LTO} \cong 3530$$

E. . .   Total Accident- elated Occ ational E os re Costs

The AOE costs were estimated by combining the immediate on-site dose cost (W_O) and long-term dose cost (W_{LTO}) equations and using the numerical values calculated in Sections E.4.3.1 and E.4.3.2.

The base case accident-related occupational exposure cost is:

$$AOE = W_O + W_{LTO} = 810 + 3{,}530 = 4{,}340 \quad \text{(E.4-14)}$$

E. .   ON- TE ECONO C CO T

The term used for on-site economic cost is designated as averted on-site costs (AOSCs). To determine the AOSC, the estimation consists of three components: (1) the estimation of cleanup and decontamination costs, (2) repair and refurbishment cost, and (3) the replacement power costs over the remaining life of the facility (Reference 1, Section 5.7.6). The repair and refurbishment costs are only considered for a recoverable accident and not for a severe accident. Therefore, this component did not need to be evaluated for this analysis. The development of the remaining two contributors is discussed in Sections E.4.4.1 and E.4.4.2.

E. . .1   Clean   econtamination

The present value of the cost of cleanup and decontamination over the remaining life of the facility (U_{CD}) was determined by using Equation E.4-15.

$$U_{CD} = (P\ _{CD})(C)(F) \quad \text{(E.4-15)}$$

where,

PV_{CD} = present value of the cost of cleanup/decontamination ( )

C = present value factor (yr)

F = CDF (events/yr)

Section 5.7.6 of Reference (1) assumes a total cleanup/decontamination cost of 1.5E 09 as a reasonable estimate and this same value was adopted for these analyses. Assuming a ten-year cleanup period, the present value of this cost was determined by using Equation E.4-16.

$$P_{CD} = \left(\frac{C_{CD}}{m}\right)\left(\frac{1-e^{-rm}}{r}\right) \qquad \text{(E.4-16)}$$

where,

PV_{CD} = present value of the cost cleanup/decontamination ( )

C_{CD} = total cost of the cleanup/decontamination effort ( )

m = cleanup period (years)

r = discount rate (%/yr)

The values for the base case are:

C_{CD} = 1.5E 09

m = 10 years

r = 7%/yr = 0.07/yr

C = 12.27 yr

F = 1.0E-05 events/yr Table E.3-20 (internal events)

$$U_{CD} = \left(\frac{1.5E+09}{10}\right)\left(\frac{1-e^{-(0.07)(10yrs)}}{0.07}\right)(12.27yr)(1.0E\text{-}05) = 132{,}362 \qquad \text{(E.4-17)}$$

E. . .2 e lacement o er Cost

Replacement power costs were calculated in accordance with Reference (1, Section 5.7.6). The replacement power is needed for the time period following a severe accident and for the remainder of the expected generating plant life. Therefore, the long-term power replacement equations were used to calculate replacement power costs. The present value of replacement power was calculated using Equation E.4-18. Equation E.4-18 was developed for discount rates between 5% and 10%.

$$P_{RP} = \frac{B}{r}\left(1 - e^{-rt_f}\right)^2 \qquad \text{(E.4-18)}$$

where,

PV_{RP} = present value of the cost of replacement power for a single event ( )

t_f = years remaining until end of facility life (yr)

r = discount rate (%/yr)

and *B* is a constant representing a string of replacement power costs that occur over the lifetime of a reactor after an event (for a 910 MWe generic reactor, Reference (1) uses a value of 1.2E 08/yr). The net power level for Davis-Besse is 908 MWe. Therefore, the value of 1.2E 08/yr for *B* is representative for Davis-Besse and is used in the analysis.

The values for the base case are:

t_f = 28 yrs

r = 7%/yr = 0.07/yr

B = 1.2E 08/yr

$$P_{RP} = \frac{1.2E+08/yr}{\left(\frac{0.07}{yr}\right)}\left(1 - e^{-\left(\frac{0.07}{yr}\right)(28yrs)}\right)^2 = 1.27x10^9 \qquad \text{(E.4-20)}$$

To account for the entire lifetime of the facility, U_{RP} was then calculated from PV_{RP} as follows:

$$U_{RP} = \frac{P_{RP}}{r}\left(1 - e^{-rt_f}\right)^2 (F) \qquad \text{(E.4-21)}$$

where,

U_{RP} = present value of the cost of replacement power over the remaining life ( )

t_f = years remaining until end of facility life (yr)

r = discount rate (%/yr)

F = CDF (events/yr)

Based upon the values previously assumed for the base case:

$$U_{RP} = \frac{1.27E+09}{\left(\frac{0.07}{yr}\right)}\left(1-e^{-\left(\frac{0.07}{yr}\right)(28yrs)}\right)^2(1.0E-05) = \$133,917 \qquad (E.4\text{-}22)$$

E. . . Total Averted On- ite Costs

The AOSCs were estimated by combining the cleanup and decontamination (U_{CD}) and replacement power costs (U_{RP}) equations, and using the numerical values calculated in Sections E.4.4.1 and E.4.4.2.

The base case averted on-site cost is:

$$AOSC = U_{CD} + U_{RP} = 132,362 + 133,917 = 266,279 \qquad (E.4\text{-}23)$$

E. . TOTA CO T OF E E E ACC ENT

The total cost of severe accident impact for internal events was calculated by summing the public exposure cost, off-site property damage cost, occupational exposure cost, and on-site economic cost. The cost of the impact of a severe accident for internal events was 339,331 as shown in Table E.4-1. Davis-Besse does not have external events (fire, seismic, other external events) PRA from which risk contributors could be combined with the internal events risk. This analysis assumed that the benefit from each hazard group s (i.e., fire, seismic, and other external events) contribution is equivalent to that of internal events. This approach is conservative, based on the discussion in Section E.3.1.2. Therefore, the cost of SAMA candidate implementation was compared with a benefit value of four times (i.e., 1x for internal events plus 3x for external events) that calculated for internal events to include the contribution from internal events, fire, seismic, and other hazard groups. This approach provided a comparison of the cost to the risk reduction estimated for internal and external events for each SAMA candidate. The maximum benefit for Davis-Besse was 1,357,324 as shown in Table E.4-1.

E. CAN ATE A A ENT F CAT ON

The first step in the SAMA process was to create a comprehensive list of potential SAMA candidates for qualitative evaluation. This was performed to capture any potential SAMA candidates that were not generated by our analyses, but were identified by others within the industry. This list of potential SAMA candidates was a compilation of candidates form several sources. These sources included:

- ndustry SAMA guidance documents
- Previously completed SAMA analyses
- Davis-Besse PE and PEEE conclusions and recommendations

n addition, the latest Davis-Besse PRA results were evaluated to identify any additional SAMA candidates that may be unique to Davis-Besse. This review included the following results from the Davis-Besse Level 1 and Level 2 analyses:

- Top 100 Level 1 cutsets
- Level 1 CDF importance values
- Level 2 LERF importance values

Once the comprehensive list of SAMA candidates was assembled, each candidate was first qualitatively screened. For those that remained following the qualitative screening, a detailed cost-benefit was performed. The following sections provide a detailed description of this process.

E. .1 E E OF N T ATA

Since Davis-Besse is a PWR, particular interest was paid to existing SAMA candidates for PWRs. NE 05-01 (Reference 2) provides a standard list of PWR SAMA candidates, which was used as the starting point for the potential Davis-Besse SAMA candidates.

n addition to the SAMA candidates provided in Reference (2), Table 14, a review was undertaken of the PWR SAMA analyses completed and documented as supplements to NUREG-1437 (References 30, 31, 32, 33, 34, 35, 36, 37, and 38). These supplements were reviewed to identify any SAMA candidates that might apply to Davis-Besse, but were not included in Reference (2). No additional candidates were identified by the review of the supplements to NUREG-1437.

E. .2 A -BE E E AN EEE E E

A review was performed of the following documents:

- PE for the Davis-Besse, February 1993 (Reference 5).
- PEEE for the Davis-Besse, November 1996 (Reference 12).

The PE identified the ma or contributors to CDF for plant internal events, including internal floods. The PE identified the following ma or contributors to plant CDF (Reference 5, Section 1.4.1):

- Total Loss of CCW

  Several SAMA candidates were considered that would either address the reliability of the CCW system or provide alternate cooling sources to CCW loads. These include CW-10, CW-21, CW-22, CW-23, CW-24, and CW-25.

- Electric power dependence between AFW and makeup/HP cooling

  SAMA candidates AC/DC-25 and AC/DC-26 were considered that would improve the reliability of AFW DC power and separate its dependence from HP DC power.

- Failure to switchover from RCS in ection to either high pressure or low pressure recirculation (LPR) for medium and large LOCAs

  SAMA candidates CC-07 (manual switchover to recirculation and CC-08 (automatic switchover to recirculation) were considered to address this finding.

- Failure to replenish the Borated Water Storage Tank (BWST) in the event of an SLOCA

  SAMA candidate CC-09 was considered to address this recommendation.

n addition, the following insights as to potential areas of improvement were identified from the original PE study:

- Operator error of commission during SLOCA (may not be realistic)

  SAMA CB-7 was considered to address operator training for SLOCA scenarios.

- Shedding of DC loads during loss of AC power scenarios

  SAMA candidate AC/DC 4 considered this issue.

- Sump recirculation using the make-up pumps

  SAMA candidate CC-20 was developed to address this issue.

- solation of RCP seal return line following loss of seal cooling

  SAMA candidate CW-19 was developed to address this issue.

- Service water room ventilation

  SAMA H -06 was developed to address this issue.

- Limited supply of fuel oil to the SBO diesel generator

  SAMA candidate AC/DC-27 was developed to address this issue.

The PEEE was reviewed for risk insights for external events and internal fires. The following results were presented in the PEEE (Reference 12):

- The internal fire PRA consisted of a screening methodology using the EPR developed F E methodology. The conclusions are stated as follows:

  > *The results of the topical assessments performed under the FIVE Fire Risk Scoping Study indicate that the following FRSS issues have been adequately addressed by DB, and the applicable aspects of the DB Fire Protection Program therefore are <u>in conformance</u> with the intent of the FRSS guidelines, as tabulated in Attachment 10.5 of the FIVE methodology*
  >
  > *(1) Potential seismic fire interactions.*
  >
  > *( ) Manual fire fighting effectiveness.*
  >
  > *( ) Total environment equipment survival.*
  >
  > *( ) Potential control systems interactions.*

  No plant-specific fire vulnerabilities were presented.

- The PEEE used a seismic margins methodology. No PRA modeling was performed and no seismic vulnerabilities were found.
- No other plant vulnerabilities that would impact PRA CDF were identified in the PEEE.

E. . E E 1 NTE NA E ENT O NANT C T ET

A review was performed of the top 100 cutsets for the latest Davis-Besse Level 1 PRA (internal events, including internal flooding). Table E.5-1 provides a summary of the top 100 Level 1 PRA cutsets. These cutsets represent over 56% of the total CDF. This list includes all cutsets above 0.11% of the total CDF. This provides a strong confidence that all significant risk contributors to Level 1 risk are captured within this list.

From these cutsets, the following significant contributors were identified:

- Partial or complete loss of CCW.

  Several SAMA candidates were considered that would either address the reliability of the CCW system or provide alternate cooling sources to CCW loads. These include CW-10, CW-21, CW-22, CW-23, CW-24, and CW-25.

- Reactor vessel rupture initiating event.

  No SAMA candidates were found that would reduce the CDF risk further.

- Operators fail to trip RCPs following loss of CCW

  Procedures at Davis-Besse instruct operators to trip RCPs on loss of CCW, with at least an hour available to trip RCPs to prevent RCP seal damage following loss of CCW. Current Davis-Besse procedures were udged to be adequate, and no additional SAMA candidates were identified.

- Small and Medium LOCA with operator failure to establish LPR.

  No weakness in procedures or training was identified for establishing recirculation cooling. SAMA candidate CC-19 addresses providing automatic switchover of emergency core cooling system (ECCS) suction from the BWST to containment sump when BWST low level is reached.

- SGTR events with failure of operator actions such as isolation of the affected steam generator, failure to provide makeup to the BWST and failure to provide cooldown via HP .

  SAMA candidates addressing SGTR events include CB-09 through CB-19.

  t should be noted that Davis-Besse plans to replace the existing steam generators with an improved design (CB-10). This should significantly reduce the risk of SGTR events.

E. . E E 1 TE O TANCE

Davis-Besse Level 1 PRA basic events were evaluated with respect to their risk reduction worth (RRW) importance measure. Having a high RRW indicates that improving the reliability of that system would result in a greater CDF reduction than systems with a relatively lower RRW value.

The list of basic event importance values includes all basic events with a RRW value of 1.005 or greater. t is udged that this list captures all risk significant basic events for the Level 1 PRA model.

Table E.5-2 provides a ranking of the basic events by RRW. Basic events with high RRW values include the following:

- Failure to initiate makeup/HP cooling after loss of all feedwater

  SAMA candidate FW-01 addresses the installation of a digital feedwater control system to improve main feedwater (MFW) reliability. No weakness in training or procedures was identified pertaining to initiation of HP cooling on loss of all feedwater.

- Failure to start motor-driven feedwater pump (MDFP) after loss of feedwater

  SAMA candidate FW-01 addresses the installation of a digital feedwater control system to improve MFW reliability. No weakness in training or procedures was identified pertaining to starting the MDFP on loss of all feedwater.

- Operator failure to trip RCP following loss of CCW

  SAMA candidates CW-07, CW-08 and CW-09 address operator training and procedures addressing loss of CCW. Procedures at Davis-Besse instruct operators to trip RCPs on loss of CCW, with at least an hour available to trip

RCPs to prevent RCP seal damage following loss of CCW. Current Davis-Besse procedures were udged to be adequate, and no additional SAMA candidates were identified.

- Failure of operator actions in response to loss of off-site power (LOOP), including starting and aligning the SBO diesel generator or emergency diesel generators (EDGs), EDG 1-1 or EDG 1-2, to the MDFP.

  No potential improvements in operator training or procedures for starting the SBO diesel generator or aligning the SBO diesel generator or EDGs were identified. SAMA candidates were identified that had the potential to reduce the likelihood of SBO events. These included SAMA candidates AC/DC-09, AC/DC-14, and AC/DC-24. n addition, numerous SAMA candidates in category AC/DC address enhancing the ability to cope with SBO scenarios. These SAMA candidates included increasing battery life and emergency battery charging systems.

- Operators fail to control AFW on loss of direct current (DC) power

  SAMA candidates AC/DC-25 and AC/DC-26 provided redundant sources of DC power to the AFW control system.

E. . E E 2 O TANCE N T

Davis-Besse PRA basic events were also evaluated with respect to their RRW importance measure for LERF. Having a high RRW indicates that improving the reliability of that system would result in a greater LERF reduction than systems with a relatively lower RRW value. Therefore, systems with high RRW values will be considered as potential SAMA candidates.

The list of basic event importance values includes all basic events with RRW value of 1.005 or greater. t is udged that this list captures all risk significant basic events for the Level 1 PRA model.

Table E.5-3 provides a ranking of the basic events by RRW. LERF importance is dominated by SGTR and SLOCA events. Basic events with high RRW values include the following:

<u>Steam Generator Tube Rupture</u>

n addition to the SGTR initiating event, basic events associated with SGTR include:

- Operators fail to cooldown during SGTR,
- Failure to close main steam isolation valve (MS) and isolate affected steam generator,
- Main steam safety valve (MSS) fails to reseat during SGTR,
- Operators fail to attempt cooldown via makeup/HP cooling, and
- Failure to makeup to BWST either due to operator error or valve failure.

SAMA candidates addressing SGTR include CB-09 through CB-19. t should be noted that FENOC plans to replace the existing steam generators with an improved design (CB-10). This replacement should significantly reduce the risk of SGTR events.

nterfacing System LOCA in the Decay Heat Removal (DHR) System

SAMA candidates addressing SLOCA events include CB-01 through CB-08. SAMA candidate CB-21 was developed specifically for Davis-Besse to provide early indication of a potential SLOCA in the DHR system.

Pressure switches fail high preventing opening of DHR valves

Davis-Besse has an abnormal procedure for loss of DHR that allows the restoration of the decay heat flow path by bypassing the two DHR suction valves (DH 11/12) by opening manual valves in containment. No other SAMA candidates addressing opening of the DHR valves were identified.

E. . NT A A A CAN ATE T

Based on the review of the aforementioned sources, an initial list of 167 SAMA candidates was assembled. The comprehensive list of initial SAMA candidates considered for implementation at Davis-Besse are provided in Table E.5-4, where each SAMA candidate is categorized and identified according to a global modification identifier.

E. A E A A ANA C EEN N

The cost-benefit evaluation performed as part of this analysis was concerned only with those modifications that reduce the severe accident risk associated with plant operation if implemented at Davis-Besse. Therefore, the purpose of the initial (qualitative) screening was to identify the subset of those SAMA candidates identified in Table E.5-4 that warrant a detailed cost-benefit evaluation.

Since most of the SAMA candidates were derived from industry sources, they include a wide variety of potential enhancements that may not be directly applicable to Davis-Besse. n addition, several SAMA candidates initially considered may have already been implemented at Davis-Besse or met the intent of the SAMA candidate. Some SAMA candidates were screened on the basis of excessive implementation cost (no cost estimate is necessary) or very low benefit (no PRA case is needed to be run). Each of the SAMA candidates was screened consistent with guidance in Reference (2). Table E.6-1 provides the results of the qualitative screening.

E. .1 NOT A CAB E C TE ON A

The SAMA candidates were reviewed to determine which ones were not applicable to Davis-Besse. Potential enhancements that were not considered applicable to Davis-Besse were those developed for systems specifically associated with boiling water reactors (BWRs) or associated with specific PWR equipment that is not present at Davis-Besse. For example, Davis-Besse does not have a gas turbine generator. Therefore, installing tornado protection is not applicable for Davis-Besse. Also, some SAMA candidates addressed the use of systems from a second unit at a multi-unit site, which also did not apply. SAMA candidates meeting this criterion were eliminated from further analysis.

The SAMA candidates that were not applicable to Davis-Besse were reviewed to ensure that other potential modifications similar in intent, and applicable to Davis-Besse, were identified.

E. .2 A EA E ENTE C TE ON B

The remaining SAMA candidates were reviewed to identify those modifications that have already been implemented at Davis-Besse. Some of the SAMA candidates had been implemented as a result of insights gained from the Davis-Besse PE and PEEE studies. For example, Davis-Besse has the capability to transfer alternating current (AC) power automatically from normal to standby power; this satisfies the SAMA candidate that calls for the addition of an automatic feature to transfer the AC from normal to standby power. The SAMA candidates meeting this criterion were eliminated from further analysis.

E. . E CE E E ENTAT ON CO T C TE ON C

Some SAMA candidates were determined to be prohibitively expensive by inspection. An example of this type of SAMA candidate was an extensive and extremely expensive modification to the containment. f a SAMA candidate required extensive changes that obviously exceeded the maximum benefit, the candidate was not retained for further evaluation. The maximum benefit (defined in Section E.4 and reported in Table E.4-1) was less than 1,400,000.

E. . E O BENEF T C TE ON

f a SAMA candidate was related to a non-risk-significant system for which the change in reliability had a negligible impact on the risk profile, the SAMA candidate had a very low benefit and was not retained for further analysis. Determination of non-risk-significance was based on a combination of factors, including importance values and inclusion in dominant cutsets.

E. . B N OF A A CAN ATE C TE ON E

During the screening process, if a particular SAMA candidate was found to be similar in nature and could be combined with another SAMA candidate to develop a more comprehensive or more plant-specific candidate, it was subsumed by the most appropriate SAMA candidate for Davis-Besse. The subsumed SAMA candidate was not evaluated further; however, the intent of such SAMA candidates was captured by the SAMA candidate by which they were subsumed.

E. . CON E E FO F T E E A AT ON C TE ON F

SAMA candidates that did not meet Criterion A, B, C, D, or E were considered for further evaluation and sub ect to a cost-benefit evaluation.

E.7 A E A A ANA CO T-BENEF T

Those SAMA candidates not eliminated by the qualitative screening were selected for cost-benefit analysis. The first step in the cost-benefit analysis was to use the Level 1 PRA and Level 2 PRA models for Davis-Besse to evaluate the impact on the CDF and release category frequencies for each SAMA candidate requiring additional consideration.

The Level 1 PRA core damage sequences were mapped to specific PDSs that reflects the condition of the RCS and to some extent, the conditions in containment prior to vessel breach. Each PDS groups Level 1 PRA sequences based on their impact on subsequent containment response. Characteristics of a PDS include:

- time of core damage,
- leakage rate from the RCS,
- RCS pressure,
- availability of heat removal via steam generators,
- water inventory in the reactor cavity,
- status of containment boundary,
- status of containment heat removal loss of coolant in ection,
- status of fission-product spray removal, and
- status of systems important to the containment performance assessment.

n the Level 2 PRA analysis, each PDS is evaluated by the CETs. The CET models accident progression and containment performance from the PDS to the eventual source release characterization. Level 2 PRA results were binned into one of 34 release categories. The frequency and source term characteristic for each release category was provided as input to the subsequent Level 3 PRA. A summary of each Level 2 PRA release category is provided in Table E.3-4.

E.7.1 A A BENEF T

The Davis-Besse baseline PRA model provided the CDF and release category frequencies for input into the cost-benefit evaluation. The CDF was used to determine the maximum benefit of eliminating all risk from the plant. The release category frequencies were used in the Level 3 PRA analysis to determine the maximum monetary loss and population dose. These values were then used in the maximum benefit evaluation.

E.7.1.1 A A Candidate Eval ation

The benefit of each SAMA candidate was estimated by modifying either the Level 1 PRA or Level 2 PRA model to reflect the benefit that could be derived (by implementing the SAMA candidate). The estimated benefit was determined by applying a bounding modeling assumption in the PRA model. For example, if the ob ective of a particular SAMA candidate was to reduce the likelihood of a certain component or system failure, that component or system was modeled to be perfectly reliable, even though the SAMA candidate would likely not completely eliminate failure of that component or system. This bounding treatment is conservative for a SAMA analysis, since underestimating the risk in the modified PRA case makes the modification look more attractive than it may actually be.

nitially applying conservative bounding estimates for an expected SAMA candidate benefit simplified the PRA modeling changes that are required, and therefore improved the efficiency of the entire process. For all the cases, a bounding analysis was sufficient to eliminate a SAMA candidate from further consideration. f the results from a bounding assumption had not provided an unambiguous conclusion for the cost-benefit analysis, then an additional case(s) would have been performed by applying a more detailed analysis and less bounding PRA modifications to better estimate the true benefit.

The PRA model modifications and calculations were performed for the at-power internal events PRA. The release frequencies for the base case are provided in Table E.3-20. t is important to note that the sum of the containment systems state frequencies calculated by the Level 2 PRA model does not exactly equal the CDF calculated by the Level 1 PRA model. The reason for this difference is the delete term approximation used to quantify successes in the sequence trees; this is an approximation to the negation which is valid when the probabilities of events are small. There are also differences in the systems included in the Level 1 and Level 2 models (e.g., the Level 2 model included containment spray and the containment isolation valves (C s) that are not included in the Level 1).

The enhanced CDF for each SAMA candidate PRA case was calculated by adding the release category frequencies. A summary of the 14 PRA results for the SAMA candidates analyzed is provided in Table E.7-1.

E.7.1.2 Best-Estimate Bene it Calc lation

The reference value parameters included the discount rate, time to expiration of the renewed Davis-Besse license, cost per person-rem, short term exposure, long-term exposure, on-site cleanup duration, total on-site cleanup cost, replacement power net present value, and present value factor. These reference values were used in the baseline calculation performed in Section E.4. A total of 14 PRA cases were modeled to analyze the benefit of plant-specific SAMA candidates identified in the screening process in Section E.6. The final inputs required were the consequence parameters. The consequence parameters, off-site dose and economic impact, were provided from the Level 3 PRA described in Section E.3.4. These consequence parameters were provided for each of the 34 release categories.

The next step in the analysis was to calculate the benefit (in U.S. dollars) for each modeled PRA case associated with the implementation of a SAMA candidate. A delta CDF was used to calculate the benefit for each SAMA candidate. The total benefit included the contribution from all hazard groups. Therefore, a worksheet was developed to calculate the benefit for internal events and total benefit including the contribution from external events. The internal events worksheets used the equations discussed in Section E.4 to calculate the AOE, AOSC, APE, and AOC. For each case, the benefit from internal events and external events (fire, seismic, and other hazard groups) were summed in a worksheet to determine the total benefit of implementing the SAMA candidate. As discussed in Section E.4.5, the fire, seismic, and other hazard group risk contribution was conservatively estimated to be equivalent to three times the internal events risk contribution.

The results of the benefit analysis for all the SAMA candidate cases are presented in Table E.7-2 for internal events. Table E.7-3 represents the total benefit for all the SAMA cases. These are the final benefit results used for comparison against the implementation costs.

E.7.1. Cost-Bene it Eval ation

The results of the cost-benefit evaluation are presented in Table E.7-5. This table provides a comparison of cost with the benefits of SAMA candidate implementation and final conclusions drawn for each SAMA candidate.

E.7.2 A A CAN ATE E ENTAT ON CO T

To assess the viability of each SAMA candidate considered for a final cost-benefit evaluation, the cost of implementing that particular SAMA candidate was estimated and compared with the estimated benefit. f the cost of implementation was greater than the attainable benefit for a particular SAMA candidate, then the modification was not considered economically viable and was eliminated from further consideration.

The cost of implementation was established from estimates provided by Davis-Besse Expert Panel review. Expert Panel review is a knowledge-based review process that requires the personnel participating to have combined knowledge of:

- Facility design and plant configuration;
- Facility operation and how SAMA candidates would be accomplished;
- B(5)b mitigation plans;
- Minor/rapid response-type repairs and modifications;
- Corrective maintenance for accomplishment of repairs;
- Ma or modification costs and cost-estimating;
- Electrical and instrumentation and control design and operational options;
- Radiation hazards to udge feasibility of a mitigation strategy; and
- Training to evaluation training impacts of changes and modifications.

The Davis-Besse Expert Panel consisted of senior staff members from the PRA group, Pro ect Management, Design Engineering, Operations, Operations Training, Technical Services Engineering, Procurement Engineering, and License Renewal. This panel, based upon their knowledge and experience, udged for each SAMA candidate whether a modification could be made to the plant, or whether procedure changes or training could be implemented to address the SAMA issues. The panel also estimated the associated costs for each modification, procedure change or training item identified for the SAMA candidates. The purpose of this approach was to minimize the effort expended on detail cost estimation. Table E.7-4 provides the implementation cost estimate in 2009 U.S. dollars for the SAMA candidates.

E. EN T T ANA

E. .1 ANT O F CAT ON

There are no plant modifications that are currently pending that would be expected to impact the results of this SAMA analysis. There are two pending plant modifications (steam generator replacement and installation of digital feedwater control) that have been accounted for in the SAMA candidate screening process (CB-10 and FW-01) (see Sections E.5.4 and E.5.5).

E. .2 NCE TA NT

While the results of the sensitivity cases in Section E.3.5.2 show the robustness of the Level 3 PRA model, and the sensitivity cases in this section showed the robustness of the SAMA cost-benefit evaluation, these analyses contained a number of conservative assumptions and inputs. No explicit uncertainty was performed since the number of conservative assumptions and inputs account for any uncertainties in the calculations.

As the SAMA candidates generally appear to be not cost-beneficial when considering the sensitivity cases, the conservatisms add further assurance of the appropriateness of the results and the subsequent conclusions. Thus, the gap between benefit and cost could be increased if some of the conservative assumptions were relaxed. Some of the base case conservatisms included:

- Each of the PRA cases to estimate the change in CDF used bounding assumptions in the manipulation of the PRA model, which offsets the CDF uncertainty. For example, if a SAMA candidate could reduce the likelihood of a large break LOCA, the bounding assumption was that there would be no large break LOCA, overestimating the benefit of the SAMA candidate.

- The multiplier used to account for fire and seismic risk contributions is conservative. The contribution of risk due to fire has been estimated to be on the same order of magnitude as the internal events CDF, while the contribution of risk due to seismic events is considered to be small compared to the internal events CDF. Using a multiplier of three (total CDF considered was four times the internal events CDF), overestimated the benefit of a SAMA candidate. For Davis-Besse, the risk contribution due to high winds is included in the internal events PRA model.

- Davis-Besse cost-benefit analysis used an analysis period of 28 years (the time from now to the end of Davis-Besse s requested license renewal period). This analysis period is conservative in contrast to the 20 years of license renewal extension, which is often used in the base case calculations as part of the SAMA analysis cost-benefit analysis. Accordingly, use of a 28-year analysis period in the base case is conservative.

- Davis-Besse-specific cost estimates were estimated by an expert panel. Detailed cost estimations would likely include factors that were not considered for this analysis; accordingly, the cost estimates are likely conservatively underestimated. The large, more generic costs far exceed the estimated benefit, such that many orders of magnitude of uncertainty could be considered without impacting the results.

- n the Level 3 PRA, several of the input parameters were purposely developed in a conservative manner:

  - The value of release fractions were taken from the end of the time traces, rather than when the release was estimated to be terminated; this approach overestimated the source term.

  - The population was escalated to 2040, three years beyond the end of the requested license renewal period. n addition, the escalation factor used was a constant, despite the census indication that the Ohio state population was increasing at a decreasing rate. Such an overestimation of the population conservatively impacted the consequence metrics used to estimate off-site dose and economic consequences of the SAMA candidates.

E. . E AC AT ON EE

A sensitivity case was performed to investigate the sensitivity of each analysis case to the evacuation speed used in the Level 3 PRA analysis. The whole body dose was used in this sensitivity case to represent the impact of the evacuation speed on the cost-benefit analysis. The Level 3 PRA sensitivity case involving evacuation speed is discussed in Section E.3.5.2.4 (sensitivity case E1). The whole body dose for Case E1 is provided in Table E.3-31. The equations used and calculations performed are consistent with Section E.4. The result of the evacuation speed sensitivity case is summarized in Table E.8-1.

E. . EA CO NT ATE

Two sensitivity cases were performed to investigate the sensitivity of each analysis case to the real discount rate. The first sensitivity case assumed a lower discount rate of three percent and the second sensitivity assumed a high discount rate of ten percent. The equations used and calculations performed are consistent with Section E.4. The results of the low and high discount rate sensitivity cases are summarized in Table E.8-1.

E. . ANA E O

Since an analysis period of 28 years (the time from now to the end of Davis-Besse s requested license renewal period) is used in the base case versus the less conservative 20 years (license renewal period), there is no need to perform a sensitivity case. The base case already incorporates the more conservative value of the analysis period.

E. . OT E EN T T CA E

Six additional sensitivity benefit calculations were performed, which are briefly described below. The equations used and calculations performed are consistent with Section E.4.

- The first sensitivity case investigated the impact of assuming damaged plant equipment is repaired and refurbished following an accident scenario, as opposed to automatically decommissioning the facility following the event.
- The second sensitivity case investigated the sensitivity of each analysis case to the on-site dose estimates. This sensitivity case assumed higher short-term dose (14,000 person-rem) and long-term dose (30,000 person-rem) (Reference 1, Section 5.7.3).
- The third sensitivity case investigated the sensitivity of each analysis case to the total on-site cleanup cost. This sensitivity case assumed a higher on-site cleanup cost of 2,000,000,000 (Reference 1, Section 5.7.6).
- The fourth sensitivity case investigated the sensitivity of each analysis case to the cost of replacement power. An inflation rate was determined by assessing the electricity costs in 1993 and in 2009 dollars for the state of Ohio. The inflation rate was used to calculate the 2009 dollar value for the string of replacement power costs.

- The fifth sensitivity case investigated the sensitivity of each analysis to the non-internal events hazard groups multiplier by assuming a multiplier of five.

- The sixth sensitivity case investigated the sensitivity of each analysis to the off-site economic cost. This sensitivity case assumed the off-site ecomonic cost was increased by twenty-five percent.

The results of the sensitivity cases (Repair, On-site Dose, On-site Cleanup, Replacement Power, Multiplier, and Off-site Economic Cost) are summarized in Table E.8-1.

E. CONC ON

The cost-benefit evaluation of SAMA candidates performed for the Davis-Besse license renewal process provided significant insight into the continued operation of Davis-Besse. The results of the evaluation of 167 SAMA candidates indicated no enhancements to be potentially cost-beneficial for implementation at Davis-Besse.

However, the sensitivity cases performed for this analysis found one SAMA candidate (AC/DC-03) to be potentially cost-beneficial for implementation at Davis-Besse under the assumptions of three of the sensitivity cases (low discount rate, replacement power, and multiplier). SAMA candidate AC/DC-03 considered the addition of a portable diesel-driven battery charger for the DC system. While the identified SAMA candidate is not related to plant aging and therefore not a required modification for the license renewal period, FENOC will, nonetheless, consider implementation of this candidate through the normal processes for evaluating possible plant modifications.

The cost-benefit evaluation performed used several conservatisms. The guidance document, Section 5 of Reference (1), used to perform the cost-benefit evaluation is inherently conservative. The PRA cases used a conservative approach to estimate the benefit from a particular SAMA candidate. The estimation of the total benefit assumed, conservatively, that the contribution due to fire, seismic and other external events was three times the risk contributions of internal events, although evidence suggests that it is less than that. The use of an analysis period of 28 years was conservative. These conservative assumptions, combined with the results of several sensitivity cases, demonstrate the robustness of the SAMA analysis results.

E.10 F E AN TAB E

Table E. -1 avis-Besse A A Anal sis odel ominant nitiatin Event Contrib tion to Core ama e nitiatin Events

nitiator	escri tion	Contrib tion to nternal C F	ercent o nternal C F	C m lative ercent o nternal C F
T3	LOOP (initiating event)	1.91E-06	21%	21%
T1	Reactor/turbine trip (initiating event)	1.32E-06	14%	35%
TMPP43XF-CC ALL	All CCW pumps fail to run due to CCF (initiating event)	6.64E-07	7%	42%
R	SGTR (initiating event)	6.22E-07	7%	49%
T2	Plant trip due to loss of MFW (initiating event)	5.72E-07	6%	55%
A	Reactor vessel rupture	5.00E-07	5%	61%
S	Small LOCA (initiating event)	4.25E-07	5%	65%
T13A-1-3- EF	Loss of CCW Train 1 initiating event Pump 1 running	4.09E-07	4%	70%
T13A-2-3- EF	Loss of CCW Train 2 initiating event Pump 2 running	3.84E-07	4%	74%
TMPP43XF-CC 1 2	CCW pumps 1 2 failure to run due to CCF (initiating event)	2.69E-07	3%	77%
F3AM	Maximum flood in CCW pump room from service water (initiating event)	1.98E-07	2%	79%
M	Medium Break LOCA	1.47E-07	2%	80%
T2B-1	SP6A fails to throttle (initiating event)	1.33E-07	1%	82%
T2A-1	SP6B fails to throttle (initiating event) SP6B	1.32E-07	1%	83%
T12B7- EF	Service water pump room ventilation failure (T 86)	1.27E-07	1%	85%
T2A-2	F C CS35B fails high (initiating event)	1.22E-07	1%	86%
T2B-2	F C CS35A fails high (initiating event)	1.22E-07	1%	87%
T18- EF	Loss of DC power from Bus d2p (initiating event)	1.10E-07	1%	88%
F7L	Large circulating water flood in turbine building (initiating event)	8.84E-08	1%	89%
T9- EF	Loss of DC power supply NN X (initiating event)	8.24E-08	1%	90%

Percentages are rounded to whole numbers. Anticipated transient without scram (ATWS) sequences are modeled as a failure to trip after an initiating event; ATWS sequences contribute approximately 1% to CDF. SBO sequences involve a LOOP (as the initiating event or following an initiating event), along with subsequent failure of power to both safety buses, C1 and D1 (i.e, a loss of both EDGs and the SBO diesel generator); SBO sequences contribute approximately 5% to CDF and are dominated by sequences initiated by a LOOP (T3).

Table E. -2 avis-Besse A A Anal sis odel To 0 Com onents b F ssell-esel nternal Events

an	Com onent	escri tion	F ssell-esel
1	P43-2	CCW Pump 1-2	1.26E-01
2	P43-1	CCW Pump 1-1	1.26E-01
3	P43-3	CCW Pump 1-3	1.21E-01
4	P14-1	Turbine-Driven Auxiliary Feedwater (TDAFW) Pump 1-1	1.15E-01
5	P14-2	TDAFW Pump 1-2	9.75E-02
6	5-2	EDG 1-2	9.00E-02
7	HX11B	Auxiliary Transformer 11 to Bus B Breaker	4.92E-02
8	LTSP9A6	SG2 SU L L XMTR for SFRCS LCH1	4.29E-02
9	LTSP9A7	SG2 SU L L XMTR for SFRCS LCH3	4.29E-02
10	LTSP9B8	SG1 SU L L XMTR for SFRCS LCH1	4.29E-02
11	LTSP9B9	SG1 SU L L XMTR for SFRCS LCH3	4.29E-02
12	LTSP9A8	SG2 SU L L XMTR for SFRCS LCH2	4.28E-02
13	LTSP9A9	SG2 SU L L XMTR for SFRCS LCH4	4.28E-02
14	LTSP9B6	SG1 SU L L XMTR for SFRCS LCH2	4.28E-02
15	LTSP9B7	SG1 SU L L XMTR for SFRCS LCH4	4.28E-02
16	HX02B	Start-up Transformer 02 to Bus B Breaker	3.70E-02
17	SP17B1	Main Steam Line 1 Code Safety	3.69E-02
18	SP17B2	Main Steam Line 1 Code Safety	3.69E-02
19	SP17B3	Main Steam Line 1 Code Safety	3.69E-02
20	SP17B4	Main Steam Line 1 Code Safety	3.69E-02
21	SP17B5	Main Steam Line 1 Code Safety	3.69E-02
22	SP17B6	Main Steam Line 1 Code Safety	3.69E-02
23	SP17B7	Main Steam Line 1 Code Safety	3.69E-02
24	SP17B8	Main Steam Line 1 Code Safety	3.69E-02
25	SP17B9	Main Steam Line 1 Code Safety	3.69E-02
26	SW1424	CCW Heat Exchanger 1 Outlet Temperature	3.15E-02
27	SW1434	CCW Heat Exchanger 2 Outlet Temperature	3.08E-02
28	5-1	EDG 1-1	2.55E-02
29	5-3	SBO Diesel Generator	2.49E-02
30	HX11A	Auxiliary Transformer 11 to Bus A Breaker	2.42E-02

Table E. - a in o evel 1 Accident e ences into evel 2 elease Cate ories

	o rce Term elease Cate ories																					
	Containment B ass - T				Containment B ass - OCA		ar e Containment solation Fail re				mall Containment solation Fail re				Earl Containment Fail re				ide all Containment Fail re			
AS	1.1	1.2	1.3	1.4	2.1	2.2	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2	5.3	5.4	6.1	6.2	6.3	6.4
A X							x	x	x	x	x	x	x	x	x	x	x	x				
ARX							x		x		x	x	x	x	x	x	x	x				
M X							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MRX							x		x		x	x	x	x	x	x	x	x	x	x	x	x
S N		x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S		x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
SRN		x		x			x		x		x	x	x	x	x	x	x	x	x	x	x	x
SR							x		x		x	x	x	x	x	x	x	x	x	x	x	x
T N		x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
T							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TRN		x		x			x		x		x	x	x	x	x	x	x	x	x	x	x	x
R N		x		x																		
R	x		x																			
RRN				x																		
RR			x																			
					x	x																

Level 1 Accident Sequences (AS) defined in terms of Core Damage Bin (i.e., Type of nitiating Event, Timing of Failure, Availability of SG Cooling)

Table E. - a in o evel 1 Accident e ences into evel 2 elease Cate ories contin ed

	o rce Term elease Cate ories											
	ate Containment Fail re								Basemat Containment Fail re		No Containment Fail re	
AS	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	8.1	8.2	9.1	9.2
A X	x	x	x	x	x	x	x	x	x	x	x	x
ARX	x	x	x	x	x	x	x	x	x	x	x	x
M X	x	x	x	x	x	x	x	x	x	x	x	x
MRX	x	x	x	x	x	x	x	x	x	x	x	x
S N	x	x	x	x	x	x	x	x	x	x	x	x
S	x	x	x	x	x	x	x	x	x	x	x	x
SRN	x	x	x	x	x	x	x	x	x	x	x	x
SR	x	x	x	x	x	x	x	x	x	x	x	x
T N	x	x	x	x	x	x	x	x	x	x	x	x
T	x	x	x	x	x	x	x	x	x	x	x	x
TRN	x	x	x	x	x	x	x	x	x	x	x	x
R N												
R												
RRN												
RR												

Level 1 Accident Sequences (AS) defined in terms of Core Damage Bin (i.e., Type of nitiating Event, Timing of Failure, Availability of SG Cooling)

Table E.3-4: Mapping of Release Categories to MAAP Runs

Release Category Number	Release Category Description				MAAP Case Characterizing Source Term
	Containment Failure Type	Core Debris Cooled?	Fission Product Scrubbing Late?	Late Revapor-ization?	
1.1	Bypass – SGTR	Y	Y	NA	ST11_RIYVXINN_52Y-0021a
1.2	Bypass – SGTR	Y	N	NA	ST12_RIYVXINN_52Y-0021a
1.3	Bypass – SGTR	N	Y	NA	ST13_RIYVXINN_52Y-0021a
1.4	Bypass – SGTR	N	N	NA	ST14_RIYVXINN_52Y-0021a
2.1	Bypass – ISLOCA	N	N	NA	ST21_ISLOCA
2.2	Bypass – ISLOCA	N	Y	NA	ST22_ISLOCA
3.1	Large Isolation	Y	Y	NA	ST31_AXI1a_4
3.2	Large Isolation	Y	N	NA	ST32_AXI1a_4
3.3	Large Isolation	N	Y	NA	ST33_AXI1a_4
3.4	Large Isolation	N	N	NA	ST34_AXI1a_4
4.1	Small Isolation	Y	Y	NA	ST41_AXI1a_4
4.2	Small Isolation	Y	N	NA	ST42_AXI1a_4
4.3	Small Isolation	N	Y	NA	ST43_AXI1a_4
4.4	Small Isolation	N	N	NA	ST44_AXI1a_4
5.1	Early	Y	Y	NA	ST51_SIYYFYYN_36Y-002
5.2	Early	Y	N	NA	ST52_TINYNINN_53Y
5.3	Early	N	Y	NA	ST53_SIYYFYYN_36Y-002
5.4	Early	N	N	NA	ST54_TINYNINN_53Y
6.1	Sidewall	Y	Y	NA	ST61_TINYNINN_53Y
6.2	Sidewall	Y	N	NA	ST62_TINYNINN_53Y
6.3	Sidewall	N	Y	NA	ST63_TINYNINN_53Y
6.4	Sidewall	N	N	NA	ST64_TINYNINN_53Y
7.1	Late	Y	Y	N	ST71_AXI1a_4
7.2	Late	Y	N	N	ST72_AXI1a_4
7.3	Late	Y	Y	Y	ST73_TINYNINN_53Y
7.4	Late	Y	N	Y	ST74_TINYNINN_53Y

Table E.3-4: Mapping of Release Categories to MAAP Runs (continued)

Release Category Number	Release Category Description				MAAP Case Characterizing Source Term
	Containment Failure Type	Core Debris Cooled?	Fission Product Scrubbing Late?	Late Revapor-ization?	
7.5	Late	N	Y	N	ST75_AXI1a_4
7.6	Late	N	N	N	ST76_AXI1a_4
7.7	Late	N	Y	Y	ST77_TINYNINN_53Y
7.8	Late	N	N	Y	ST78_TINYNINN_53Y
8.1	Basemat	N	Y	NA	ST81_AXI1a_4
8.2	Basemat	N	N	NA	ST82_AXI1a_4
9.1	No Failure	Y	Y	NA	ST91_AXI1a_4
9.2	No Failure	Y	N	NA	ST92_AXI1a_4

Table E. -   escri tion o   e resentative   elease   e   ences

elease Cate or	e resentative AA Accident e ence
1	Based on the Level 1 sequence R X NN; a double-ended tube rupture above the steam generator lower tube sheet. ECCS in ection fails and, an MSS on the faulted generator sticks open. AFW was secured at time zero. RCs 1.1 and 1.3 include fission product scrubbing; AFW is restored to the faulted steam generator when core exit temperatures exceed 600 F, but limited by CST inventory. RC 1.1 and 1.2 include debris coolability; containment spray in ects the contents of the BWST at the time of vessel failure.
2	Based on containment bypass sequence - guillotine rupture of the 12-inch diameter decay heat removal return line with failure of two valves in series. Primary system coolant is discharged to mechanical penetration room 2 which communicates with the shield building annulus (wire mesh doors). Following the pipe rupture, the room blowout panels fail allowing a release to the Auxiliary Building and environment. ECCS in ection fails.
3	Based on the Level 1 sequence AX 1a; a 4.0 ft^2 cold leg break with ECCS in ection and CAC failures. The large isolation failure was modeled as a failure to isolate a single 8-inch vacuum breaker line to containment. RCs 3.1 and 3.3 include fission product scrubbing; containment spray in in ection and recirculation.
4	Based on the Level 1 sequence AX 1a; a 4.0 ft^2 cold leg break with ECCS in ection and CACs failures. The small isolation failure was modeled as a failure to isolate the normal containment sump line. RCs 4.1 and 4.3 include fission product scrubbing; containment spray in in ection and recirculation.
5	RCs 5.1 and 5.3 are based on Level 1 sequence S F N; a loss of CCW and a 100 gpm seal leak per RCP at 30 minutes. AFW was failed at time zero. CACs and containment spray are available, but ECCS in ection fails. RCs 5.2 and 5.4 are based on Level 1 sequence T N N NN; a SBO, and loss of AFW at time zero. The loss of power fails containment spray, so there is no fission product scrubbing. essel failure and debris discharge are into an essentially dry containment. Early containment failure due to hydrogen combustion of ex-vessel steam explosion coincident with vessel failure.

Table E. - escri tion o e resentative elease e ences contin ed

elease Cate or	e resentative AA Accident e ence
6	Based on the Level 1 sequence T N N NN; a SBO and loss of AFW at time zero. RCs 6.1 and 6.2 assume direct impingement of entrained core debris on the containment free standing steel shell to obtain sidewall failure even with a coolable debris bed geometry. Sidewall failure 2 minutes after vessel failure results in early containment failure. Sidewall failures communicate with the shield building annulus and auxiliary building 4 mechanical penetration room. Release of fission products to the environment occurs following blow out panel failures; no annulus or auxiliary building decontamination factors are credited. RCs 6.3 and 6.4 include uncoolable debris beds; the debris is assumed to pool in the lower compartment against the outer concrete curb. Late containment failure occurs when sufficient concrete is eroded. RCs 6.1 and 6.3 include fission product scrubbing via containment spray and CACs.
7	RCs 7.3, 7.4, 7.7, and 7.8 involve late containment failures with revaporization and are based on Level 1 sequence T N N NN; a loss of offsite power and loss of battery power for 2 hours. ECCS in ection and CACs fail. After 2 hours, pressurizer control is lost (POR fails closed), and AFW level control is lost (steam generator overfills). The overfill fails the AFW pumps leading to steam generator dryout followed by heatup and loss of primary coolant. RCs 7.1, 7.2, 7.5, and 7.6 involve late containment failures without revaporization and are based on Level 1 sequence AX 1a; a 4.0 ft^2 cold leg break with ECCS in ection, containment spray and AFW, but no CACs. RCs 7.1, 7.2, 7.3 and 7.4 include a coolable debris bed; containment spray is modeled to in ect the BWST contents to containment to create a deep water pool overlying the debris bed. f fission product scrubbing is successful, containment spray recirculation is also modeled.
8	Based on the Level 1 sequence AX 1a; a 4.0 ft^2 cold leg break with containment spray but ECCS in ection failure. The uncoolable debris bed with basemat failure from core-concrete attack results in a large containment failure. Although containment failure occurs at the cavity floor elevation (below grade level), and debris could be leached and transported to ground water, basemat failures were treated as airborne releases at grade elevation. RC 8.1 includes fission product scrubbing; containment spray in in ection and recirculation.
9	Based on the Level 1 sequence AX 1a; a 4.0 ft^2 cold leg break with CAC operation but ECCS in ection failure. RC 9.1 includes containment spray in ection and recirculation; coolable debris and fission product scrubbing.

Table E. - elease everit o rce Term elease Fraction

elease Cate or	Cesi m odine elease
1.4	46.60%
2.1	37.60%
3.2	36.30%
2.2	34.80%
3.4	33.60%
5.4	25.50%
5.2	23.90%
6.2	20.40%
1.2	17.00%
1.3	15.50%
6.1	12.00%
1.1	11.30%
6.4	4.59%
4.2	1.96%
7.8	1.43%
8.2	1.25%
5.1	0.70%
5.3	0.65%
3.1	0.60%
3.3	0.59%
7.2	0.55%
4.4	0.53%
7.6	0.36%
4.1	0.12%
4.3	0.08%
6.3	0.04%
7.4	0.01%
7.3	0.01%
9.2	0.01%
9.2	0.01%
7.1	0.00%
7.7	0.00%
7.5	0.00%
8.1	0.00%
9.1	0.00%

Table E. -7 elease Timin Classi ication cheme

Classi ication Cate or	Time o elease [1]
Late	greater than 6 hrs
Early	less than 6 hrs

(1) Relative to declaration of a General Emergency.

Table E. - avis-Besse A A Anal sis odel To 0 Com onents or evel 2 b F ssell- esel nternal Events

an	Com onent	escri tion	F ssell- esel
1	5-2	Emergency Diesel Generator 1-2	1.47E-01
2	5-1	Emergency Diesel Generator 1-1	1.09E-01
3	SP17B1	Main Steam Line 1 Code Safety	8.34E-02
4	SP17B2	Main Steam Line 1 Code Safety	8.34E-02
5	SP17B3	Main Steam Line 1 Code Safety	8.34E-02
6	SP17B4	Main Steam Line 1 Code Safety	8.34E-02
7	SP17B5	Main Steam Line 1 Code Safety	8.34E-02
8	SP17B6	Main Steam Line 1 Code Safety	8.34E-02
9	SP17B7	Main Steam Line 1 Code Safety	8.34E-02
10	SP17B8	Main Steam Line 1 Code Safety	8.34E-02
11	SP17B9	Main Steam Line 1 Code Safety	8.34E-02
12	HX11B	Auxiliary Transformer 11 to Bus B Breaker	6.76E-02
13	5-3	Station Blackout Diesel Generator	6.37E-02
14	HX11A	Auxiliary Transformer 11 to Bus A Breaker	5.39E-02
15	MS101	Main Steam Line 1 solation	5.38E-02
16	DH11	RCS to Decay Heat Removal System	5.09E-02
17	DH12	RCS to Decay Heat Removal System	5.09E-02
18	CS 11B	Main Steam Line 1 Atmospheric ent	4.60E-02
19	SP17A1	Main Steam Line 2 Code Safety	4.52E-02
20	SP17A2	Main Steam Line 2 Code Safety	4.52E-02
21	SP17A3	Main Steam Line 2 Code Safety	4.52E-02
22	SP17A4	Main Steam Line 2 Code Safety	4.52E-02
23	SP17A5	Main Steam Line 2 Code Safety	4.52E-02
24	SP17A6	Main Steam Line 2 Code Safety	4.52E-02
25	SP17A7	Main Steam Line 2 Code Safety	4.52E-02
26	SP17A8	Main Steam Line 2 Code Safety	4.52E-02
27	SP17A9	Main Steam Line 2 Code Safety	4.52E-02
28	MS100	Main Steam Line 2 solation	4.47E-02
29	P14-1	Turbine Driven Auxiliary Feedwater Pump 1-1	3.80E-02
30	C25-4	EDG Room 1 entilation Fan	3.14E-02

Table E.3-9: Davis-Besse SAMA Analysis Model Top Ten Operator Actions for Level 2 by Fussell-Vesely (Internal Events)

Rank	Basic Event Name	Description	Fussell-Vesely
1	XHAMUCDE	Operators fail to attempt cooldown via makeup/HPI cooling	3.76E-01
2	CHASGDPE	Operators fail to cooldown during a SGTR	3.33E-01
3	LHAMSIVE	Failure to close MSIV and isolate steam generator containing ruptured tube	3.07E-01
4	QHARCPCE	Operators fail to trip RCPs after a total loss of seal cooling	6.49E-02
5	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1	6.17E-02
6	EHASBDGE	Operators fail to align power from SBO diesel generator to supply MDFP	6.06E-02
7	QHAMDFPE	Failure to start MDFP after loss of feedwater coincident with reactor trip	5.71E-02
8	QHAOVF2E	Operators fail to take local manual control of AFW turbine 1-2 to supply MDFP given LOOP	3.88E-02
9	EHAD2DGE	Operators fail to align power from EDG 1-1 or EDG 1-2 to supply MDFP given LOOP	3.71E-02
10	UHAISBOR	Operators fail to manually isolate containment normal sump	3.49E-02

Table E.3-10: Ohio State Census Data

Year	Population	Estimated Escalation (per decade)	Comment
1990	10,847,115	--	
2000	11,353,140	4.7%	
2008	11,485,910 (estimated)	1.5%	Equivalent escalation from 2001 to 2010 assuming uniform escalation per each year in the decade, the per-year escalation rate is $(1.012)^{(1/8)}$% or 1.0015 per year. For a per-decade rate, $(1.0015)^{10}$ = 1.015, or a rate of 1.5% per decade.

Table E. -11 Total ermanent and Transient Escalated o lation 0- ile adi s avis-Besse or the ear 20 0

ector	1 mile	2 miles	miles	miles	miles	10 miles	20 miles	0 miles	0 miles	0 miles
N	0	0	0	0	0	0	0	0	54861	351575
NNE	6	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	828	0	0	0
E	0	0	0	0	0	0	2229	219	0	13561
E E	0	0	320	0	0	0	11198	50152	20763	104445
E	662	661	0	0	6786	27558	7443	9301	35612	11828
E	661	729	60	71	109	1593	2075	23880	6229	20419
	4	12	55	328	651	1680	34083	7301	34694	7138
	17	5	82	79	482	5743	4141	6025	26881	12565
	37	20	20	469	197	1728	9970	9130	7669	64607
	0	50	0	35	84	1050	8246	12404	47735	14163
	0	53	72	66	87	847	19318	259606	102087	25871
N	683	723	156	0	7274	4821	7009	207932	58896	13460
N	0	165	595	0	0	1763	0	53092	20356	25771
NN	20	138	0	0	0	0	0	20080	77289	233548

Table E. -12 i in ei ht

Time	i in ei hts meters
Morning/Winter	700
Morning/Spring	550
Morning/Summer	350
Morning/Autumn	500
Afternoon/Winter	900
Afternoon/Spring	1500
Afternoon/Summer	1600
Afternoon/Autumn	1200

Table E. -1 AA O t t or ACC 2

avis-Besse AA Case		T11 NN 2 -0021a	T12 N N 2 -0021a	T1 NN 2 -0021a	T1 N N 2 -0021a	T21 OCA
elease Cate or		1.1	1.2	1.3	1.4	2.1
OA A ncover hrs	Core Uncovery (E NT(49))	1.67	1.67	1.67	1.67	8.34E-02
OA A ncover s	Core Uncovery (E NT(49))	6000	6000	6000	6000	300
EAT atts		6.94E 07	6.94E 07	6.94E 07	6.94E 07	6.92E 06
TE meters	TDPLH TE	18.44	18.44	18.44	18.44	2.13
E F C	FREL(1)	9.81E-01	7.00E-01	9.84E-01	7.70E-01	9.41E-01
	FREL(2)	1.13E-01	1.70E-01	1.55E-01	4.66E-01	3.48E-01
	FREL(3)	6.29E-02	1.43E-01	8.62E-02	2.03E-01	3.75E-01
	FREL(4)	9.34E-04	9.67E-05	1.01E-03	2.73E-04	6.51E-03
	FREL(5)	9.91E-03	7.22E-04	9.91E-03	6.74E-04	1.04E-02
	FREL(6)	5.26E-02	6.30E-02	5.85E-02	7.15E-02	3.25E-01
	FREL(7)	8.20E-03	8.18E-04	8.28E-03	1.54E-03	1.17E-02
	FREL(8)	1.64E-04	1.72E-05	2.01E-04	4.09E-05	2.01E-04
	FREL(9)	2.46E-04	3.24E-05	3.70E-04	1.01E-04	8.82E-04
	FREL(10)	3.56E-01	4.03E-02	3.65E-01	1.21E-01	1.58E-01
	FREL(11)	0.00E 00	0.00E 00	4.68E-05	9.54E-05	2.91E-05
	FREL(12)	0.00E 00	0.00E 00	1.25E-06	4.66E-07	1.87E-07
E A hrs		73.20	2.17	73.1	2.17	0.42
E A s		263520	7812	263160	7812	1512
hrs		42.93	13.76	75.20	48.95	11.76
s		154548	49536	270720	176220	42336
End o elease hrs		116.13	15.93	148.3	51.12	12.18

Table E. -1 AA O t t or ACC 2 contin ed

avis-Besse AA Case		T22 OCA	T 1 A 1A	T 2 A 1A	T A 1A	T A 1A
elease Cate or		2.2	3.1	3.2	3.3	3.4
OA A ncover hrs	Core Uncovery (E NT(49))	8.38E-02	8.37E-02	8.37E-02	8.37E-02	8.37E-02
OA A ncover s	Core Uncovery (E NT(49))	302	301	301	301	301
EAT atts		9.44E 06	2.22E 06	2.63E 06	2.22E 06	2.63E 06
TE meters	TDPLH TE	2.13	45.42	45.42	45.42	45.42
E F C	FREL(1)	1.00E 00	9.99E-01	9.68E-01	9.99E-01	9.94E-01
	FREL(2)	3.76E-01	6.02E-03	3.63E-01	5.86E-03	3.36E-01
	FREL(3)	3.75E-01	4.25E-03	3.34E-01	4.23E-03	3.25E-01
	FREL(4)	2.59E-02	5.78E-04	5.54E-03	5.63E-04	1.75E-02
	FREL(5)	1.27E-02	6.59E-03	4.56E-03	6.26E-03	4.62E-03
	FREL(6)	3.43E-01	5.06E-03	2.89E-01	4.97E-03	2.85E-01
	FREL(7)	2.12E-02	1.38E-03	9.69E-03	1.34E-03	1.50E-02
	FREL(8)	1.60E-02	1.64E-05	1.61E-04	1.59E-05	1.48E-02
	FREL(9)	3.62E-02	2.68E-05	6.88E-04	2.65E-05	3.46E-02
	FREL(10)	2.49E-01	7.21E-03	2.10E-01	6.78E-03	2.72E-01
	FREL(11)	3.29E-03	1.80E-08	5.54E-05	1.02E-06	6.71E-03
	FREL(12)	3.29E-04	2.21E-13	1.63E-07	2.32E-09	2.94E-04
E A hrs		0.50	0.33	0.33	0.33	0.33
E A s		1800	1188	1188	1188	1188
hrs		10.96	11.43	49.56	19.52	49.56
s		39456	41148	178416	70272	178416
End o elease hrs		11.46	11.76	49.89	19.85	49.89

Table E. -1 AA O t t or ACC 2 contin ed

avis-Besse AA Case		T 1 A 1A	T 2 A 1A	T A 1A	T A 1A	T 1 F N -002
elease Cate or		4.1	4.2	4.3	4.4	5.1
OA A ncover hrs	Core Uncovery (E NT(49))	8.34E-02	8.37E-02	8.34E-02	8.37E-02	6.68E-01
OA A ncover s	Core Uncovery (E NT(49))	300	301	300	301	2406
EAT atts		9.28E 05	2.31E 05	7.41E 05	2.21E 05	3.25E 06
TE meters	TDPLH TE	2.13	2.13	2.13	2.13	45.42
E F C	FREL(1)	5.33E-01	5.62E-01	4.69E-01	5.52E-01	9.82E-01
	FREL(2)	1.22E-03	1.96E-02	8.26E-04	5.32E-03	7.02E-03
	FREL(3)	1.24E-05	1.16E-02	6.63E-06	4.47E-03	2.84E-03
	FREL(4)	7.00E-11	9.71E-05	1.35E-08	2.30E-03	6.90E-06
	FREL(5)	2.78E-10	1.80E-04	9.37E-08	9.10E-05	1.75E-04
	FREL(6)	1.03E-04	9.31E-03	1.90E-04	3.95E-03	1.61E-03
	FREL(7)	3.67E-10	1.99E-04	1.34E-07	1.07E-03	6.63E-05
	FREL(8)	2.18E-12	4.04E-06	1.40E-08	1.97E-03	2.19E-06
	FREL(9)	4.54E-12	1.79E-05	3.43E-08	4.39E-03	2.42E-06
	FREL(10)	5.17E-05	1.50E-02	1.39E-03	2.22E-02	1.40E-03
	FREL(11)	0.00E 00	0.00E 00	2.92E-04	1.34E-03	3.16E-08
	FREL(12)	0.00E 00	0.00E 00	3.42E-08	3.43E-05	0.00E 00
E A hrs		12.75	0.42	14.52	0.42	1.84
E A s		45900	1512	52272	1512	6624
hrs		36.95	49.25	35.17	49.24	15.26
s		133020	177300	126612	177264	54936
End o elease hrs		49.7	49.67	49.69	49.66	17.1

Table E. -1 AA O t t or ACC 2 contin ed

avis-Besse AA Case		T 2 T N N N N	T F N -002	T T N N N N	T 1 T N N NN	T 2 T N N NN
elease Cate or		5.2	5.3	5.4	6.1	6.2
OA A ncover hrs	Core Uncovery (E NT(49))	9.17E-01	6.68E-01	9.17E-01	9.18E-01	9.18E-01
OA A ncover s	Core Uncovery (E NT(49))	3300	2406	3300	3305	3305
EAT atts		1.07E 07	3.07E 06	9.10E 06	6.44E 07	9.70E 07
TE meters	TDPLH TE	45.42	45.42	45.42	2.13	2.13
E F C	FREL(1)	9.72E-01	9.70E-01	9.95E-01	9.89E-01	9.87E-01
	FREL(2)	2.39E-01	6.51E-03	2.55E-01	1.20E-01	2.04E-01
	FREL(3)	2.90E-01	2.81E-03	3.07E-01	3.56E-02	5.84E-02
	FREL(4)	1.78E-04	8.36E-06	2.78E-02	1.44E-05	6.02E-05
	FREL(5)	6.36E-04	1.65E-04	5.16E-04	8.56E-05	1.25E-04
	FREL(6)	1.28E-01	1.58E-03	1.30E-01	1.69E-02	2.84E-02
	FREL(7)	1.12E-03	7.81E-05	1.34E-02	9.34E-05	3.04E-04
	FREL(8)	3.81E-05	2.42E-06	2.41E-02	2.18E-06	7.71E-06
	FREL(9)	8.53E-05	2.72E-06	6.87E-02	5.32E-06	1.79E-05
	FREL(10)	3.23E-02	1.32E-03	2.57E-01	7.95E-03	1.97E-02
	FREL(11)	0.00E 00	5.73E-07	1.05E-02	9.14E-09	5.86E-06
	FREL(12)	0.00E 00	2.34E-09	4.36E-04	0.00E 00	0.00E 00
E A hrs		2.00	1.84	2.00	2.33	2.33
E A s		7200	6624	7200	8388	8388
hrs		48.01	12.50	48.02	2.17	48.13
s		172836	45000	172872	7812	173268
End o elease hrs		50.01	14.34	50.02	4.5	50.46

Table E. -1 AA O t t or ACC 2 contin ed

avis-Besse AA Case		T TN NN N	T TN NN N	T71 A 1A	T72 A 1A	T7 TN NN N
elease Cate or		6.3	6.4	7.1	7.2	7.3
OA A ncover hrs	Core Uncovery (E NT(49))	9.18E-01	9.18E-01	8.37E-02	8.37E-02	3.51
OA A ncover s	Core Uncovery (E NT(49))	3305	3305	301	301	12636
EAT atts		6.19E 07	9.17E 07	2.80E 07	2.78E 07	2.89E 07
TE meters	TDPLH TE	2.13	2.13	45.42	45.42	45.42
E F C	FREL(1)	9.99E-01	9.94E-01	9.99E-01	1.00E 00	1.00E 00
	FREL(2)	3.61E-04	4.59E-02	6.43E-06	5.48E-03	8.98E-05
	FREL(3)	1.13E-05	2.92E-03	6.30E-05	1.67E-04	1.92E-05
	FREL(4)	1.06E-09	2.99E-04	1.73E-08	4.16E-08	6.03E-10
	FREL(5)	3.94E-09	2.38E-05	1.44E-07	6.39E-07	1.27E-08
	FREL(6)	9.30E-06	1.29E-03	1.27E-04	5.36E-04	1.87E-06
	FREL(7)	5.42E-09	1.39E-04	4.42E-08	1.24E-07	4.59E-09
	FREL(8)	4.06E-10	2.94E-04	5.30E-10	1.37E-09	9.34E-11
	FREL(9)	7.24E-10	9.23E-04	1.43E-09	2.33E-09	2.08E-10
	FREL(10)	9.52E-06	2.14E-02	9.80E-05	1.81E-04	2.11E-05
	FREL(11)	2.61E-06	1.48E-03	0.00E 00	0.00E 00	0.00E 00
	FREL(12)	5.47E-11	9.07E-06	0.00E 00	0.00E 00	0.00E 00
E A hrs		11.92	11.02	28.94	33.6	35.14
E A s		42912	39672	104184	120960	126504
hrs		38.44	39.44	20.69	16.02	7.51
s		138384	141984	74484	57672	27036
End o elease hrs		50.36	50.46	49.63	49.62	42.65

Table E. -1 AA O t t or ACC 2 contin ed

avis-Besse AA Case		T7 T N N N N	T7 A 1A	T7 A 1A	T77 T N N NN	T7 T N N N N
elease Cate or		7.4	7.5	7.6	7.7	7.8
OA A ncover hrs	Core Uncovery (E NT(49))	3.51	8.37E-02	8.34E-02	3.51	3.51
OA A ncover s	Core Uncovery (E NT(49))	12636	301	300	12636	12636
EAT atts		2.84E 07	2.24E 07	2.56E 07	1.96E 07	2.53E 07
TE meters	TDPLH TE	45.42	45.42	45.42	45.42	45.42
E F C	FREL(1)	1.00E 00	9.98E-01	9.62E-01	8.39E-01	9.41E-01
	FREL(2)	1.38E-04	9.65E-07	3.60E-03	4.87E-06	1.43E-02
	FREL(3)	2.30E-05	6.62E-07	5.28E-03	5.70E-07	9.70E-03
	FREL(4)	6.03E-10	2.08E-08	5.92E-06	6.96E-10	1.58E-05
	FREL(5)	1.27E-08	1.90E-07	1.38E-06	1.27E-08	1.43E-06
	FREL(6)	3.18E-06	2.02E-06	1.24E-03	4.49E-07	5.33E-04
	FREL(7)	4.59E-09	5.35E-08	4.79E-06	4.68E-09	8.15E-06
	FREL(8)	9.34E-11	6.38E-10	3.77E-06	1.96E-10	1.43E-05
	FREL(9)	2.08E-10	1.55E-09	9.35E-06	4.80E-10	4.93E-05
	FREL(10)	1.09E-05	1.45E-05	4.01E-02	1.36E-05	1.78E-02
	FREL(11)	0.00E 00	1.02E-06	5.34E-03	1.99E-06	2.59E-03
	FREL(12)	0.00E 00	4.79E-12	2.16E-07	6.80E-12	4.48E-07
E A hrs		40.41	35.77	35.29	51.01	41.54
E A s		145476	128772	127044	183636	149544
hrs		9.60	13.93	14.52	2.26	11.75
s		34560	50148	52272	8136	42300
End o elease hrs		50.01	49.7	49.81	53.27	53.29

Table E. -1 AA O t t or ACC 2 contin ed

avis-Besse AA Case		T 1 A 1a	T 2 A 1a	T 1 A 1A	T 2 A 1A
elease Cate or		8.1	8.2	9.1	9.2
OA A ncover hrs	Core Uncovery (E NT(49))	8.34E-02	8.34E-02	8.34E-02	8.37E-02
OA A ncover s	Core Uncovery (E NT(49))	300	300	300	301
EAT atts		1.15E 07	9.07E 07	2.65E 02	3.29E 02
TE meters	TDPLH TE	0.00	0.00	45.42	45.42
E F C	FREL(1)	8.73E-01	9.88E-01	1.47E-03	1.50E-03
	FREL(2)	7.91E-07	1.25E-02	6.34E-07	5.54E-05
	FREL(3)	1.03E-06	3.98E-03	5.71E-07	4.59E-05
	FREL(4)	2.04E-08	6.40E-05	1.86E-08	4.98E-07
	FREL(5)	1.89E-07	9.69E-06	1.82E-07	1.96E-06
	FREL(6)	3.26E-06	3.49E-03	5.66E-07	3.99E-05
	FREL(7)	5.42E-08	4.00E-05	5.11E-08	1.18E-06
	FREL(8)	6.48E-10	4.68E-05	6.09E-10	2.20E-08
	FREL(9)	1.54E-09	1.18E-04	1.49E-09	8.60E-08
	FREL(10)	2.31E-06	7.20E-02	4.55E-07	3.18E-05
	FREL(11)	3.11E-07	3.45E-03	0.00E 00	0.00E 00
	FREL(12)	1.35E-12	2.36E-06	0.00E 00	0.00E 00
E A hrs		33.32	16.04	0.33	0.42
E A s		119952	57744	1188	1512
hrs		16.43	33.71	5.94	24.58
s		59148	121356	21384	88488
End o elease hrs		49.75	49.75	6.27	25

Table E. -1 ro ndshine and Clo dshine hieldin Factors Base Case

	Evac ation	Normal	helterin	Comments
Cloudshine Shielding Factor (CSFACT)	1.0	0.9	0.6	Evacuation Outside Normal Wood house Sheltering Wood house basement
Groundshine Shielding Factor (GSHFAC)	0.5	0.4	0.1	Evacuation Car on fully contaminated road Normal One- or two-story wood house Sheltering House basement with one or two exposed walls

Table E. -1 ro ndshine and Clo dshine hieldin Factors ensitivit Case

	Evac ation	Normal	helterin	Comments
Cloudshine Shielding Factor (CSFACT)	1.0	0.6	0.4	Evacuation Outside Normal Brick house Sheltering Brick house basement
Groundshine Shielding Factor (GSHFAC)	0.5	0.2	0.1	Evacuation Car on fully contaminated road Normal One- or two-story brick house Sheltering House basement with one or two exposed walls

Table E. -1 mmar o hieldin Factors

Cate or	Evac ation	Normal	helterin
Cloudshine Shielding Factor	1.0	0.9	0.6
Groundshine Shielding Factor	0.5	0.4	0.1
Protection Factor for nhalation	1.0	0.41	0.33
Skin Protection Factor	1.0	0.41	0.33
Breathing Rate (meter^3 per second)	2.66E-04	2.66E-04	2.66E-04

Table E. -17 avis-Besse Core nventor F ll Core at EOC 177FAs

soto e	Activit C ries	Activit B	soto e	Activit C ries	Activit B
r-85	9.68E 05	3.58E 16	Te-132	1.09E 08	4.05E 18
r-85m	1.87E 07	6.91E 17	-131	7.71E 07	2.86E 18
r-87	3.54E 07	1.31E 18	-132	1.11E 08	4.12E 18
r-88	4.98E 07	1.84E 18	-133	1.55E 08	5.73E 18
Rb-86	2.10E 05	7.76E 15	-134	1.69E 08	6.26E 18
Sr-89	6.76E 07	2.50E 18	-135	1.45E 08	5.36E 18
Sr-90	7.66E 06	2.84E 17	Xe-133	1.51E 08	5.57E 18
Sr-91	8.49E 07	3.14E 18	Xe-135	3.93E 07	1.45E 18
Sr-92	9.31E 07	3.44E 18	Cs-134	2.05E 07	7.58E 17
-90	8.00E 06	2.96E 17	Cs-136	5.41E 06	2.00E 17
-91	8.83E 07	3.27E 18	Cs-137	1.12E 07	4.13E 17
-92	9.35E 07	3.46E 18	Ba-139	1.37E 08	5.06E 18
-93	1.10E 08	4.06E 18	Ba-140	1.32E 08	4.90E 18
r-95	1.25E 08	4.63E 18	La-140	1.40E 08	5.17E 18
r-97	1.26E 08	4.68E 18	La-141	1.25E 08	4.61E 18
Nb-95	1.26E 08	4.67E 18	La-142	1.20E 08	4.44E 18
Mo-99	1.44E 08	5.35E 18	Ce-141	1.26E 08	4.65E 18
Tc-99m	1.26E 08	4.68E 18	Ce-143	1.14E 08	4.24E 18
Ru-103	1.23E 08	4.56E 18	Ce-144	9.73E 07	3.60E 18
Ru-105	8.76E 07	3.24E 18	Pr-143	1.11E 08	4.12E 18
Ru-106	4.81E 07	1.78E 18	Nd-147	5.05E 07	1.87E 18
Rh-105	8.05E 07	2.98E 18	Np-239	1.73E 09	6.39E 19
Sb-127	8.84E 06	3.27E 17	Pu-238	4.56E 05	1.69E 16
Sb-129	2.56E 07	9.48E 17	Pu-239	3.33E 04	1.23E 15
Te-127	8.75E 06	3.24E 17	Pu-240	5.38E 04	1.99E 15
Te-127m	1.16E 06	4.28E 16	Pu-241	1.21E 07	4.47E 17
Te-129	2.52E 07	9.33E 17	Am-241	1.64E 04	6.06E 14
Te-129m	3.75E 06	1.39E 17	Cm-242	4.03E 06	1.49E 17
Te-131m	1.13E 07	4.19E 17	Cm-244	6.62E 05	2.45E 16

Table E. -1 Economic ata

e ion Name tate	Fraction o and evoted to Farmin in e ion	Fraction o Farm ales es ltin rom air in e ion	Total Ann al Farm ales or the e ion hectare	Farmland ro ert al e or the e ion hectare	Non arm ro ert al e or the e ion erson
Crawford, OH	0.854	0.044	1301	1295	266
Erie, OH	0.522	0.025	1186	1616	23037
Fulton, OH	0.709	0.086	1802	1451	6598
Hancock, OH	0.729	0.032	1007	1316	10215
Huron, OH	0.697	0.055	1507	1399	4935
Lorain, OH	0.395	0.106	2612	1821	21053
Lucas, OH	0.289	0.000	1881	1761	20782
Ottawa, OH	0.706	0.019	990	1170	33272
Sandusky, OH	0.694	0.024	1081	1250	10013
Seneca, OH	0.764	0.021	985	1264	1411
Wood, OH	0.698	0.044	1125	1359	15504
Lenawee, M	0.727	0.244	1142	1294	19618
Monroe, M	0.591	0.011	1547	1548	33156
Wayne, M	0.045	0.000	4074	3133	25408

Table E. -1 ACC 2 Economic arameters sed in C ONC

ariable	escri tion	al e in avis-Besse model
DPRATE	Property depreciation rate (/year)	0.20
DSRATE	nvestment rate of return (/year)	0.12
POPCST	Population relocation cost (/person)	5000/person
CDFRM0	Cost of farm decontamination for various levels of decontamination (/hectare)	562.50/hectare, 1250/hectare
CDNFRM	Cost of non-farm decontamination per person for various levels of decontamination (/person)	3000/person, 8000/person
DLBCST	Average cost of decontamination labor (/person-year)	35,000/person-year

Table E. -20 Fre enc ector

elease Cate or	Fre enc ear	ercent
1.1	2.2E-08	0.22%
1.2	1.3E-08	0.13%
1.3	5.9E-07	5.83%
1.4	1.2E-09	0.01%
2.1	5.4E-08	0.06%
2.2	6.0E-09	0.53%
3.1	2.5E-09	0.02%
3.2	2.8E-11	0.00%
3.3	2.5E-11	0.00%
3.4	1.7E-09	0.02%
4.1	1.0E-09	0.01%
4.2	3.4E-08	0.34%
4.3	1.1E-11	0.00%
4.4	7.7E-09	0.08%
5.1	2.9E-08	0.29%
5.2	3.8E-09	0.04%
5.3	2.8E-09	0.03%
5.4	8.9E-10	0.01%
6.1	4.4E-10	0.00%
6.2	3.3E-11	0.00%
6.3	4.5E-09	0.04%
6.4	3.1E-08	0.31%
7.1	1.4E-11	0.00%
7.2	5.7E-10	0.01%
7.3	2.2E-12	0.00%
7.4	2.4E-09	0.02%
7.5	2.7E-11	0.00%
7.6	1.9E-08	0.19%
7.7	3.6E-11	0.00%
7.8	9.8E-08	0.97%
8.1	6.3E-08	0.62%
8.2	1.3E-07	1.28%
9.1	7.6E-06	75.11%
9.2	1.4E-06	13.84%
m C F	1.0E-0	100.00

[3] The sum of the Containment Systems State frequencies calculated by the Level 2 PRA model is slightly different than the CDF calculated by the Level 1 PRA due to the delete term approximation and the additional systems included in the Level 2 PRA models.

Table E. -21 Base Case es lts or nternal Events at 0 iles

elease Cate or	hole Bod ose 0 rem r	Economic m act 0 r
1.1	4.4E-02	4.2E 01
1.2	2.7E-02	2.6E 01
1.3	1.2E 00	1.2E 03
1.4	3.2E-03	2.5E 00
2.1	2.8E-02	2.1E 01
2.2	5.0E-01	2.3E 02
3.1	1.9E-03	1.1E 00
3.2	1.1E-04	9.8E-02
3.3	1.9E-05	1.1E-02
3.4	1.1E-02	6.8E 00
4.1	3.5E-05	8.7E-03
4.2	3.1E-02	1.8E 01
4.3	6.6E-07	1.2E-04
4.4	1.0E-02	7.3E 00
5.1	9.0E-03	2.9E 00
5.2	1.1E-02	9.9E 00
5.3	8.7E-04	2.7E-01
5.4	6.6E-03	3.4E 00
6.1	4.8E-04	4.0E-01
6.2	5.3E-05	4.6E-02
6.3	3.9E-05	5.9E-03
6.4	1.7E-02	7.4E 00
7.1	5.3E-07	3.1E-05
7.2	6.8E-05	2.6E-02
7.3	5.1E-09	3.5E-07
7.4	7.7E-06	7.2E-04
7.5	3.5E-08	0.0E 00
7.6	6.1E-03	1.7E 00
7.7	2.7E-08	2.3E-07
7.8	1.8E-02	7.4E 00
8.1	1.1E-04	7.6E-04
8.2	9.1E-02	2.9E 01
9.1	2.0E-03	1.1E-04
9.2	2.0E-02	1.3E 00
Total	2.0E 00	1. E 0

Table E. -22 Base Case Conse ence n t to A A Anal sis

elease Cate or	hole Bod ose 0 rem	Economic m act 0
1.1	2.0E 06	1.9E 09
1.2	2.1E 06	2.0E 09
1.3	2.0E 06	2.0E 09
1.4	2.7E 06	2.1E 09
2.1	4.7E 06	3.5E 09
2.2	9.3E 06	4.3E 09
3.1	7.7E 05	4.3E 08
3.2	4.1E 06	3.5E 09
3.3	7.6E 05	4.2E 08
3.4	6.3E 06	4.0E 09
4.1	3.5E 04	8.7E 06
4.2	9.1E 05	5.3E 08
4.3	6.0E 04	1.1E 07
4.4	1.3E 06	9.5E 08
5.1	3.1E 05	9.9E 07
5.2	3.0E 06	2.6E 09
5.3	3.1E 05	9.5E 07
5.4	7.4E 06	3.8E 09
6.1	1.1E 06	9.2E 08
6.2	1.6E 06	1.4E 09
6.3	8.6E 03	1.3E 06
6.4	5.5E 05	2.4E 08
7.1	3.8E 04	2.2E 06
7.2	1.2E 05	4.6E 07
7.3	2.3E 03	1.6E 05
7.4	3.2E 03	3.0E 05
7.5	1.3E 03	0.0E 00
7.6	3.2E 05	8.7E 07
7.7	7.4E 02	6.5E 03
7.8	1.8E 05	7.6E 07
8.1	1.8E 03	1.2E 04
8.2	7.0E 05	2.2E 08
9.1	2.6E 02	1.5E 01
9.2	1.4E 04	9.3E 05
Total	.2 E 07	. 2E 10

Table E. -2 Com arison o Base Case and Case 1

	nternal Events		
	Base	1	di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	2.23E 00	9.3%
Economic mpact (50) (/yr)	1.59E 03	1.73E 03	8.8%

Table E. -2 Com arison o Base Case and Case 2

	nternal Events		
	Base	2	di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	1.81E 00	-11.3%
Economic mpact (50) (/yr)	1.59E 03	1.43E 03	-10.1%

Table E. -2 Com arison o Base Case and Case

	nternal Events		
	Base		di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	2.09E 00	2.5%
Economic mpact (50) (/yr)	1.59E 03	1.59E 03	0.0%

Table E. -2 Com arison o Base Case and Case 1

	nternal Events		
	Base	1	di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	2.07E 00	1.5%
Economic mpact (50) (/yr)	1.59E 03	1.57E 03	-1.3%

Table E. -27 Com arison o Base Case and Case 2

	nternal Events		
	Base	2	di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	1.87E 00	-8.3%
Economic mpact (50) (/yr)	1.59E 03	1.52E 03	-4.4%

Table E. -2 Com arison o Base Case and Case A1

	nternal Events		
	Base	A1	di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	1.52E 00	-25.5%
Economic mpact (50) (/yr)	1.59E 03	1.25E 03	-21.4%

Table E. -2 Com arison o Base Case and Case A2

	nternal Events		
	Base	A2	di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	2.04E 00	0.0%
Economic mpact (50) (/yr)	1.59E 03	1.59E 03	0.0%

Table E. - 0 Com arison o Base Case and Case A

	nternal Events		
	Base	A	di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	2.04E 00	0.0%
Economic mpact (50) (/yr)	1.59E 03	1.59E 03	0.0%

Table E. - 1 Com arison o Base Case and Case E1

	nternal Events		
	Base	E1	di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	2.02E 00	-1.0%
Economic mpact (50) (/yr)	1.59E 03	1.59E 03	0.0%

Table E. - 2 Com arison o Base Case and Case E2

	nternal Events		
	Base	E2	di .
Whole Body Dose (50) (person-rem/yr)	2.04E 00	1.66E 00	-18.6%
Economic mpact (50) (/yr)	1.59E 03	1.23E 03	-22.6%

Table E. -1 Total Cost o evere Accident m act

APE	49,080
AOC	19,632
AOE	4,340
AOSC	266,279
Severe Accident mpact (nternal Events)	339,331
Fire, Seismic, Other	1,017,993
a im m Bene it (nternal Events, Fire, Seismic, Other)	1,357,324

Table E. -1 avis-Besse To 100 C tsets

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
1	6.55E-07	6.71%	1.04E-03	TMPP43XF-CC ALL	All CCW pumps fail to run due to CCF (initiating event)
			6.30E-04	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
2	5.00E-07	5.12%	5.00E-07	A	Reactor vessel rupture
3	1.95E-07	2.00%	3.10E-04	F3AM	Maximum flood in CCW pump room from service water (initiating event)
			6.30E-04	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
4	1.44E-07	1.47%	7.00E-03	R	SGTR (initiating event)
			5.00E-01	AASGTR11	SGTR occurs on OTSG 1-1 (split fraction)
			1.00	CHASGDPE	Operators fail to cooldown during a SGTR
			1.00	LHAMS E	Failure to close MS and isolate steam generator containing ruptured tube
			1.00	XHAMUCDE	Operators fail to attempt cooldown via makeup/HP cooling
			4.10E-05	COMB NAT ON661	HRA events
5	1.44E-07	1.47%	7.00E-03	R	SGTR (initiating event)
			5.00E-01	AASGTR12	SGTR occurs on OTSG 1-2 (split fraction)
			1.00	CHASGDPE	Operators fail to cooldown during a SGTR
			1.00	LHAMS E	Failure to close MS and isolate steam generator containing ruptured tube
			1.00	XHAMUCDE	Operators fail to attempt cooldown via makeup/HP cooling
			4.10E-05	COMB NAT ON661	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
6	1.29E-07	1.32%	1.01E-03	TMPP43XF-CC 1 2	CCW pumps 1 2 failure to run due to CCF (initiating event)
			4.00E-01	XHOS-CCW1RUN2STB	CCW pump 1 running, pump 2 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
7	1.29E-07	1.32%	1.01E-03	TMPP43XF-CC 1 2	CCW pumps 1 2 fail to run due to CCF (initiating event)
			4.00E-01	XHOS-CCW2RUN1STB	CCW pump 2 running, pump 1 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
8	9.09E-08	0.93%	4.64E-02	T3	LOOP (initiating event)
			1.40E-02	EMBEDG12	EDG Train 2 in maintenance
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			2.50E-04	COMB NAT ON243	HRA events
9	8.87E-08	0.91%	1.36E-01	T2	Plant trip due to loss of MFW (initiating event)
			2.42E-04	TP000XA-CC 1 2	CCF of two components: TP0001A TP0002A
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
			2.70E-03	COMB NAT ON1203	HRA events
10	7.60E-08	0.78%	4.64E-02	T3	LOOP (initiating event)
			1.17E-02	EDG0012A	EDG 1-2 fails to start
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			2.50E-04	COMB NAT ON243	HRA events
11	7.59E-08	0.78%	4.64E-02	T3	LOOP (initiating event)
			7.35E-02	EDG0012F	EDG 1-2 fails to run
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			8.90E-02	OP006ER	Failure to restore off-site power within 30 minutes after loss of AFW
			2.50E-04	COMB NAT ON243	HRA events
12	6.80E-08	0.70%	4.00E-05	M	Medium Break LOCA
			1.70E-03	HALPRME	Operators fail to initiate LPR for a medium LOCA
13	6.73E-08	0.69%	1.36E-01	T2	Plant trip due to loss of MFW (initiating event)
			1.83E-04	PLT09XXD-CC ALL	CCF of all components in group PLT09XXD-CC
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
			2.70E-03	COMB NAT ON1203	HRA events
14	5.60E-08	0.57%	1.00	T13A-2-3- EF	Loss of CCW Train 2 initiating event Pump 2 running
			1.34E-01	TTC1434T	Temperature control valve SW1434 fails to throttle (initiating event)
			3.27E-03	WCDC113C	Breaker AC113 fails to close
			4.00E-01	XHOS-CCW2RUN1STB	CCW Pump 2 running, Pump 1 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
15	5.60E-08	0.57%	1.00	T13A-1-3- EF	Loss of CCW Train 1 initiating event Pump 2 running
			1.34E-01	TTC1424T	TC SW1424 fails to throttle (one-year mission time) (initiating event)
			3.27E-03	WCDD113C	Breaker AD113 fails to close
			4.00E-01	XHOS-CCW1RUN2STB	CCW Pump 1 running, Pump 2 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
16	5.54E-08	0.57%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			8.33E-02	FMFWTR P	MFW/ ntegrated Control System (CS) faults following trip
			2.42E-04	TP000XA-CC 1 2	CCF of two components: TP0001A TP0002A
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
17	4.93E-08	0.50%	4.64E-02	T3	LOOP (initiating event)
			2.42E-04	TP000XA-CC 1 2	CCF of two components: TP0001A TP0002A
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			4.40E-03	COMB NAT ON372	HRA events
18	4.38E-08	0.45%	5.00E-04	S	Small LOCA (initiating event)
			8.77E-05	LSC007XN-CC 1 2	CCF of two components: LSC0076N LSC0077N
19	4.21E-08	0.43%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			8.33E-02	FMFWTR P	MFW/ CS faults following trip
			1.83E-04	PLT09XXD-CC ALL	CCF of all components in group PLT09XXD-CC
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
20	4.18E-08	0.43%	4.40E-04	F3AL	Large flood in CCW pump room from service water (initiating event)
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHAF3 SE	Failure to isolate flood in room 328 before CCW pumps are affected
			9.50E-05	COMB NAT ON1226	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
21	4.11E-08	0.42%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			2.49E-03	EC1 100N	Breaker HX11B fails to open
			7.35E-02	EDG0012F	EDG 1-2 fails to run
			1.00	EHAD1ACE	Failure to lineup alternate source to D1
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	FHASUF3E	Operators fail to actuate the startup feedpump
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			2.20E-04	COMB NAT ON465	HRA events
22	4.11E-08	0.42%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			2.49E-03	EC1 153C	Breaker HX02B fails to close
			7.35E-02	EDG0012F	EDG 1-2 fails to run
			1.00	EHAD1ACE	Failure to lineup alternate source to D1
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	FHASUF3E	Operators fail to actuate the startup feedpump
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			2.20E-04	COMB NAT ON465	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
23	3.81E-08	0.39%	1.00	T13A-2-3- EF	Loss of CCW Train 2 initiating event Pump 2 running
			9.11E-02	TMPP432F	CCW Pump 1-2 fails to run (initiating event)
			3.27E-03	WCDC113C	Breaker AC113 fails to close
			4.00E-01	XHOS-CCW2RUN1STB	CCW Pump 2 running, Pump 1 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
24	3.81E-08	0.39%	1.00	T13A-1-3- EF	Loss of CCW Train 1 initiating event Pump 1 running
			9.11E-02	TMPP431F	CCW Pump 1-1 fails to run (initiating event)
			3.27E-03	WCDD113C	Breaker AD113 fails to close
			4.00E-01	XHOS-CCW1RUN2STB	CCW Pump 1 running, Pump 2 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
25	3.63E-08	0.37%	5.00E-04	S	Small LOCA (initiating event)
			9.68E-05	MFC31XA-CC ALL	CCF of all components in group MFC31XA-CC
			7.50E-01	XHOS-SWTEMP-LOW	Service Water temperature less than 72
26	3.03E-08	0.31%	4.64E-02	T3	LOOP (initiating event)
			2.42E-04	TP000XA-CC 1 2	CCF of two components: TP0001A TP0002A
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
27	2.98E-08	0.31%	2.21E-05	TF2	Tornado F-Scale 2 (initiating event)
			7.35E-02	EDG0011F	EDG 1-1 fails to run
			7.35E-02	EDG0012F	EDG 1-2 fails to run
			1.00	NORC RT3	No recovery of off-site power following a tornado
			5.00E-01	NT TOR2	Condensate storage tank (CST) fails due to high winds from an F-Scale 2 tornado
			5.00E-01	SBOTOR2A	SBO diesel generator damaged due to high winds from an F-Scale 2 tornado
28	2.88E-08	0.29%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			1.44E-02	FMM00003	Any MSS on SG1 fails to reseat
			7.26E-04	M 0599	Motor-operated valve AF 599 fails to remain open
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
29	2.88E-08	0.29%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			1.44E-02	FMM00004	Any MSS on SG2 fails to reseat
			7.26E-04	M 0608	Motor-operated valve AF 608 fails to remain open
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
30	2.82E-08	0.29%	6.69E-06	TF3	Tornado F-Scale 3 (initiating event)
			7.35E-02	EDG0011F	EDG 1-1 fails to run
			7.35E-02	EDG0012F	EDG 1-2 fails to run
			1.00	NORC RT3	No recovery of off-site power following a tornado
			8.84E-01	NT TOR3	CST fails due to high winds from an F-Scale 3 tornado
			8.84E-01	SBOTOR3A	SBO diesel generator damaged due to high winds from an F-Scale 3 tornado
31	2.66E-08	0.27%	1.40E-04	F2CL	Large flood in room 53 from service water return (initiating event)
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	SHAF2 SE	Failure to isolate flood before service water pumps are affected
			1.90E-04	COMB NAT ON1157	HRA events
32	2.63E-08	0.27%	1.36E-01	T2	Plant trip due to loss of MFW (initiating event)
			1.29E-02	MBAFP12	AFW Train 2 in maintenance
			5.55E-03	TP0001A	AFP/T-1 fails to start
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
33	2.51E-08	0.26%	5.00E-04	S	Small LOCA (initiating event)
			5.03E-05	LMPP42XF-CC 1 2	CCF of two components: LMPP421F LMPP422F
34	2.47E-08	0.25%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			3.72E-02	BLAUXBF	Auxiliary boiler fails to supply steam
			2.42E-04	TP000XA-CC 1 2	CCF of two components: TP0001A TP0002A
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
			2.70E-03	COMB NAT ON1203	HRA events
35	2.41E-08	0.25%	1.36E-01	T2	Plant trip due to loss of MFW (initiating event)
			1.18E-02	MBAFP11	AFW Train 1 in maintenance
			5.55E-03	TP0002A	AFP/T-2 fails to start
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
36	2.28E-08	0.23%	4.64E-02	T3	LOOP (initiating event)
			3.51E-03	EMF 163A	ent Fan 3 fails to start
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			2.50E-04	COMB NAT ON243	HRA events
37	2.28E-08	0.23%	4.64E-02	T3	LOOP (initiating event)
			3.51E-03	EMF 165A	ent Fan 4 fails to start
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			2.50E-04	COMB NAT ON243	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
38	2.27E-08	0.23%	4.64E-02	T3	LOOP (initiating event)
			3.50E-03	EMD5336C	Motor-operated damper H 5336B fails to close
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			2.50E-04	COMB NAT ON243	HRA events
39	2.27E-08	0.23%	4.64E-02	T3	LOOP (initiating event)
			3.50E-03	EMD 119N	Motor damper H 5336A fails to open
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			2.50E-04	COMB NAT ON243	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
40	2.27E-08	0.23%	4.64E-02	T3	LOOP (initiating event)
			3.50E-03	EMD 121N	Motor damper H 5336C fails to open
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			2.50E-04	COMB NAT ON243	HRA events
41	2.05E-08	0.21%	5.00E-04	S	Small LOCA (initiating event)
			4.10E-05	HASDCSE	Operators fail to establish shutdown cooling or LPR after small LOCA
42	1.97E-08	0.20%	1.00	T13A-1-3- EF	Loss of CCW Train 1 initiating event Pump 1 running
			1.15E-03	SA 1434N	Air-operated valve SW 1434 fails to open
			1.34E-01	TTC1424T	TC SW1424 fails to throttle (one-year mission time) (initiating event)
			4.00E-01	XHOS-CCW1RUN2STB	CCW Pump 1 running, Pump 2 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
43	1.97E-08	0.20%	1.00	T13A-2-3- EF	Loss of CCW Train 2 initiating event Pump 2 running
			1.15E-03	SA 1424N	Air-operated valve SW-1424 fails to open
			1.34E-01	TTC1434T	Temperature control valve SW1434 fails to throttle (initiating event)
			4.00E-01	XHOS-CCW2RUN1STB	CCW Pump 2 running, Pump 1 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
44	1.95E-08	0.20%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			2.93E-02	MBAUXB1	Auxiliary Boiler unavailable due to maintenance
			2.42E-04	TP000XA-CC 1 2	CCF of two components: TP0001A TP0002A
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
45	1.89E-08	0.19%	4.64E-02	T3	LOOP (initiating event)
			1.40E-02	EMBEDG12	EDG Train 2 in maintenance
			1.18E-02	MBAFP11	AFW Train 1 in maintenance
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			4.40E-03	COMB NAT ON297	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
46	1.88E-08	0.19%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			1.83E-04	PLT09XXD-CC ALL	CCF of all components in group PLT09XXD-CC
			3.72E-02	BLAUXBF	Auxiliary Boiler fails to supply steam
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
47	1.86E-08	0.19%	4.64E-02	T3	LOOP (initiating event)
			2.42E-04	TP000XA-CC 1 2	CCF of two components: TP0001A TP0002A
			1.00	MHARM TE	Operators fail to compensate for loss of room cooling for makeup pumps
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			4.60E-01	OP006CR	Failure to restore off-site power
			3.60E-03	COMB NAT ON674	HRA events
48	1.81E-08	0.18%	4.64E-02	T3	LOOP (initiating event)
			1.28E-05	S 64XXD-CC ALL	CCF of all components in group S 64XXD-CC
			6.60E-02	HARM TE	Operators fail to compensate for loss of room cooling for makeup pumps
			4.60E-01	OP006CR	Failure to restore off-site power
49	1.68E-08	0.17%	1.36E-01	T2	Plant trip due to loss of MFW (initiating event)
			4.58E-05	PA 01XN-CC 1 2	CCF of two components: PA 011N PA 012N
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
50	1.67E-08	0.17%	4.64E-02	T3	LOOP (initiating event)
			1.40E-02	EMBEDG12	EDG Train 2 in maintenance
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	HAMDF3E	Failure to start MDFP prior to depletion of BWST during makeup
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			4.60E-05	COMB NAT ON817	HRA events
51	1.64E-08	0.17%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			8.33E-02	FMFWTR P	MFW/ CS faults following trip
			1.29E-02	MBAFP12	AFW Train 2 in maintenance
			5.55E-03	TP0001A	AFP/T-1 fails to start
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
52	1.62E-08	0.17%	1.01E-03	TMPP43XF-CC 1 3	CCW Pumps 1 3 fail to run due to CCF (initiating event)
			5.00E-02	XHOS-CCW1RUN3STB	CCW Pump 1 running, Pump 3 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
53	1.62E-08	0.17%	1.01E-03	TMPP43XF-CC 1 3	CCW Pumps 1 3 fail to run due to CCF (initiating event)
			5.00E-02	XHOS-CCW3RUN1STB	CCW Pump 3 running, Pump 1 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
54	1.62E-08	0.17%	1.01E-03	TMPP43XF-CC 2 3	CCW Pumps 2 3 fail to run due to CCF (initiating event)
			5.00E-02	XHOS-CCW2RUN3STB	CCW Pump 2 running, Pump 3 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
55	1.62E-08	0.17%	1.01E-03	TMPP43XF-CC 2 3	CCW Pumps 2 3 fail to run due to CCF (initiating event)
			5.00E-02	XHOS-CCW3RUN2STB	CCW Pump 3 running, Pump 2 in standby
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
56	1.58E-08	0.16%	4.64E-02	T3	LOOP (initiating event)
			1.17E-02	EDG0012A	EDG 1-2 fails to start
			1.18E-02	MBAFP11	AFW Train 1 in maintenance
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			4.40E-03	COMB NAT ON297	HRA events
57	1.51E-08	0.15%	1.00	D- EF	SLOCA due to internal rupture of DHR suction valves
			3.51E-04	LM F011R	nternal rupture of DH 11 (Annual frequency)
			4.29E-04	LM U012R	nternal rupture of DH 12 since cold shutdown
			1.00E-01	LPPN SO	SLOCA occurs in non-isolable portion of DHR system
58	1.51E-08	0.15%	1.00	D- EF	SLOCA due to internal rupture of DHR suction valves
			3.51E-04	LM F012R	nternal rupture of DH 12 (Annual frequency)
			4.29E-04	LM U011R	nternal rupture of DH 11 since cold shutdown
			1.00E-01	LPPN SO	SLOCA occurs in non-isolable portion of DHR system
59	1.50E-08	0.15%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			8.33E-02	FMFWTR P	MFW/ CS faults following trip
			1.18E-02	MBAFP11	AFW Train 1 in maintenance
			5.55E-03	TP0002A	AFP/T-2 fails to start
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1   avis-Besse To   100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
60	1.48E-08	0.15%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			1.83E-04	PLT09XXD-CC ALL	CCF of all components in group PLT09XXD-CC
			2.93E-02	MBAUXB1	Auxiliary boiler unavailable due to maintenance
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
61	1.46E-08	0.15%	4.64E-02	T3	LOOP (initiating event)
			1.29E-02	MBAFP12	AFW Train 2 in maintenance
			5.55E-03	TP0001A	AFP/T-1 fails to start
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			4.40E-03	COMB NAT ON372	HRA events
62	1.40E-08	0.14%	5.00E-04	S	Small LOCA (initiating event)
			1.40E-04	LMPP42XA-CC 1 2	CCF of two components: LMPP421A LMPP422A
			2.00E-01	RCLP PR	Fail to recover LP pump from start fault (at least 2 hrs available for recovery)
63	1.40E-08	0.14%	4.64E-02	T3	LOOP (initiating event)
			1.17E-02	EDG0012A	EDG 1-2 fails to start
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	HAMDF3E	Failure to start MDFP prior to depletion of BWST during makeup
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			4.60E-05	COMB NAT ON817	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
64	1.40E-08	0.14%	4.64E-02	T3	LOOP (initiating event)
			7.35E-02	EDG0012F	EDG 1-2 fails to run
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	HAMDF3E	Failure to start MDFP prior to depletion of BWST during makeup
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			8.90E-02	OP006ER	Failure to restore off-site power within 30 minutes after loss of AFW
			4.60E-05	COMB NAT ON817	HRA events
65	1.34E-08	0.14%	1.00	T13A-1-3- EF	Loss of CCW Train 1 initiating event Pump 1 running
			4.00E-01	XHOS-CCW1RUN2STB	CCW Pump 1 running, Pump 2 in standby
			9.11E-02	TMPP431F	CCW Pump 1-1 fails to run (initiating event)
			1.15E-03	SA 1434N	Air-operated valve SW 1434 fails to open
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
66	1.34E-08	0.14%	1.00	T13A-2-3- EF	Loss of CCW Train 2 initiating event Pump 2 running
			4.00E-01	XHOS-CCW2RUN1STB	CCW Pump 2 running, Pump 1 in standby
			9.11E-02	TMPP432F	CCW Pump 1-2 fails to run (initiating event)
			1.15E-03	SA 1424N	Air-operated valve SW-1424 fails to open
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
67	1.34E-08	0.14%	4.64E-02	T3	LOOP (initiating event)
			1.18E-02	MBAFP11	AFW Train 1 in maintenance
			5.55E-03	TP0002A	AFP/T-2 fails to start
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			4.40E-03	COMB NAT ON372	HRA events
68	1.24E-08	0.13%	4.64E-02	T3	LOOP (initiating event)
			1.91E-03	EC2 000N	Breaker AD110 fails to open
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.00	HAO F2E	Operators fail to take local manual control of AFW turbine 1-2 speed
			5.60E-01	OP007BR	Failure to restore off-site power within one hour to prevent loss of DC
			2.50E-04	COMB NAT ON243	HRA events
69	1.23E-08	0.13%	2.21E-05	TF2	Tornado F-Scale 2 (initiating event)
			2.23E-03	EDG001XF-CC 1 2	CCF of two components: EDG0011F EDG0012F
			1.00	NORC RT3	No recovery of off-site power following a tornado
			5.00E-01	NT TOR2	CST fails due to high winds from an F-Scale 2 tornado
			5.00E-01	SBOTOR2A	SBO diesel generator damaged due to high winds from an F-Scale 2 Tornado

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
70	1.23E-08	0.13%	1.00	T13A-1-3- EF	Loss of CCW Train 1 initiating event Pump 1 running
			4.00E-01	XHOS-CCW1RUN2STB	CCW Pump 1 Running, Pump 2 in standby
			2.93E-02	THXE221P	CCW heat exchanger plugs during operation (initiating event)
			3.27E-03	WCDD113C	Breaker AD113 fails to close
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
71	1.23E-08	0.13%	1.00	T13A-2-3- EF	Loss of CCW Train 2 initiating event Pump 2 running
			4.00E-01	XHOS-CCW2RUN1STB	CCW Pump 2 running, Pump 1 in standby
			2.93E-02	THXE222P	CCW heat exchanger 1-2 plugs during operation (initiating event)
			3.27E-03	WCDC113C	Breaker AC113 fails to close
			1.00	HARCPCE	Operators fail to trip RCPs after a total loss of seal cooling
			1.00	WHASPREE	Failure to recover CCW using spare CCW train
			3.20E-04	COMB NAT ON1240	HRA events
72	1.22E-08	0.13%	1.29E-02	T2A-1	SP6B fails to throttle (initiating event)
			1.88E-02	PLT09B6D	Level Transmitter LTSP9B6 fails to respond
			1.88E-02	PLT09B8D	Level Transmitter LTSP9B8 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
73	1.22E-08	0.13%	1.29E-02	T2A-1	SP6B fails to throttle (initiating event)
			1.88E-02	PLT09B6D	Level Transmitter LTSP9B6 fails to respond
			1.88E-02	PLT09B9D	Level Transmitter LTSP9B9 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
74	1.22E-08	0.13%	1.29E-02	T2A-1	SP6B fails to throttle (initiating event)
			1.88E-02	PLT09B7D	Level Transmitter LTSP9B7 fails to respond
			1.88E-02	PLT09B8D	Level Transmitter LTSP9B8 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
75	1.22E-08	0.13%	1.29E-02	T2A-1	SP6B fails to throttle (initiating event)
			1.88E-02	PLT09B7D	Level Transmitter LTSP9B7 fails to respond
			1.88E-02	PLT09B9D	Level Transmitter LTSP9B9 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
76	1.22E-08	0.13%	1.29E-02	T2B-1	SP6A fails to throttle (initiating event)
			1.88E-02	PLT09A6D	Level Transmitter LTSP9A6 fails to respond
			1.88E-02	PLT09A8D	Level Transmitter LTSP9A8 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
77	1.22E-08	0.13%	1.29E-02	T2B-1	SP6A fails to throttle (initiating event)
			1.88E-02	PLT09A6D	Level Transmitter LTSP9A6 fails to respond
			1.88E-02	PLT09A9D	Level Transmitter LTSP9A9 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
78	1.22E-08	0.13%	1.29E-02	T2B-1	SP6A fails to throttle (initiating event)
			1.88E-02	PLT09A7D	Level Transmitter LTSP9A7 fails to respond
			1.88E-02	PLT09A8D	Level Transmitter LTSP9A8 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
79	1.22E-08	0.13%	1.29E-02	T2B-1	SP6A fails to throttle (initiating event)
			1.88E-02	PLT09A7D	Level Transmitter LTSP9A7 fails to respond
			1.88E-02	PLT09A9D	Level Transmitter LTSP9A9 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
80	1.22E-08	0.12%	1.00	T9- EF	Loss of DC power supply NN X (initiating event)
			1.00E-06	1	Reactor fails to trip following automatic demand
			1.22E-02	TPXNN XF	NN X power supply no output

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
81	1.21E-08	0.12%	5.00E-04	S	Small LOCA (initiating event)
			9.68E-05	MFC31XA-CC ALL	CCF of all components in group MFC31XA-CC
			2.50E-01	XHOS-SWTEMP-H GH	Service Water temperature greater than 72
82	1.20E-08	0.12%	5.00E-04	S	Small LOCA (initiating event)
			9.62E-05	MFC31XA-CC 1 3	CCF of two components: MFC311A MFC314A
			2.50E-01	XHOS-SWTEMP-H GH	Service Water temperature greater than 72
83	1.20E-08	0.12%	5.00E-04	S	Small LOCA (initiating event)
			9.62E-05	MFC31XA-CC 1 4	CCF of two components: MFC311A MFC315A
			2.50E-01	XHOS-SWTEMP-H GH	Service Water temperature greater than 72
84	1.20E-08	0.12%	5.00E-04	S	Small LOCA (initiating event)
			9.62E-05	MFC31XA-CC 2 3	CCF of two components: MFC312A MFC314A
			2.50E-01	XHOS-SWTEMP-H GH	Service Water temperature greater than 72
85	1.20E-08	0.12%	5.00E-04	S	Small LOCA (initiating event)
			9.62E-05	MFC31XA-CC 2 4	CCF of two components: MFC312A MFC315A
			2.50E-01	XHOS-SWTEMP-H GH	Service Water temperature greater than 72

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
86	1.20E-08	0.12%	4.64E-02	T3	LOOP (initiating event)
			1.00	EHAD2DGE	Operators fail to align power from EDG 1 or 2 to supply MDFP given LOOP
			1.00	EHASBD1E	Operators fail to start SBO diesel generator and align to Bus D1
			1.00	EHASBDGE	Operators fail to align power from SBO diesel generator
			1.40E-02	EMBEDG12	EDG Train 2 in maintenance
			1.18E-02	MBAFP11	AFW Train 1 in maintenance
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			7.10E-01	OP006FR	Failure to restore off-site power
			2.20E-03	COMB NAT ON374	HRA events
87	1.17E-08	0.12%	6.69E-06	TF3	Tornado F-Scale 3 (initiating event)
			2.23E-03	EDG001XF-CC 1 2	CCF of two components: EDG0011F EDG0012F
			1.00	NORC RT3	No recovery of off-site power following a tornado
			8.84E-01	NT TOR3	CST fails due to high winds from an F-Scale 3 tornado
			8.84E-01	SBOTOR3A	SBO diesel generator damaged due to high winds from an F-Scale 3 tornado
88	1.16E-08	0.12%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			5.81E-03	F 011AT	A CS11A fails to reseat after steam
			7.26E-04	M 0608	Motor-operated valve AF 608 fails to remain open
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
89	1.16E-08	0.12%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			5.81E-03	F 011BT	A CS11B fails to reseat after steam
			7.26E-04	M 0599	Motor-operated valve AF 599 fails to remain open
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
90	1.13E-08	0.12%	1.36E-01	T2	Plant trip due to loss of MFW (initiating event)
			5.55E-03	TP0001A	AFP/T-1 fails to start
			5.55E-03	TP0002A	AFP/T-2 fails to start
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
91	1.13E-08	0.12%	1.19E-02	T2A-2	F C CS35B fails high (initiating event)
			1.88E-02	PLT09B6D	Level Transmitter LTSP9B6 fails to respond
			1.88E-02	PLT09B8D	Level Transmitter LTSP9B8 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
92	1.13E-08	0.12%	1.19E-02	T2A-2	F C CS35B fails high (initiating event)
			1.88E-02	PLT09B6D	Level Transmitter LTSP9B6 fails to respond
			1.88E-02	PLT09B9D	Level Transmitter LTSP9B9 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
93	1.13E-08	0.12%	1.19E-02	T2A-2	F C CS35B fails high (initiating event)
			1.88E-02	PLT09B7D	Level Transmitter LTSP9B7 fails to respond
			1.88E-02	PLT09B8D	Level Transmitter LTSP9B8 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
94	1.13E-08	0.12%	1.19E-02	T2A-2	F C CS35B fails high (initiating event)
			1.88E-02	PLT09B7D	Level Transmitter LTSP9B7 fails to respond
			1.88E-02	PLT09B9D	Level Transmitter LTSP9B9 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
95	1.13E-08	0.12%	1.19E-02	T2B-2	F C CS35A fails high (initiating event)
			1.88E-02	PLT09A6D	Level Transmitter LTSP9A6 fails to respond
			1.88E-02	PLT09A8D	Level Transmitter LTSP9A8 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
96	1.13E-08	0.12%	1.19E-02	T2B-2	F C CS35A fails high (initiating event)
			1.88E-02	PLT09A6D	Level Transmitter LTSP9A6 fails to respond
			1.88E-02	PLT09A9D	Level Transmitter LTSP9A9 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -1 avis-Besse To 100 C tsets contin ed

C tset	C tset Fre enc	C F	Event robabilit	Event	escri tion
97	1.13E-08	0.12%	1.19E-02	T2B-2	F C CS35A fails high (initiating event)
			1.88E-02	PLT09A7D	Level Transmitter LTSP9A7 fails to respond
			1.88E-02	PLT09A8D	Level Transmitter LTSP9A8 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
98	1.13E-08	0.12%	1.19E-02	T2B-2	F C CS35A fails high (initiating event)
			1.88E-02	PLT09A7D	Level Transmitter LTSP9A7 fails to respond
			1.88E-02	PLT09A9D	Level Transmitter LTSP9A9 fails to respond
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
99	1.12E-08	0.11%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			1.44E-02	FMM00003	Any MSS on SG1 fails to reseat
			2.83E-04	C 0049R	Check valve AF 49 fails to remain closed
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events
100	1.12E-08	0.11%	1.02E 00	T1	Reactor/turbine trip (initiating event)
			1.44E-02	FMM00004	Any MSS on SG2 fails to reseat
			2.83E-04	C 0052R	Check valve AF52 fails to remain closed
			1.00	HAMDFPE	Failure to start MDFP after loss of feedwater
			1.00	UHAMUHPE	Failure to initiate makeup/HP cooling after loss of all feedwater
			2.70E-03	COMB NAT ON1203	HRA events

Table E. -2 Basic Event evel 1 A m ortance

Event Name	F-		escri tion
UHAMUHPE	2.59E-01	1.349	Failure to initiate makeup/HP cooling after loss of all feedwater
HAMDFPE	2.45E-01	1.324	Failure to start MDFP after loss of feedwater
HARCPCE	2.32E-01	1.302	Operators fail to trip RCPs after a total loss of seal cooling
T3	1.96E-01	1.243	LOOP (initiating event)
EHASBDGE	1.64E-01	1.196	Operators fail to align power from SBO diesel generator to supply MDFP
EHASBD1E	1.58E-01	1.187	Operators fail to start SBO diesel generator and align to bus D1
EHAD2DGE	1.53E-01	1.181	Operators fail to align power from EDG 1-1 or EDG 1-2 to supply MDFP given LOOP
T1	1.35E-01	1.156	Reactor/turbine trip (initiating event)
HAO F2E	1.22E-01	1.139	Operators fail to take local manual control of TDAFW pump 1-2 speed.
HARCPCE	1.10E-01	1.124	Operators fail to trip RCPs following loss of seal cooling
WHASPREE	1.07E-01	1.12	Failure to recover CCW using spare CCW train (prior to damage)
MBAFP11	7.61E-02	1.082	AFW Train 1 in maintenance
XHOS-CCW1RUN2STB	7.54E-02	1.082	CCW Pump 1 running, Pump 2 in standby
EDG0012F	7.12E-02	1.077	EDG 1-2 fails to run
OP007BR	7.09E-02	1.076	Failure to restore off-site power
TMPP43XF-CC ALL	6.79E-02	1.073	All CCW pumps fail to run due to CCF (initiating event)
XHOS-CCW2RUN1STB	6.57E-02	1.07	CCW Pump 2 running, Pump 1 in standby
R	6.37E-02	1.068	SGTR (initiating event)
EHAD1ACE	5.90E-02	1.063	Failure to lineup alternate source to D1
T2	5.86E-02	1.062	Plant trip due to loss of MFW (initiating event)
NORC RT3	5.57E-02	1.059	Offsite power recovery not possible after a tornado.
A	5.12E-02	1.054	Reactor vessel rupture
TP000XA-CC 1 2	5.13E-02	1.054	CCF of two components: TP0001A TP0002A (TDAFW)
TP0001A	4.90E-02	1.051	AFP/T-1 fails to start
MBAFP12	4.67E-02	1.049	AFW Train 2 in maintenance
OP006FR	4.58E-02	1.048	Failure to restore off-site power
S	4.35E-02	1.045	Small LOCA (initiating event)

Table E. -2 Basic Event evel 1 A m ortance contin ed

Event Name	F-		escri tion
T13A-1-3- EF	4.18E-02	1.044	Loss of CCW Train 1 initiating event Pump 1 running
MHARM TE	4.17E-02	1.043	Operators fail to compensate for loss of room cooling for makeup pumps by.
XHAMUCDE	4.10E-02	1.043	Operators fail to attempt cooldown via makeup/HP cooling.
T13A-2-3- EF	3.93E-02	1.041	Loss of CCW Train 2 initiating event Pump 2 running
EMBEDG12	3.85E-02	1.04	EDG Train 2 in maintenance
CHASGDPE	3.63E-02	1.038	Operators fail to cooldown during a SGTR
FMFWTR P	3.71E-02	1.038	MFW/ CS faults following trip
FMM00003	3.52E-02	1.037	Any MSS s on SG1 fail to reseat
EDG0012A	3.46E-02	1.036	EDG 1-2 fails to start
AASGTR11	3.42E-02	1.035	SGTR occurs on OTSG 1-1 (split fraction)
LHAMS E	3.34E-02	1.035	Failure to close MS and isolate steam generator containing ruptured tube
HAMDF3E	3.34E-02	1.035	Failure to start MDFP prior to depletion of BWST during makeup
TP0002A	3.25E-02	1.034	AFP/T-2 fails to start
EDG0011F	3.13E-02	1.032	EDG 1-1 fails to run
FC RCTMP	3.00E-02	1.031	Circ water temperature not acceptable
EC1 100N	2.84E-02	1.029	B R HX11B fails to open
EC1 153C	2.84E-02	1.029	B R HX02B fails to close
FHASUF3E	2.78E-02	1.029	Operators fail to actuate the startup feed pump as backup to the turbine-driven pump
PLT09XXD-CC ALL	2.85E-02	1.029	CCF of all components in group PLT09XXD-CC
AASGTR12	2.75E-02	1.028	SGTR occurs on OTSG 1-2 (split fraction)
TMPP43XF-CC 1 2	2.75E-02	1.028	CCW Pumps 1 2 fail to run due to CCF (initiating event)
HAO F1E	2.64E-02	1.027	Operators fail to take local manual control of AFW turbine-driven pump 1-1 speed.
TF2	2.35E-02	1.024	Tornado F-Scale 2 (initiating event)
NT TOR2	2.23E-02	1.023	Condensate storage tank (CST) fails due to high winds from an F-Scale 2 tornado
TTC1424T	2.22E-02	1.023	Temperature control valve SW1424 fails to throttle (one-year mission time) (initiating event)
OP006CR	2.27E-02	1.023	Failure to restore off-site power
NT TOR3	2.14E-02	1.022	CST fails due to high winds from an F-Scale 3 tornado
TF3	2.20E-02	1.022	Tornado F-Scale 3 (initiating event)

Table E. -2 Basic Event evel 1 A m ortance contin ed

Event Name	F-		escri tion
F3AM	2.02E-02	1.021	Maximum flood in CCW pump room from service water (initiating event)
TTC1434T	2.09E-02	1.021	Temperature control valve SW1434 fails to throttle (initiating event)
EHASBC1E	1.88E-02	1.019	Operators fail to start SBO diesel generator and align to bus C1
FMM00004	1.86E-02	1.019	Any MSS s on SG2 fail to reseat
SBOTOR2A	1.84E-02	1.019	SBO diesel generator damaged due to high winds from an F-Scale 2 Tornado
SBOTOR3A	1.86E-02	1.019	SBO diesel generator damaged due to high winds from an F-Scale 3 Tornado
XHOS-SWTEMP-H GH	1.88E-02	1.019	Service water temperature greater than 72
EDG0SBOA	1.75E-02	1.018	SBO diesel generator fails to start
XHOS-T-BELOW-86	1.77E-02	1.018	Outside ambient temperature 86 F
EC1 XXXN-CC 1 2	1.64E-02	1.017	CCF of two components: EC1 089N EC1 100N
WCDD113C	1.66E-02	1.017	B R AD113 fails to close
OP006ER	1.72E-02	1.017	Failure to restore off-site power within 30 minutes after loss of AFW
BLAUXBF	1.60E-02	1.016	Auxiliary boiler fails to supply steam
TP0001F	1.56E-02	1.016	AFP/T-1 fails to run
RMBRC11N	1.55E-02	1.016	Operation with power operated relief valve (POR) block valve (RC11) closed
WCDC113C	1.54E-02	1.016	Breaker AC113 fails to close
XHOS-SW23RUN	1.59E-02	1.016	Service water pumps 2 and 3 running
MMDCBUR	1.62E-02	1.016	Failure to recover Bus after a Bus fault (at least two hours available)
M	1.50E-02	1.015	Medium break LOCA
TMPP431F	1.49E-02	1.015	CCW Pump 1-1 fails to run (initiating event)
EMBEDG11	1.40E-02	1.014	EDG Train 1 in maintenance
F 011BT	1.34E-02	1.014	A CS11B fails to reseat after steam
TP0002F	1.41E-02	1.014	AFP/T-2 fails to run
RHA011NE	1.43E-02	1.014	Operators fail to open the POR block valve (RC 11) to permit use of POR for MU
T2A-1	1.35E-02	1.014	SP6B fails to throttle (initiating event)
T2B-1	1.36E-02	1.014	SP6A fails to throttle (initiating event)
TMPP432F	1.40E-02	1.014	CCW Pump 1-2 fails to run (initiating event)
EMBSBODG	1.25E-02	1.013	SBO diesel generator in maintenance
MBAUXB1	1.25E-02	1.013	Auxiliary boiler unavailable due to maintenance
M 0608	1.28E-02	1.013	Motor-operated valve AF 608 fails to remain open

Table E.5-2: Basic Event Level 1 PRA Importance (continued)

Event Name	F-V	RRW	Description
T12B7-IEF	1.30E-02	1.013	Service water pump room ventilation failure (T<86)
T2A-2	1.24E-02	1.013	FICICS35B fails high (initiating event)
T2B-2	1.24E-02	1.013	FICICS35A fails high (initiating event)
TMFC99XF-CC_ALL	1.25E-02	1.013	CCF of all components in group 'TMFC99XF-CC'
XHOS-AMB->40F	1.24E-02	1.013	Ambient temperature is > 40
XHOS-SW13RUN	1.31E-02	1.013	Service water pumps 1 and 3 running
EDG0011A	1.12E-02	1.011	EDG 1-1 fails to start
QMV0599K	1.10E-02	1.011	Motor-operated valve AF599 fails to remain open
T18-IEF	1.13E-02	1.011	Loss of DC power from bus d2p (initiating event)
ZHARMVTE	1.07E-02	1.011	Operators fail to compensate for loss of room cooling for makeup pumps.
EMD5336C	9.88E-03	1.01	Motor-operated damper HV5336b fails to close
EMDZ119N	9.88E-03	1.01	Motor damper HV5336a fails to open
EMDZ121N	9.88E-03	1.01	Motor damper HV5336c fails to open
EMFZ163A	9.91E-03	1.01	Vent Fan 3 fails to start
EMFZ165A	9.91E-03	1.01	Vent Fan 4 fails to start
EDG0SBOF	9.33E-03	1.009	SBO diesel generator fails to run
ELOOPRT	8.53E-03	1.009	LOOP given reactor trip
F7L	9.04E-03	1.009	Large circulating water flood in turbine building (initiating event)
PAVZ011N	9.14E-03	1.009	Air-operated valve MS 5889A fails to open
PAVZ01XN-CC_1_2	9.38E-03	1.009	CCF of two components: PAVZ011N & PAVZ012N
QMPMDFPA	8.68E-03	1.009	MDFP fails to start
T9-IEF	8.43E-03	1.009	Loss of DC power supply NNIX (initiating event)
XHOS-CCW1RUN3STBY	9.10E-03	1.009	CCW Pump 1 running, Pump 3 in standby
XHOS-CCW3RUN2STBY	9.26E-03	1.009	CCW Pump 3 running, Pump 2 in standby
LSZ0012R	7.58E-03	1.008	POS Switch ZS DH 12 fails to remain closed
PLT09A6D	7.92E-03	1.008	Level transmitter LTSP9A6 fails to respond
PLT09A7D	7.92E-03	1.008	Level transmitter LTSP9A7 fails to respond
PLT09A8D	7.80E-03	1.008	Level transmitter LTSP9A8 fails to respond
PLT09A9D	7.80E-03	1.008	Level transmitter LTSP9A9 fails to respond
PLT09B6D	7.80E-03	1.008	Level transmitter LTSP9B6 fails to respond
PLT09B7D	7.80E-03	1.008	Level transmitter LTSP9B7 fails to respond

Table E. -2 Basic Event evel 1 A m ortance contin ed

Event Name	F-		escri tion
PLT09B8D	7.92E-03	1.008	Level transmitter LTSP9B8 fails to respond
PLT09B9D	7.92E-03	1.008	Level transmitter LTSP9B9 fails to respond
S 6452D	7.55E-03	1.008	Solenoid valve FW 6452 fails to operate
S 64XXD-CC ALL	7.99E-03	1.008	CCF of all components in group S 64XXD-CC
XHOS-CCW2RUN3STB	8.24E-03	1.008	CCW Pump 2 running, Pump 3 in standby
XHOS-CCW3RUN1STB	8.07E-03	1.008	CCW Pump 3 running, Pump 1 n standby
XHOS-SW12RUN3AS1	7.85E-03	1.008	Service water pumps 1 and 2 running, 3 Spare and aligned as 1
XHOS-SW12RUN3AS2	7.85E-03	1.008	Service water pumps 1 and 2 running, 3 Spare and aligned as 2
F 011AT	7.06E-03	1.007	A CS11A fails to reseat after steam
LS 0011R	7.10E-03	1.007	POS switch S DH 11 fails to remain closed
T7	6.86E-03	1.007	Loss of power from bus AU (initiating event)
XHALPRME	6.96E-03	1.007	Operators fail to initiate LPR for a medium LOCA
XHOS-SAC1-STB	6.95E-03	1.007	Service Air Compressor is in standby
XHOS-SAC2-RUN	6.95E-03	1.007	Service Air Compressor 1-2 is running
EMF 1XXA-CC ALL	6.16E-03	1.006	CCF of all components in group EMF 1XXA-CC
1	5.63E-03	1.006	Reactor fails to trip following automatic demand
NT TOR4	6.08E-03	1.006	CST fails due to high winds from an F-Scale 4 tornado
PA 012N	6.10E-03	1.006	Air-operated valve MS 5889B fails to open
RR RC2AN	5.89E-03	1.006	POR (RC2A) fails to open
SA 1434N	5.81E-03	1.006	Air-operated valve SW 1434 fails to open
SHAF2 SE	6.37E-03	1.006	Failure to isolate flood before service water pumps are affected
T10- EF	5.97E-03	1.006	Loss of Service Water Train 1
T19A-2- EF	6.02E-03	1.006	SAC 1-2 fails to run (initiating event)
TAM 009F	5.76E-03	1.006	SAC 1-2 fails to run
TC D202R	5.95E-03	1.006	NT D202 fails to remain closed
TF4	6.21E-03	1.006	Tornado F-Scale 4 (nitiating Event)
TMPP301F	5.95E-03	1.006	Service water pump 1-1 fails to run (one-year mission time)
TPXNN XF	5.93E-03	1.006	NN X power supply no output
MFC31XA-CC ALL	5.63E-03	1.006	CCF of all components in group MFC31XA-CC

Table E. -2 Basic Event evel 1 A m ortance contin ed

Event Name	F-		escri tion
XHOS-SWTEMP-LOW	5.51E-03	1.006	Service Water temperature less than 72
EBC002PF	4.79E-03	1.005	Charger 2P no output
EC1XXXXC-CC 1 2	5.33E-03	1.005	CCF of two components: EC1X02AC EC1 153C
EC1 088C	4.89E-03	1.005	B R HX01A fails to close
EC1 089N	4.89E-03	1.005	B R HX11A fails to open
EC2 000N	5.30E-03	1.005	B R AD110 fails to open
EDG001XF-CC 1 2	4.96E-03	1.005	CCF of two components: EDG0011F EDG0012F
F7S	4.88E-03	1.005	Small circulating water flood in turbine building (initiating event)
FLCO101F	5.27E-03	1.005	Logic card fails during operation
HMBHP 11	4.66E-03	1.005	HP Train 1 in maintenance
LMBDHP11	4.88E-03	1.005	LP Train 1 in maintenance
LMBDHP12	4.75E-03	1.005	LP Train 2 in maintenance
LPPN SO	4.82E-03	1.005	SLOCA occurs in non-isolable portion of DHR system
LSC007XN-CC 1 2	4.93E-03	1.005	CCF of two components: LSC0076N LSC0077N
LT TOR3	5.42E-03	1.005	BWST fails due to high winds from F-Scale 3 Tornado
PM 0106N	4.68E-03	1.005	Motor-operated valve MS 106 fails to open
M 3870	5.44E-03	1.005	Motor-operated valve AF 3870 fails to remain open
S 6451D	5.08E-03	1.005	Solenoid valve AF6451 fails to operate
SA 1424N	5.40E-03	1.005	Air-operated valve SW-1424 fails to open
SBOTOR4A	5.36E-03	1.005	SBO diesel generator damaged due to high winds from an F-Scale 4 Tornado
SMPP302A	5.06E-03	1.005	Failure of service water pump 1-2 to start
T11- EF	5.00E-03	1.005	Loss of Service Water Train 2
T17- EF	4.90E-03	1.005	Loss of DC power from bus D1P (initiating event)
TBD0D2PF	5.35E-03	1.005	PNL D2P local faults
THXE221P	4.57E-03	1.005	CCW heat exchanger plugs during operation (initiating event)
TMPP302F	4.97E-03	1.005	Service water pump 1-2 pump fails to run (one-year mission time)
D- EF	5.07E-03	1.005	SLOCA due to internal rupture of DHR suction valves
WHAF3 SE	4.50E-03	1.005	Failure to isolate flood in Room 328 before CCW pumps are affected

Table E. - Basic Event E F m ortance

Event Name	F-		escri tion
R	9.00E-01	10.048	SGTR (initiating event)
XHAMUCDE	6.10E-01	2.563	Operators fail to attempt cooldown via makeup/HP cooling
CHASGDPE	5.40E-01	2.175	Operators fail to cooldown during a SGTR
LHAMS E	4.97E-01	1.989	Failure to close MS and isolate steam generator containing ruptured tube
AASGTR11	4.81E-01	1.926	SGTR occurs on OTSG 1-1 (split fraction)
AASGTR12	3.93E-01	1.646	SGTR occurs on OTSG 1-2 (split fraction)
FMM00003	7.90E-02	1.086	Any MSS s on SG1 fail to reseat
D- EF	7.54E-02	1.082	SLOCA due to internal rupture of DHR suction valves
FLCO101F	7.31E-02	1.079	Logic card fails during operation MS 101 fails to close
LPPN SO	7.18E-02	1.077	SLOCA occurs in non-isolable portion of DHR system
FMM00004	6.80E-02	1.073	Any MSS s on SG2 fail to reseat
FLC0100F	6.13E-02	1.065	Logic card fails during operation MS 100 fails to close
HAMDFPE	5.96E-02	1.063	Failure to start MDFP as backup to turbine-driven feedwater pumps for transient, Small LOCA or SGTR events
EC1 XXXN-CC 1 2	5.19E-02	1.055	CCF of two components: EC1 089N EC1 100N
LPSRC2BH	4.93E-02	1.052	Press switch PSH RC2B4 fails high fails DHR
LPS 416H	4.93E-02	1.052	Press switch PSH 7531A fails high - fails DHR
LM F012R	4.53E-02	1.047	nternal rupture of DH 12 (annual frequency)
LMBCWRT1	4.12E-02	1.043	CWR Train 1 unavailable due to maintenance
EDG0012F	3.47E-02	1.036	EDG 1-2 fails to run
FC RCTMP	3.00E-02	1.031	Circ water temperature not acceptable
F 011BT	3.04E-02	1.031	A CS11B fails to reseat after steam
LM F011R	3.01E-02	1.031	nternal rupture of DH 11 (annual frequency)
ELOOPRT	2.93E-02	1.03	LOOP given reactor trip
EHASBDGE	2.70E-02	1.028	Operators fail to align power from SBO diesel generator to supply MDFP given LOOP
EHAD2DGE	2.65E-02	1.027	Operators fail to align power from EDG 1-1 or EDG 1-2 to supply MDFP given LOOP
F 011AT	2.61E-02	1.027	A CS11A fails to reseat after SGTR

Table E. -   Basic Event   E F m ortance contin ed

Event Name	F-		escri tion
LM U011R	2.41E-02	1.025	nternal rupture of DH 11 since cold shutdown
LM U012R	2.41E-02	1.025	nternal rupture of DH 12 since cold shutdown
LMBCWRT2	2.16E-02	1.022	CWR Train 2 unavailable due to maintenance
FLC011BF	1.97E-02	1.02	CS logic card fails CS11B (A SG1) fails to open
FLC011AF	1.84E-02	1.019	CS logic card fails CS11A (A SG2) fails to open
EC1 100N	1.79E-02	1.018	Breaker HX11B fails to open fails power from SU1 an d SU2 to Bus B
EC1 153C	1.79E-02	1.018	Breaker HX02B fails to close - fails power from SU1 to Bus B
EHASBD1E	1.56E-02	1.016	Operators fail to start SBO diesel generator and align to bus D1
ET4DF12F	1.54E-02	1.016	Transformer DF 1-2 local faults
LA 1761N	1.57E-02	1.016	Air-operated valve WC 1761 fails to open
LM 0011H	1.52E-02	1.015	Motor-operated valve DH 11 fails to hold on high exposure
XHOS-CCW1RUN2STB	1.53E-02	1.015	CCW Pump 1 running, Pump 2 in standby
XHOS-CCW2RUN1STB	1.51E-02	1.015	CCW Pump 2 running, Pump 1 in standby
EHAD1ACE	1.43E-02	1.014	Failure to lineup alternate source to D1
EB200D1F	1.31E-02	1.013	Bus D1 local faults not including fire
EDG0SBOF	1.33E-02	1.013	SBO diesel generator fails to run
LX 0125C	1.12E-02	1.011	Manual valve WC 125 fails to close makeup to BWST for SGTR
LX 0169N	1.12E-02	1.011	Manual valve WC 169 fails to open makeup to BWST for SGTR
LX 0171C	1.12E-02	1.011	Manual valve WC 171 fails to close makeup to BWST for SGTR
LX 0172C	1.12E-02	1.011	Manual valve WC 172 fails to close makeup to BWST for SGTR
LX BW15C	1.12E-02	1.011	Manual valve BW 15 fails to close makeup to BWST for SGTR
LX BW16N	1.12E-02	1.011	Manual valve BW 16 fails to open makeup to BWST for SGTR
LX SF79N	1.12E-02	1.011	Manual valve SF 79 fails to open makeup to BWST for SGTR
LX SF80C	1.12E-02	1.011	Manual valve SF 80 fails to close makeup to BWST for SGTR

Table E. - Basic Event E F m ortance contin ed

Event Name	F-		escri tion
LX SF87N	1.12E-02	1.011	Manual valve SF 87 fails to open makeup to BWST for SGTR
LX SF92C	1.12E-02	1.011	Manual valve SF 92 fails to close makeup to BWST for SGTR
LX WC44N	1.12E-02	1.011	Manual valve WC 44 fails to open makeup to BWST for SGTR
EDG0SBOA	1.03E-02	1.01	SBO diesel generator fails to start
F 0101C	1.03E-02	1.01	MS 101 (MS SG1) fails to close
HA SOLR	1.03E-02	1.01	Operators fail to attempt to close DH1A to isolate SLOCA
HA SOLR	1.03E-02	1.01	Failure to find and isolate SLOCA resulting from reverse flow through LP in ection line
F 0100C	8.51E-03	1.009	MS100 (MS SG2) fails to close
OP007BR	9.05E-03	1.009	Failure to recover offsite power within one hour to prevent loss of DC
EMBEDG12	7.83E-03	1.008	EDG Train 2 in maintenance
XHABWMUE	7.93E-03	1.008	Operators fail to initiate makeup to the BWST during a SGTR.
EB300F1F	6.53E-03	1.007	Bus F1 local faults
EDG0012A	6.64E-03	1.007	EDG 1-2 fails to start
EMBSBODG	7.40E-03	1.007	SBO diesel generator in maintenance
LM 0011N	7.09E-03	1.007	Motor-operated valve DH 11 fails to open
LM 0012N	7.09E-03	1.007	Motor-operated valve DH 12 fails to open
MBAFP12	6.78E-03	1.007	AFW train 2 in maintenance
L20- EF	6.47E-03	1.007	SLOCA via Train 2 in ection line reverse flow (initiating event)
XHOS-AMB- 40F	7.27E-03	1.007	Ambient temperature is 40
EC1BET9N	6.07E-03	1.006	CCF for failure of 13.8 k breakers to open
EC1CC09N	6.07E-03	1.006	Breaker HX11A OR HX11B fails to open
EC2 012R	5.58E-03	1.006	Breaker AD1DF12 fails to remain closed
EDG0011F	5.53E-03	1.006	EDG 1-1 fails to run
LM 0011X	6.02E-03	1.006	Motor-operated valve DH 11 fails to close while indicating closed
LM 0012X	6.02E-03	1.006	Motor-operated valve DH 12 fails to close while indicating closed
MBAFP11	6.29E-03	1.006	AFW Train 1 in maintenance
L10- EF	6.45E-03	1.006	SLOCA ia Train 1 in ection line reverse flow (initiating event)
LC F030R	5.42E-03	1.005	nternal leak develops in check valve cf 30 (per year)
LC F031R	5.40E-03	1.005	Check valve fails to remain closed (per year)

Table E.5-3: Basic Event LERF Importance (continued)

Event Name	F-V	RRW	Description
NORCVRT3	4.70E-03	1.005	Off-site power recovery not possible after a tornado
ZHABWMUE	4.49E-03	1.005	Operators fail to initiate makeup to the BWST during a SGTR.

Table E. - ist o nitial A A Candidates

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
Enhancements elated to Alternate C rrent AC and C o er			
AC/DC-01	Provide additional DC battery capacity.	This SAMA candidate would provide longer battery lifetime during SBO events.	2, Table 14 , 30, Table 5-5 , 31, Table G-3 , 35, Table 5-5
AC/DC-02	Replace lead-acid batteries with fuel cells.	This SAMA candidate would replace batteries with fuel cells increase the time available for recovery of off-site power. Therefore, the likelihood of recovery of off-site power would be increased.	2, Table 14 , 30, Table 5-5 , 35, Table 5-5 , 38, Table 5-5
AC/DC-03	Add a portable, diesel-driven battery charger to existing DC system.	This SAMA candidate would provide longer battery lifetime during SBO events. ncreasing battery capacity would increase the time available for recovery of off-site or on-site power.	2, Table 14
AC/DC-04	mprove DC bus load shedding.	This SAMA candidate would extend battery lifetime during an SBO scenario, and thereby would increase the likelihood of recovering on-site or off-site power.	2, Table 14
AC/DC-05	Provide DC bus cross-ties.	This SAMA candidate would improve the availability of DC power system.	2, Table 14 , 30, Table 5-5
AC/DC-06	Provide additional DC power to the 120/240 vital AC system.	This SAMA candidate would increase the availability of the vital AC buses.	2, Table 14
AC/DC-07	Add an automatic feature to transfer the 120 vital AC buses from normal to standby power.	This SAMA candidate would increase the availability of the 120 vital AC buses.	2, Table 14
AC/DC-08	ncrease training on response to loss of 120 AC buses that cause inadvertent actuation signals.	This SAMA candidate would improve the chances of successful response to loss of 120 AC buses.	2, Table 14
AC/DC-09	Provide an additional diesel generator.	This SAMA candidate would increase the availability of on-site emergency AC power.	2, Table 14 , 32, Table 5-5 , 34, Table 5-6
AC/DC-10	Revise procedure to allow bypass of diesel generator trips.	This SAMA candidate would reduce the likelihood of unnecessary diesel generator trips during LOOP events.	2, Table 14
AC/DC-11	mprove 4.16k bus cross-tie ability.	This SAMA candidate would increase the availability of on-site AC power.	2, Table 14
AC/DC-12	Create AC power cross-tie capability with other unit (multi-unit site).	This SAMA candidate would increase the availability of on-site AC power.	2, Table 14 , 30, Table 5-5 , 31, Table G-3

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
AC/DC-13	nstall an additional, buried off-site power source.	This SAMA candidate would reduce the probability of LOOP.	2, Table 14 , 30, Table 5-5 , 35, Table 5-5 , 38, Table 5-5
AC/DC-14	nstall a gas turbine generator.	Adding a gas turbine-powered generator would improve the reliability of emergency power through increased redundancy, and more importantly, by adding diversity.	2, Table 14 , 30, Table 5-5 , 35, Table 5-5
AC/DC-15	nstall tornado protection on gas turbine generator.	Typically, additional on-site power sources have been classified as non-safety, and as such may not be housed in tornado-resistant structures. For those designs, this SAMA candidate would upgrade that structure to be tornado resistant.	2, Table 14 , 30, Table 5-5
AC/DC-16	mprove uninterruptible power supplies.	This SAMA candidate would increase the availability of power supplies supporting front-line equipment.	2, Table 14
AC/DC-17	Create a cross-tie for diesel fuel oil (multi-unit site).	This SAMA candidate would increase availability of the diesel generators.	2, Table 14
AC/DC-18	Develop procedures for replenishing diesel fuel oil to the emergency and SBO diesel generators.	This SAMA candidate would increase availability of the diesel generators.	2, Table 14 , 5
AC/DC-19	Use fire water system as a backup source for diesel cooling.	This SAMA candidate would provide an alternate cooling water supply to an EDG in the event of a LOOP concurrent with a loss of cooling water to the diesel generator.	2, Table 14 , 30, Table 5-5 , 31, Table G-3
AC/DC-20	Add a new backup source of diesel generator cooling.	This SAMA candidate would increase the availability of the diesel generators.	2, Table 14 , 31, Table G-3
AC/DC-21	Develop procedures to repair or replace failed 4k breakers.	n the event of a loss of bus due to a failed breaker, this SAMA candidate would provide the ability to repair or replace 4k breakers in a timely manner to restore AC power to the affected division.	2, Table 14 , 30, Table 5-5 , 33, Table 5-5 , 35, Table 5-5 , 38, Table 5-5
AC/DC-22	n training, emphasize steps in recovery of off- site power after an SBO.	This SAMA candidate would reduce the human error probability (HEP) during off-site power recovery.	2, Table 14
AC/DC-23	Develop a severe weather conditions procedure.	This SAMA candidate would improve off-site power recovery following external weather-related events.	2, Table 14

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
AC/DC-24	Bury off-site power lines.	This SAMA candidate would reduce the likelihood of LOOP from severe weather by burying the cables.	2, Table 14 , 31, Table G-3
AC/DC-25	Provide a dedicated DC power system (battery/battery charger) for TDAFW control.	This SAMA candidate would increase the reliability/availability of the TDAFW pumps in an SBO event.	5
AC/DC-26	Provide an alternator/generator that would be driven by each TDAFW pump to provide DC control power	This SAMA candidate would allow the TDAFW pumps to continue operation independent of other DC power supplies in the event of an SBO.	5
AC/DC-27	ncrease the size of the SBO fuel oil tank.	This SAMA candidate would increase the reliability of the SBO diesel and allow more recovery time for off-site power or EDGs.	5
Enhancements elated to Antici ated Transient itho t cram AT Events			
AT-01	Add an independent boron in ection system.	This SAMA candidate would improve the availability of boron in ection during an ATWS.	2, Table 14
AT-02	Add a system of relief valves to prevent equipment damage from pressure spikes during an ATWS.	This SAMA candidate would improve the equipment availability after an ATWS.	2, Table 14
AT-03	Provide an additional control system for rod insertion (e.g., ATWS Mitigation System Actuation Circuitry (AMSAC)).	This SAMA candidate would add redundancy to the rod control system and reduce ATWS frequency.	2, Table 14
AT-04	nstall an ATWS-sized filtered containment vent to remove decay heat.	This SAMA candidate would increase the ability to remove reactor heat during ATWS events.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
AT-05	Revise procedure to bypass MS isolation in turbine trip ATWS scenarios.	Discharge of a substantial fraction of steam to the main condenser (i.e., as opposed to into the primary containment) affords the operator more time to perform actions (e.g., lower water level, depressurize reactor pressure vessel (RP)) than if the main condenser was unavailable, resulting in lower human error probabilities.	2, Table 14
AT-06	Revise procedure to allow override of LP during an ATWS event.	Allows immediate control of LP . On failure of high pressure core in ection and condensate, some plants direct reactor depressurization followed by five minutes of automatic LP .	2, Table 14
AT-07	nstall motor generator set trip breakers in control room.	This SAMA candidate would reduce the frequency of core damage due to an ATWS.	2, Table 14

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
AT-08	Provide capability to remove power from the bus powering the control rods.	This SAMA candidate would decrease the time required to insert control rods if the reactor trip breakers fail (during a loss of feedwater ATWS that has a rapid pressure excursion).	2, Table 14
Enhancements elated to Containment B ass			
CB-01	nstall additional pressure or leak monitoring instruments for detection of SLOCA.	This SAMA candidate would reduce the SLOCA frequency.	2, Table 14 , 31, Table G-3
CB-02	Add redundant and diverse limit switches to each C .	This SAMA candidate would reduce the frequency of containment isolation failure and SLOCAs.	2, Table 14 , 30, Table 5-5 , 31, Table G-3 , 37, Table 5-5
CB-03	ncrease leak testing of valves in SLOCA paths.	This SAMA candidate would reduce the SLOCA frequency.	2, Table 14 , 30, Table 5-5 , 37, Table 5-5
CB-04	nstall self-actuating C s.	This SAMA candidate would reduce the frequency of isolation failures.	2, Table 14
CB-05	Locate DHR system inside containment.	This SAMA candidate would reduce the frequency of SLOCA.	2, Table 14 , 30, Table 5-5
CB-06	Ensure SLOCA releases are scrubbed. One method is to plug drains in potential break areas so that break point will be covered with water.	This SAMA candidate would provide the ability to scrub SLOCA releases.	2, Table 14 , 30, Table 5-5 , 31, Table G-3 , 37, Table 5-5
CB-07	Revise emergency operating procedures (EOPs) to improve SLOCA identification.	This SAMA candidate would increase likelihood that LOCAs outside containment are identified. For example, a DHR SLOCA could direct initial leakage back to the pressurizer relief tank, giving indication that the LOCA was inside containment.	2, Table 14
CB-08	mprove operator training on SLOCA coping.	This SAMA candidate would decrease the SLOCA consequences.	2, Table 14 , 30, Table 5-5 , 5
CB-09	nstitute a maintenance practice to perform a 100% inspection of steam generator tubes during each refueling outage.	This SAMA candidate would reduce the frequency of a SGTR event.	2, Table 14
CB-10	Replace steam generators with a new design.	This SAMA candidate would reduce the frequency of a SGTR event.	2, Table 14 , 30, Table 5-5 , 37, Table 5-5

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
CB-11	ncrease the pressure capacity of the secondary side so that a SGTR would not cause the relief valves to lift.	This SAMA candidate would prevent a direct release pathway to the environment in the event of a SGTR sequence.	2, Table 14
CB-12	nstall a redundant spray system to depressurize the primary system during a SGTR.	This SAMA candidate would enhance depressurization capabilities during SGTR to reduce the duration of the release.	2, Table 14
CB-13	Proceduralize use of pressurizer vent valves during SGTR sequences.	This SAMA candidate would be a backup method to using pressurizer sprays to reduce primary system pressure following a SGTR.	2, Table 14
CB-14	Provide improved instrumentation to detect SGTR, such as Nitrogen-16 monitors.	This SAMA candidate would improve mitigation of SGTR.	2, Table 14
CB-15	Route the discharge from the MSS s through a structure where a water spray would condense the steam and remove most of the fission products.	The intent of this SAMA candidate is to scrub the release to reduce the consequences of a SGTR.	2, Table 14
CB-16	nstall a highly reliable (closed loop) steam generator shell-side heat removal system that relies on natural circulation and stored water sources.	The intent of this SAMA candidate is to reduce the consequences of a SGTR.	2, Table 14
CB-17	Revise EOPs to direct isolation of a faulted steam generator.	This SAMA candidate would reduce consequences of a SGTR.	2, Table 14
CB-18	Direct steam generator flooding after a SGTR, prior to core damage.	This SAMA candidate would provide for improved scrubbing of SGTR releases by maintaining adequate water coverage of a ruptured steam generator tube.	2, Table 14
CB-19	ent MSS s in containment.	This SAMA candidate would route the MSS s steam releases back into containment to minimize releases to the environment due to a SGTR event.	2, Table 14
CB-20	nstall relief valves in the CCW system.	This SAMA candidate would relieve pressure buildup from a RCP thermal barrier tube rupture and aid in preventing the onset of an SLOCA.	2, Table 14
CB-21	nstall pressure measurements between the two DHR suction valves in the line from the RCS hot leg.	This SAMA candidate would provide indication of failure of inboard isolation valves allowing time to initiate mitigating actions to prevent SLOCA.	2, Table 14
Enhancements elated to Core Coolin stems			
CC-01	nstall an independent active or passive HP system.	This SAMA candidate would improve the prevention of core melt sequences.	2, Table 14

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
CC-02	Provide an additional HP pump with independent diesel generator.	This SAMA candidate would reduce the frequency of core melt from small LOCA and SBO sequences.	2, Table 14 , 31, Table G-3 , 35, Table 5-5 , 37, Table 5-5 , 38, Table 5-5
CC-03	Revise procedure to allow operators to inhibit automatic vessel depressurization in non-ATWS scenarios.	This SAMA candidate would extend the use of high pressure and LP systems.	2, Table 14
CC-04	Add a diverse LP system.	This SAMA candidate would improve in ection capability.	2, Table 14
CC-05	Provide capability for alternate LP via diesel-driven fire pump.	This SAMA candidate would improve in ection capability.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
CC-06	mprove ECCS suction strainers.	During energetic large LOCA events, debris such as insulation could be dislodged and potentially block the ECCS strainers, thereby failing ECCS suction. This SAMA candidate would reduce the likelihood of strainer blockage during LOCA events.	2, Table 14
CC-07	Add the ability to manually align ECCS recirculation.	This SAMA candidate would enhance the reliability of ECCS suction.	2, Table 14
CC-08	Add the ability to automatically align ECCS to recirculation mode upon BWST depletion.	This SAMA candidate would enhance the reliability of ECCS suction.	2, Table 14
CC-09	Provide hardware and procedure to refill the BWST once it reaches a specified low level.	This SAMA candidate would extend BWST capacity in the event of a SGTR.	2, Table 14 , 5
CC-10	Provide an in-containment reactor water storage tank.	This SAMA candidate would provide a continuous source of water to the safety in ection pumps during a LOCA event. Water released from a breach of the primary system collects in the in-containment reactor water storage tank, and thereby eliminates the need to realign the safety in ection pumps for long-term post LOCA recirculation.	2, Table 14
CC-11	Modify procedures to throttle LP pumps earlier in medium or large break LOCAs to maintain BWST inventory.	This SAMA candidate would extend BWST capacity.	2, Table 14
CC-12	Emphasize timely recirculation alignment in operator training.	This SAMA candidate would reduce HEP associated with recirculation failure.	2, Table 14

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
CC-13	Upgrade the chemical and volume control system to mitigate small break LOCAs.	An upgrade to the chemical and volume control system would decrease the frequency of core damage.	2, Table 14
CC-14	Change the in-containment reactor water storage tank suction from four check valves to two check and two air-operated valves.	This SAMA candidate would reduce common mode failure of in ection paths.	2, Table 14
CC-15	Replace two of the four electric safety in ection pumps with diesel-powered pumps.	This SAMA candidate would provide diversity within the high and low pressure safety in ection systems.	2, Table 14
CC-16	Provide capability for remote, manual operation of secondary side pilot-operated relief valves in an SBO.	This SAMA candidate would improve the chance of successful operation during SBO events in which high area temperatures may be encountered.	2, Table 14
CC-17	Create a reactor coolant depressurization system.	This SAMA candidate would allow low pressure ECCS in ection in the event of a small break LOCA and high pressure safety in ection failure.	2, Table 14
CC-18	Make procedure changes for RCS depressurization.	This SAMA candidate would allow low pressure ECCS in ection in the event of a small break LOCA and high pressure safety in ection failure.	2, Table 14
CC-19	Provide automatic switchover of HP and LP suction from the BWST to containment sump for LOCAs.	This SAMA candidate will increase the reliability of switchover of suction from the BWST to the containment sump by providing both manual and automatic switchover.	
CC-20	Modify EOPs to allow using the make-up pumps for high pressure recirculation from the containment sump.	This SAMA candidate would improve the reliability of high pressure recirculation following the loss of HP .	5
CC-21	Reduce the BWST level at which switchover to containment recirculation is initiated.	This SAMA candidate would extend the time available to accomplish BWST refill.	5
Enhancements elated to Containment henomena			
CP-01	Create a reactor cavity flooding system.	This SAMA candidate would enhance debris coolability, reduce core concrete interaction, and increase fission product scrubbing.	2, Table 14 , 31, Table G-3 , 35, Table 5-5 , 36, Table 5-6 , 38, Table 5-5
CP-02	nstall a passive containment spray system.	This SAMA candidate would improve containment spray capability.	2, Table 14 , 35, Table 5-5 , 37, Table 5-5 , 38, Table 5-5

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
CP-03	Use the fire water system as a backup source for the containment spray system.	This SAMA candidate would improve containment spray capability.	2, Table 14 , 33, Table 5-5 , 35, Table 5-5 , 38, Table 5-5
CP-04	nstall an unfiltered, hardened containment vent.	This SAMA candidate would increase decay heat removal capability for non-ATWS events, without scrubbing released fission products.	2, Table 14
CP-05	nstall a filtered containment vent to remove decay heat. Option 1: Gravel Bed Filter Option 2: Multiple enturi Scrubber	This SAMA candidate would increase decay heat removal capability for non-ATWS events, with scrubbing of released fission products.	2, Table 14 , 36, Table 5-6
CP-06	Enhance fire protection system hardware and procedures.	This SAMA candidate would improve fission product scrubbing in severe accidents.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
CP-07	Provide post-accident containment inerting capability.	This SAMA candidate would reduce the likelihood of hydrogen and carbon monoxide gas combustion.	2, Table 14
CP-08	Create a large concrete crucible with heat removal potential to contain molten core debris.	This SAMA candidate would increase cooling and containment of molten core debris. Molten core debris escaping from the vessel is contained within the crucible and a water cooling mechanism cools the molten core in the crucible, preventing melt-through of the base mat.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
CP-09	Create a core melt source reduction system.	This SAMA candidate would increase cooling and containment of molten core debris. Refractory material would be placed underneath the reactor vessel such that a molten core falling on the material would melt and combine with the material. Subsequent spreading and heat removal from the vitrified compound would be facilitated, and concrete attack would not occur.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
CP-10	Strengthen primary/secondary containment (e.g., add ribbing to containment shell).	This SAMA candidate would reduce the probability of containment over-pressurization.	2, Table 14
CP-11	ncrease depth of the concrete base mat or use an alternate concrete material to ensure melt-through does not occur.	This SAMA candidate would reduce probability of base mat melt-through.	2, Table 14

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
CP-12	Provide a reactor vessel exterior cooling system.	This SAMA candidate would increase potential to cool a molten core before it causes vessel failure, by submerging the lower head in water.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
CP-13	Construct a building to be connected to primary/secondary containment and maintained at a vacuum.	This SAMA candidate would reduce the probability of containment over-pressurization.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
CP-14	nstitute simulator training for severe accident scenarios.	This SAMA candidate would improve arrest of core melt progress and prevention of containment failure.	2, Table 14
CP-15	mprove leak detection procedures.	This SAMA candidate would increase piping surveillance to identify leaks prior to complete failure. mproved leak detection would reduce LOCA frequency.	2, Table 14
CP-16	Delay containment spray actuation after a large break LOCA.	This SAMA candidate would lengthen time of BWST.	2, Table 14
CP-17	nstall automatic containment spray pump header throttle valves.	This SAMA candidate would extend the time over which water remains in the BWST, when full containment spray flow is not needed.	2, Table 14
CP-18	nstall a redundant containment spray system.	This SAMA candidate would increase containment heat removal ability.	2, Table 14
CP-19	nstall a redundant containment fan system.	This SAMA candidate would increase containment heat removal ability.	
CP-20	nstall or use an independent power supply to the hydrogen control system using either new batteries, a non-safety grade portable generator, existing station batteries, or existing AC/DC independent power supplies, such as the security system diesel generator.	This SAMA candidate would reduce the hydrogen detonation potential.	2, Table 14
CP-21	nstall a passive hydrogen control system.	This SAMA candidate would reduce the hydrogen detonation potential.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
CP-22	Erect a barrier that would provide enhanced protection of the containment walls (shell) from e ected core debris following a core melt scenario at high pressure.	This SAMA candidate would reduce the probability of containment failure.	2, Table 14
Enhancements elated to Coolin ater			
CW-01	Add redundant DC control power for service water pumps.	This SAMA candidate would increase the availability of service water.	2, Table 14

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
CW-02	Replace ECCS pump motors with air-cooled motors.	This SAMA candidate would replace the ECCS pump motors with air-cooled pump motors that would eliminate the ECCS dependency on the CCW system.	2, Table 14 , 31, Table G-3 , 37, Table 5-5
CW-03	Enhance procedural guidance for use of cross-tied component cooling or service water pumps.	This SAMA candidate would reduce the frequency of loss of CCW and service water.	2, Table 14
CW-04	Add a redundant service water pump.	This SAMA candidate would increase the availability of cooling water to one of the two safety divisions.	2, Table 14
CW-05	Enhance the screen wash system.	This SAMA candidate would reduce the potential for loss of service water due to clogging of screens.	2, Table 14
CW-06	Cap downstream piping of normally closed CCW drain and vent valves.	This SAMA candidate would reduce the frequency of loss of CCW initiating events, some of which can be attributed to catastrophic failure of the many single isolation valves.	2, Table 14 , 31, Table G-3
CW-07	Enhance loss of CCW (or loss of service water) procedures to facilitate stopping the RCPs.	This SAMA candidate would reduce the potential for RCP seal damage due to pump bearing failure.	2, Table 14
CW-08	Enhance loss of CCW procedure to underscore the desirability of cooling down the RCS prior to seal LOCA.	This SAMA candidate would reduce the probability of RCP seal failure.	2, Table 14
CW-09	Additional training on loss of CCW.	This SAMA candidate would improve the success of operator actions after a loss of CCW.	2, Table 14
CW-10	Provide hardware connections to allow another essential raw cooling water system to cool charging pump seals.	This SAMA candidate would reduce the effect of loss of CCW by providing a means to maintain the charging pump seal in ection following a loss of normal cooling water.	2, Table 14
CW-11	On loss of essential raw cooling water, proceduralize shedding CCW loads to extend the CCW heat-up time.	This SAMA candidate would increase the time before loss of CCW during a loss of essential raw cooling water sequences.	2, Table 14
CW-12	ncrease charging pump lube oil capacity.	This SAMA candidate would increase the time before charging pump failure due to lube oil overheating in loss of cooling water sequences.	2, Table 14
CW-13	nstall an independent RCP seal in ection system, with dedicated diesel generator.	This SAMA candidate would reduce the frequency of core damage from loss of CCW, service water, or SBO.	2, Table 14 , 30, Table 5-5 , 31, Table G-3 , 37, Table 5-5

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
CW-14	nstall an independent RCP seal in ection system, without dedicated diesel generator.	This SAMA candidate would reduce the frequency of core damage from loss of CCW, service water, or SBO.	2, Table 14 , 30, Table 5-5 , 31, Table G-3 , 37, Table 5-5
CW-15	Use existing hydro test pump for RCP seal in ection.	This SAMA candidate would reduce the frequency of core damage from loss of CCW, service water, or SBO.	2, Table 14 , 30, Table 5-5 , 37, Table 5-5
CW-16	nstall improved RCP seals.	This SAMA candidate would reduce the likelihood of RCP seal LOCA.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
CW-17	nstall an additional CCW pump.	This SAMA candidate would reduce the likelihood of loss of CCW leading to a RCP seal LOCA.	2, Table 14 , 38, Table 5-5
CW-18	Prevent make-up pump flow diversion through the relief valves.	f spurious HP relief valve opens creating a flow diversion large enough to prevent RCP seal in ection, then this SAMA would reduce the frequency of loss of RCP seal cooling.	2, Table 14 , 37, Table 5-5
CW-19	Change procedures to isolate RCP seal return flow on loss of CCW, and provide (or enhance) guidance on loss of in ection during seal LOCA.	This SAMA candidate would reduce the frequency of core damage due to a loss of RCP seal cooling.	2, Table 14
CW-20	mplement procedures to stagger high pressure safety in ection pump use after a loss of service water.	This SAMA candidate would allow HP to be extended prior to overheating following a loss of service water.	2, Table 14
CW-21	Use fire prevention system pumps as a backup RCP seal in ection and high pressure make-up source.	This SAMA candidate would reduce the frequency of a RCP seal LOCA.	2, Table 14
CW-22	mplement procedure and hardware modifications to allow manual alignment of the fire water system to the CCW system.	This SAMA candidate would improve the ability to cool DHR heat exchangers.	2, Table 14
CW-23	nstall a CCW header cross-tie.	This SAMA candidate would improve the ability to cool DHR heat exchangers.	2, Table 14
CW-24	Replace the standby CCW pump with a pump diverse from the other two CCW pumps.	This SAMA candidate would improve CCW reliability by reducing the likelihood of a CCF of all three CCW pumps.	
CW-25	Provide the ability to cool make-up pumps using fire water in the event of loss of CCW.	This SAMA candidate would allow continued in ection of RCP seal water in the event of loss of CCW.	

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
Enhancements elated to nternal Floodin			
FL-01	mprove inspection of rubber expansion oints on main condenser.	This SAMA candidate would reduce the frequency of internal flooding due to failure of circulating water system expansion oints.	2, Table 14
FL-02	Modify swing direction of doors separating turbine building basement from areas containing safeguards equipment.	This SAMA candidate would prevent flood propagation.	2, Table 14
Enhancements to ed ce Fire is			
FR-01	Replace mercury switches in fire protection system.	This SAMA candidate would decrease the probability of spurious fire suppression system actuation.	2, Table 14
FR-02	Upgrade fire compartment barriers.	This SAMA candidate would decrease the consequences of a fire.	2, Table 14
FR-03	nstall additional transfer and isolation switches.	This SAMA candidate would reduce the number of spurious actuations during a fire.	2, Table 14
FR-04	Enhance fire brigade awareness.	This SAMA candidate would decrease the consequences of a fire.	2, Table 14
FR-05	Enhance control of combustibles and ignition sources.	This SAMA candidate would decrease the fire frequency and consequences.	2, Table 14
Enhancements elated to Feed ater and Condensate			
FW-01	nstall a digital feedwater upgrade.	This SAMA candidate would reduce the chance of loss of MFW following a plant trip.	2, Table 14 , 30, Table 5-5 , 31, Table G-3 , 35, Table 5-5
FW-02	Create ability for emergency connection of existing or new water sources to feedwater and condensate systems.	This SAMA candidate would increase the availability of feedwater.	2, Table 14
FW-03	nstall an independent diesel for the CST make-up pumps.	This SAMA candidate would extend the inventory in the CST during an SBO.	2, Table 14
FW-04	Add a MDFP.	This SAMA candidate would increase the availability of feedwater.	2, Table 14
FW-05	nstall manual isolation valves around the TDAFW pump steam admission valves.	This SAMA candidate would reduce dual turbine-driven pump maintenance unavailability.	2, Table 14

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
FW-06	nstall accumulators for TDAFW pump flow control valves.	This SAMA candidate would provide control air accumulators for the TDAFW pump flow control valves. These accumulators would eliminate the need for local manual action to align nitrogen bottles for control air following a LOOP.	2, Table 14
FW-07	nstall a new CST (AFW storage tank).	This SAMA candidate would increase the reliability of the AFW system.	2, Table 14
FW-08	Modify the TDAFW pump to be self-cooled.	This SAMA candidate would improve the success probability during an SBO.	2, Table 14
FW-09	Proceduralize local manual operation of AFW system when control power path is lost.	This SAMA candidate would improve AFW availability during an SBO. Also would provide a success path should AFW control power be lost in non-SBO sequences.	2, Table 14
FW-10	Provide hookup for portable diesel generators to power the TDAFW pump after station batteries are depleted.	This SAMA candidate would extend the availability of AFW.	2, Table 14 , 30, Table 5-5 , 35, Table 5-5 , 38, Table 5-5
FW-11	Use fire water system as a backup for steam generator inventory.	This SAMA candidate would create a backup to main and AFW for steam generator water supply.	2, Table 14
FW-12	Change failure position of condenser make-up valve if the condenser make-up valve fails open on loss of air or power.	This SAMA candidate would allow greater inventory for the AFW pumps by preventing CST flow diversion to the condenser if the condenser make-up valve fails open on loss of air or power.	2, Table 14
FW-13	Provide a passive, secondary-side heat-re ection loop consisting of a condenser and heat sink.	This SAMA candidate would reduce the potential for core damage due to a loss of feedwater event.	2, Table 14
FW-14	Modify the startup feedwater pump so that it can be used as a backup to the AFW system, including during an SBO.	This SAMA candidate would increase the reliability of decay heat removal.	2, Table 14
FW-15	Replace existing pilot-operated relief valves with larger ones, such that only one is required for successful feed and bleed.	This SAMA candidate would increase the probability of a successful feed and bleed.	2, Table 14
FW-16	Perform surveillances on manual valves used for backup AFW pump suction.	This SAMA candidate would improve the success probability for providing an alternate water supply to the AFW pumps.	2, Table 14

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
Enhancements elated to eatin entilation and Air Conditionin AC			
H -01	Provide a redundant train or means of ventilation.	This SAMA candidate would provide either a redundant cooling train to the critical switchgear room or a cross-tie to the critical switchgear room from another cooling train.	2, Table 14
H -02	Add a diesel building high temperature alarm or redundant louver and thermostat.	This SAMA candidate would improve the diagnosis of a loss of diesel building H AC.	2, Table 14
H -03	Stage backup fans in switchgear rooms.	This SAMA candidate would increase the availability of ventilation in the event of a loss of switchgear ventilation.	2, Table 14
H -04	Add a switchgear room high temperature alarm.	This SAMA candidate would improve the diagnosis of a loss of switchgear H AC.	2, Table 14 , 35, Table 5-5 , 38, Table 5-5
H -05	Create ability to switch emergency feedwater room fan power supply to station batteries in an SBO.	This SAMA candidate would allow continued fan operation in an SBO.	2, Table 14 , 31, Table G-3
H -06	Provide procedural guidance for establishing an alternate means of room ventilation to the service water pump room.	This SAMA candidate would prevent the loss of one train of service water in the event of loss of one H AC fan for the service water pump room.	5
Enhancements elated to nstr ment Air and Nitro en l			
A-01	Provide cross-unit connection of uninterruptible compressed air supply (multi-unit).	This SAMA candidate would increase the ability to vent containment using the hardened vent.	2, Table 14
A-02	Modify procedure to provide ability to align diesel power to more air compressors.	This SAMA candidate would increase the availability of instrument air after a LOOP.	2, Table 14 , 30, Table 5-5
A-03	Replace service and instrument air compressors with more reliable compressors that have self-contained air cooling by shaft-driven fans.	This SAMA candidate would eliminate the dependence of instrument air system on CCW and service water cooling.	2, Table 14 , 30, Table 5-5 , 31, Table G-3
A-04	nstall nitrogen bottles as backup gas supply for safety relief valves (SR s).	This SAMA candidate would extend the SR operation time.	2, Table 14
A-05	mprove SR and MS pneumatic components.	This SAMA candidate would improve the availability of SR s and MS s.	2, Table 14

Table E. - ist o nitial A A Candidates contin ed

A A Candidate denti ier	A A Candidate escri tion	erived Bene it	o rce
Enhancements elated to eismic is			
SR-01	ncrease seismic ruggedness of plant components.	This SAMA candidate would increase the availability of necessary plant equipment during and after a seismic event.	2, Table 14
SR-02	Provide additional restraints for CO_2 tanks.	This SAMA candidate would increase the availability of fire protection given a seismic event.	2, Table 14
Other Enhancements			
OT-01	nstall digital large break LOCA protection system.	This SAMA candidate would reduce the probability of a large break LOCA (a leak before break).	2, Table 14 , 30, Table 5-5 , 35, Table 5-5 , 38, Table 5-5
OT-02	Enhance procedures to mitigate large break LOCA.	This SAMA candidate would reduce the consequences of a large break LOCA.	2, Table 14
OT-03	nstall computer-aided instrumentation system to assist the operator in assessing post-accident plant status.	This SAMA candidate would improve the prevention of core melt sequences by making operator actions more reliable.	2, Table 14
OT-04	mprove maintenance procedures.	This SAMA candidate would improve the prevention of core melt sequences by increasing reliability of important equipment.	2, Table 14
OT-05	ncrease training and operating experience feedback to improve operator response.	This SAMA candidate would improve the likelihood of success of operator actions taken in response to abnormal conditions.	2, Table 14
OT-06	Develop procedures for transportation and nearby facility accidents.	This SAMA candidate would reduce the consequences of transportation and nearby facility accidents.	2, Table 14
OT-07	nstall secondary side guard pipes up to the MS s.	This SAMA candidate would prevent secondary side depressurization should a steam line break occur upstream of the MS s. This SAMA candidate would also guard against or prevent consequential multiple SGTRs following a main steam line break event.	2, Table 14 , 30, Table 5-5 , 35, Table 5-5 , 38, Table 5-5

Table E. -1 alitative creenin o A A Candidates

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
Enhancements elated to AC and C o er			
AC/DC-01	Provide additional DC battery capacity.	Criterion F Considered for Further Evaluation	This SAMA candidate would provide DC power for extended periods of time during an SBO event to allow for a greater likelihood of recovery of either on-site or off-site power. Therefore, this SAMA candidate is considered for further evaluation.
AC/DC-02	Replace lead-acid batteries with fuel cells.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 2,000,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
AC/DC-03	Add a portable, diesel-driven battery charger to existing DC system.	Criterion F Considered for Further Evaluation	This SAMA candidate would provide DC power for extended periods of time during an SBO event to allow for a greater likelihood of recovery of either on-site or off-site power. Therefore, this SAMA candidate is considered for further evaluation.
AC/DC-04	mprove DC bus load shedding.	Criterion B Already mplemented	f power is lost to DC MCC 1 or DC MCC 2, selective battery load shedding is performed in accordance with Attachment 5 of DB-OP-02521. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
AC/DC-05	Provide DC bus cross-ties.	Criterion B Already mplemented	DC cross-ties already exist at Davis-Besse. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
AC/DC-06	Provide additional DC power to the 120/240 vital AC system.	Criterion E Subsumed	This SAMA candidate would provide DC power for extended periods of time during an SBO event to allow for a greater likelihood of recovery of either on-site or off-site power. This SAMA candidate will be subsumed in AC/DC-01.
AC/DC-07	Add an automatic feature to transfer the 120 vital AC buses from normal to standby power.	Criterion B Already mplemented	The Davis-Besse 120 vital AC is normally aligned to emergency power backed up by EDGs. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
AC/DC-08	ncrease training on response to loss of 120 AC buses that cause inadvertent actuation signals.	Criterion D ery Low Benefit	Abnormal Procedure DB-OP-2532 addresses the loss of both AC and DC power to both the Non-Nuclear nstrumentation (NN) and the CS that are powered from uninterruptible AC instrumentation distribution panels AU and BU. t is udged that operator awareness to the required actions is well established.
AC/DC-09	Provide an additional diesel generator.	Criterion E Subsumed	Davis-Besse has an SBO diesel in addition to the two EDGs. A large contributor to loss of all diesel generators is operator failure to manually start the SBO diesel. Therefore, an additional EDG may be of low value, but for conservatism, this SAMA is subsumed in SAMA candidate AC/DC-14.
AC/DC-10	Revise procedure to allow bypass of diesel generator trips.	Criterion B Already mplemented	Procedure DB-OP-02043, Emergency Diesel Generator 1 Alarm Panel 43 Annunciator, instructs operators to reset any protection relays, and clear and reset any alarms when the EDG is running in Emergency Mode. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
AC/DC-11	mprove 4.16k bus cross-tie ability.	Criterion B Already mplemented	The 4.16 k safety buses C1 and D1 can be cross tied in numerous ways. For example, Bus C1 can be powered from either 13.8 k non-safety bus, the SBO diesel, EDG 1 or EDG2 and Bus D1. Bus D1 can similarly be supplied. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
AC/DC-12	Create AC power cross-tie capability with other unit (multi-unit site).	Criterion A Not Applicable	Davis-Besse is a single unit site. Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.
AC/DC-13	nstall an additional, buried off-site power source.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require more than 25,000,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
AC/DC-14	nstall a gas turbine generator.	Criterion F Considered for Further Evaluation	This SAMA candidate would increase the reliability of emergency power during a LOOP event by adding a diverse AC power source. Therefore, this SAMA candidate is considered for further evaluation.
AC/DC-15	nstall tornado protection on gas turbine generator.	Criterion A Not Applicable	Davis-Besse does not have a gas turbine. Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.
AC/DC-16	mprove uninterruptible power supplies.	Criterion D ery Low Benefit	Uninterruptible power supplies have been updated and have proven to be very reliable. Based on dominant cutsets and component importance values, UPS failure is not a significant risk contributor at Davis-Besse.
AC/DC-17	Create a cross-tie for diesel fuel oil (multi-unit site).	Criterion A Not Applicable	Davis-Besse is not a multi-unit site. Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.
AC/DC-18	Develop procedures for replenishing diesel fuel oil to the emergency and SBO diesel generators.	Criterion B Already mplemented	Davis-Besse procedures provide adequate guidance to replenish SBO diesel fuel oil during a LOOP event. A more beneficial SAMA candidate is to increase the size of the SBO day tank. This is described in SAMA candidate AC/DC-27. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
AC/DC-19	Use fire water system as a backup source for diesel cooling.	Criterion F Considered for Further Evaluation	Davis-Besse has the capability to use fire water to cool the Train 2 ECCs pumps (including makeup pump) and the Train 2 decay heat removal heat exchanger. By providing the ability to supply the Train 2 EDG, this alignment could also operate in LOOP conditions.
AC/DC-20	Add a new backup source of diesel generator cooling.	Criterion E Subsumed	Davis-Besse has the capability to use fire water to cool the Train 2 ECCs pumps (including makeup pump) and the Train 2 decay heat removal heat exchanger. By providing the ability to supply the Train 2 EDG, this alignment could also operate in LOOP conditions. This SAMA candidate will be subsumed in SAMA candidate AC/DC-19.
AC/DC-21	Develop procedures to repair or replace failed 4k breakers.	Criterion F Considered for Further Evaluation	By pre-staging safety-related breakers and developing procedures to replace failed breakers, many components/buses could be restored in a timely manner if they have failed due to breaker failure. Therefore, this SAMA candidate is considered for further evaluation.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
AC/DC-22	n training, emphasize steps in recovery of off-site power after an SBO.	Criterion B Already mplemented	On loss of power to the startup transformers, the procedure directs the operators to inform the System Dispatcher all necessary steps were taken to restore power to the startup transformers. This occurs whether or not an SBO occurs. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
AC/DC-23	Develop a severe weather conditions procedure.	Criterion B Already mplemented	Procedure RA-EP-02810, Tornado, is initiated whenever a tornado watch or warning has been issued. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
AC/DC-24	Bury off-site power lines.	Criterion C Excessive mplementation Cost	n order to realize a significant benefit from this SAMA, the length of power lines buried must be significant. The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require more than 25,000,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
AC/DC-25	Provide a dedicated DC power system (battery/battery charger) for TDAFW control valve and NN -X for SG level indication.	Criterion F Considered for Further Evaluation	For SBO scenarios, this SAMA increases the time available before manual control of the TDAFW pumps would be required. Therefore, this SAMA candidate is considered for further evaluation.
AC/DC-26	Provide an alternator/generator that would be driven by each TDAFW pump.	Criterion F Considered for Further Evaluation	For SBO scenarios, this SAMA candidate would eliminate the need to assume manual control of the TDAFW pumps. Therefore, this SAMA candidate is considered for further evaluation.
AC/DC-27	ncrease the size of the SBO fuel oil tank.	Criterion F Considered for Further Evaluation	This SAMA candidate would extend the time before the SBO fuel tank would require filling, thereby increasing the reliability of the SBO diesel and offering more time for recovery of either off-site power or the EDGs. Therefore, this SAMA candidate is considered for further evaluation.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
Enhancements elated to AT Events			
AT-01	Add an independent boron in ection system.	Criterion D ery Low Benefit	Based on the top 100 cutsets and the component importance measures, loss of emergency boration is not a significant risk contributor at Davis-Besse.
AT-02	Add a system of relief valves to prevent equipment damage from pressure spikes during an ATWS.	Criterion D ery Low Benefit	Based on the top 100 cutsets and the component importance measures, inadequate pressure relief during an ATWS event is not a significant risk contributor at Davis-Besse.
AT-03	Provide an additional control system for rod insertion (e.g., AMSAC).	Criterion B Already mplemented	Davis-Besse has an equivalent system - the Diverse Scram System. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
AT-04	nstall an ATWS-sized filtered containment vent to remove decay heat.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at ermont ankee was estimated by Entergy Nuclear to require more than 2,000,000 in 2007. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
AT-05	Revise procedure to bypass MS isolation in turbine trip ATWS scenarios.	Criterion B Already mplemented	Davis-Besse already has the ability and procedures in place to open the MS bypass valves, equalize pressure around the MS s and re-open the MS s. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
AT-06	Revise procedure to allow override of LP during an ATWS event.	Criterion A Not Applicable	ATWS scenarios at Davis-Besse would not be mitigated by RCS depressurization and LP . Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.
AT-07	nstall motor generator set trip breakers in control room.	Criterion D ery Low Benefit	Based on the top 100 cutsets and component basic event importance, failure to trip the reactor is not significant risk contributor at Davis-Besse. Also, if the reactor power is not decreasing, procedures instruct the operators to first de-energize substations E2 and F2, and if necessary locally open reactor trip breakers in the Low oltage Switchgear room.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
AT-08	Provide capability to remove power from the bus powering the control rods.	Criterion B Already mplemented	Davis-Besse procedures call for de-energizing 480 substations E2 and F2 if reactor power is not decreasing. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
Enhancements elated to Containment B ass			
CB-01	nstall additional pressure or leak monitoring instruments for detection of SLOCA.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 2,300,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CB-02	Add redundant and diverse limit switches to each C .	Criterion D ery Low Benefit	LERF results are dominated by containment bypass events such as SGTR and SLOCA events. Containment isolation is not a significant contributor to LERF.
CB-03	ncrease leak testing of valves in SLOCA paths.	Criterion D ery Low Benefit	HP and LP in ection check valves are leak tested per Appendix . DHR suction lines are not tested, but rather than a leakage test, it is udged that continuously monitoring these valves at power would be preferable to leakage test. A SAMA candidate to continuously monitor the DHR suction valves is provided in SAMA candidate CB-21.
CB-04	nstall self-actuating C s.	Criterion D ery Low Benefit	mportant C s receive a close signal from the safety actuation system. Many are air-operated and fail in the closed position. t is udged that self-actuating valves would not provide any significant increase in the reliability of isolation.
CB-05	Locate DHR system inside containment.	Criterion C Excessive mplementation Cost	This would require relocating DHR pumps within the primary containment. These pumps would need to be protected from the hostile environment resulting from a significant LOCA. This would require extensive modifications within the primary containment, which are udged to be excessive in cost.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CB-06	Ensure SLOCA releases are scrubbed. One method is to plug drains in potential break areas so that break point will be covered with water.	Criterion D ery Low Benefit	This SAMA candidate would have very little benefit. t is likely that the break would be well above floor drain level. Therefore, a significant height of water would be required before any scrubbing took place. At these levels, the water level would likely have undesirable effects such as threatening mitigating equipment due to flooding.
CB-07	Revise EOPs to improve SLOCA identification.	Criterion B Already mplemented	Davis-Besse has in place procedures that take steps to identify any resulting leaks. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CB-08	mprove operator training on SLOCA coping.	Criterion E Subsumed	This SAMA would reduce the risk of SLOCA events by improving the likelihood of timely identification and diagnosis of SLOCA events and thereby increasing the likelihood of successful mitigating actions. This SAMA will be subsumed in CB-07.
CB-09	nstitute a maintenance practice to perform a 100% inspection of steam generator tubes during each refueling outage.	Criterion D ery Low Benefit	Davis-Besse is scheduled to replace the steam generators in 2013, which would result in inspecting new steam generator tubes. Therefore, this SAMA candidate is considered very low benefit for Davis-Besse.
CB-10	Replace steam generators with a new design.	Criterion B Already mplemented	Davis-Besse is scheduled to replace the steam generators in 2013. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CB-11	ncrease the pressure capacity of the secondary side so that a SGTR would not cause the relief valves to lift.	Criterion C Excessive mplementation Cost	ncreasing the secondary side pressure capacity would potentially require significant design changes. ncreasing atmospheric and safety valve setpoints would impact heat removal and AFW pump performance, and plant response to various transients. Pressure capacity of the steam generators and piping could not be increased without significant implementation cost. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CB-12	nstall a redundant spray system to depressurize the primary system during a SGTR.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 5,000,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CB-13	Proceduralize use of pressurizer vent valves during SGTR sequences.	Criterion B Already mplemented	Davis-Besse has a procedure in place that directs the operator to use of the POR or Pressurizer ent alve for large SGTR tube leaks. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CB-14	Provide improved instrumentation to detect SGTRs, such as Nitrogen-16 monitors.	Criterion B Already mplemented	Main steam lines include radiation monitors (RE600, RE609). Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CB-15	Route the discharge from the MSS s through a structure where a water spray would condense the steam and remove most of the fission products.	Criterion C Excessive mplementation Cost	The cost of implementing this at Davis-Besse was estimated by FirstEnergy to require more than 8,500,000 in 2009. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CB-16	nstall a highly reliable (closed loop) steam generator shell-side heat removal system that relies on natural circulation and stored water sources.	Criterion C Excessive mplementation Cost	The cost of implementing this at Davis-Besse was estimated by FirstEnergy to require more than 11,500,000 in 2009. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CB-17	Revise EOPs to direct isolation of a faulted steam generator.	Criterion B Already mplemented	The preferred method to respond to a SGTR at Davis-Besse is to cooldown to 500^{o}F using both steam generators, then isolate the affected steam generator and continue plant cooldown using the unaffected steam generator. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CB-18	Direct steam generator flooding after a SGTR, prior to core damage.	Criterion D ery Low Benefit	Flooding the SG prior to core damage could impact efforts to mitigate the SGTR. For example, flooding may present a risk to the operation of the TDAFW pumps by risking steam generator overfill.
CB-19	ent MSS s in containment.	Criterion D ery Low Benefit	This SAMA candidate would result in plant decay heat being deposited into primary containment, resulting in a harsh environment. The possible advantages for SGTR will be offset by the negative impacts for other events where secondary steam is deposited into containment with intact steam generators.
CB-20	nstall relief valves in the CCW system.	Criterion D ery Low Benefit	Based on the top 100 cutsets and component basic event importance, SLOCA in the CCW is not significant risk contributor at Davis-Besse.
CB-21	nstall pressure measurements between the two DHR suction valves in the line from the RCS hot leg.	Criterion F Considered for Further Evaluation	This would provide operators with indication of failure of inboard isolation valves and provide them time to initiate mitigating actions to prevent an SLOCA through these valves. Therefore, this SAMA candidate is considered for further evaluation.
Enhancements elated to Core Coolin stems			
CC-01	nstall an independent active or passive HP system.	Criterion F Considered for Further Evaluation	This SAMA would increase the reliability of HP for smaller break LOCA scenarios. Therefore, this SAMA candidate is considered for further evaluation.
CC-02	Provide an additional HP pump with independent diesel generator.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 5,000,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CC-03	Revise procedure to allow operators to inhibit automatic vessel depressurization in non-ATWS scenarios.	Criterion A Not Applicable	Davis-Besse does not have an automatic vessel depressurization system. Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CC-04	Add a diverse LP system.	Criterion F Considered for Further Evaluation	Examination of dominant cutsets and component basic event importance shows the failure of LP pumps to have moderate risk significance at Davis-Besse. This SAMA candidate would improve the reliability of the LP /DHR system. Therefore, this SAMA candidate is considered for further evaluation.
CC-05	Provide capability for alternate LP via diesel-driven fire pump.	Criterion F Considered for Further Evaluation	This SAMA would initiate LP during an SBO event. Therefore, this SAMA candidate is considered for further evaluation.
CC-06	mprove ECCS suction strainers.	Criterion B Already mplemented	ECCS suction strainers have been replaced at Davis-Besse. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CC-07	Add the ability to manually align ECCS recirculation.	Criterion B Already mplemented	Davis-Besse manually aligns ECCS to the recirculation mode after the BWST inventory has been exhausted. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CC-08	Add the ability to automatically align ECCS to recirculation mode upon BWST depletion.	Criterion E Subsumed	Davis-Besse currently has the ability to initiate automatic switchover from the BWST to the containment sump on low BWST level, but this feature has been deactivated. The cost would by minor to reactivate this feature. This SAMA candidate will be subsumed in SAMA candidate CC-19.
CC-09	Provide hardware and procedure to refill the BWST once it reaches a specified low level.	Criterion B Already mplemented	Davis-Besse has the ability to refill the BWST using the Clean Waste Receiver Tank (CWRT). The CWRT contains borated water. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CC-10	Provide an in-containment reactor water storage tank.	Criterion C Excessive mplementation Cost	This SAMA candidate is intended to increase reliability by eliminating the need to switch from the BWST to the containment sump. mplementing ma or modifications inside containment is estimated to require excessive implementation costs. A SAMA candidate to implement the automatic switchover from the BWST to the containment sump is considered a much more cost-effective way to address this issue.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CC-11	Modify procedures to throttle LP pumps earlier in medium or large break LOCAs to maintain BWST inventory.	Criterion D ery Low Benefit	Davis-Besse Operators are prohibited from throttling LP pumps earlier in medium or large break LOCAs to maintain BWST inventory. f BWST flow was throttled down to reduce flowrate, the additional time gained is approximately 20 minutes, which, from a PRA perspective, is of low benefit for a LOCA condition.
CC-12	Emphasize timely recirculation alignment in operator training.	Criterion B Already mplemented	Alignment to ECCS containment recirculation is a critical action in response to a LOCA event. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CC-13	Upgrade the chemical and volume control system to mitigate small break LOCAs.	Criterion D ery Low Benefit	The make-up system can be used to provide make-up to the RCS in the event of a small LOCA. Because of the separate HP and make-up systems, the plant has essentially four separate systems capable of in ecting from the BWST into the RCS at high pressure. This was identified as a unique safety feature in the PE.
CC-14	Change the in-containment reactor water storage tank suction from four check valves to two check and two air-operated valves.	Criterion A Not Applicable	Davis-Besse does not have an in-containment reactor water storage tank. Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.
CC-15	Replace two of the four electric safety in ection pumps with diesel-powered pumps.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 2,000,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CC-16	Provide capability for remote, manual operation of secondary side pilot-operated relief valves in an SBO.	Criterion B Already mplemented	Davis-Besse procedure includes operator action to provide manual control of atmospheric vent valves. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CC-17	Create a reactor coolant depressurization system.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 4,600,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CC-18	Make hardware and procedure changes to allow RCS depressurization.	Criterion B Already mplemented	There currently exist several ways to depressurizing the RCS. The one uses the normal pressurizer spray, and two methods use the vent path. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CC-19	Provide automatic switchover of HP and LP suction from the BWST to containment sump for LOCAs.	Criterion F Considered for Further Evaluation	Davis-Besse currently has the ability to initiate automatic switchover from the BWST to the containment sump on low BWST level, but this feature has been deactivated. The cost would by minor to reactivate this feature. Therefore, this SAMA candidate is considered for further evaluation.
CC-20	Modify hardware and procedures to allow using the make-up pumps for high pressure recirculation from the containment sump.	Criterion C Excessive mplementation Cost	The cost of implementing this at Davis-Besse was estimated by FirstEnergy to require more than 10,000,000 in 2009. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CC-21	Reduce the BWST level at which switchover to containment recirculation is initiated.	Criterion D ery Low Benefit	Reducing the level at which switchover occurs (nine feet) would not significantly extend the time to switchover, and would increase the probability of pump failure due to loss of suction head. Davis-Besse has installed more accurate BWST level instrumentation which allows reaching a lower level prior to switchover to recirculation.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
Enhancements elated to Containment henomena			
CP-01	Create a reactor cavity flooding system.	Criterion B Already mplemented	The capability exists to dump BWST water into the containment. Severe Accident Management Guidelines (SAMGs) describes the strategy for performing, including several methods to move the contents of the BWST into the containment. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CP-02	nstall a passive containment spray system.	Criterion C Excessive mplementation Cost	nstalling a passive containment system is considered prohibitively expensive. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CP-03	Use the fire water system as a backup source for the containment spray system.	Criterion D ery Low Benefit	Davis-Besse has a very large dry containment. Containment over-pressurization is not a significant risk contributor.
CP-04	nstall an unfiltered, hardened containment vent.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 3,100,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CP-05	nstall a filtered containment vent to remove decay heat. Option 1: Gravel Bed Filter Option 2: Multiple enturi Scrubber	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 5,700,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CP-06	Enhance fire protection system hardware and procedures.	Criterion D ery Low Benefit	This SAMA candidate addresses the scrubbing of radioactive releases into certain areas by actuating the fire protection system. Although some scrubbing benefits might be realized, this SAMA candidate presents the risk of impacting required equipment by spray or flooding. This could only be performed with fire protection systems that could be remotely actuated. f the temperature in certain areas became high enough, some existing fire protection systems may automatically actuate.
CP-07	Provide post-accident containment inerting capability.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 10,900,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CP-08	Create a large concrete crucible with heat removal potential to contain molten core debris.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 108,000,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CP-09	Create a core melt source reduction system.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at .A. Fitzpatrick was estimated to cost more than 5,000,000. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CP-10	Strengthen primary/secondary containment (e.g., add ribbing to containment shell).	Criterion C Excessive mplementation Cost	Significant modifications to the primary/secondary containment, if possible, are considered prohibitively expensive. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CP-11	ncrease depth of the concrete base mat or use an alternate concrete material to ensure melt-through does not occur.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at ermont ankee was estimated by Entergy Nuclear to require more than 5,000,000 in 2007. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CP-12	Provide a reactor vessel exterior cooling system.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 2,500,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CP-13	Construct a building to be connected to primary/secondary containment and maintained at a vacuum.	Criterion C Excessive mplementation Cost	Construction of a building connected to the primary/secondary containment, if possible, is considered to be prohibitively expensive. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CP-14	nstitute simulator training for severe accident scenarios.	Criterion B Already mplemented	Davis-Besse currently does not have severe accidents modeled on the plant simulator. Training on severe accidents is accomplished by other means, such as table-top exercises, computer-based training and in Emergency Response Organization training. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CP-15	mprove leak detection procedures.	Criterion B Already mplemented	Davis-Besse has a Reactor Coolant System ntegrated Leakage Program. Davis-Besse also has a Containment Leak Detection System and associated procedures. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CP-16	Delay containment spray actuation after a large break LOCA.	Criterion D ery Low Benefit	The delay time that could be realized if containment spray was delayed would be less than 10 minutes. This SAMA candidate is considered to be of very low benefit.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CP-17	nstall automatic containment spray pump header throttle valves.	Criterion D ery Low Benefit	The capability already exists at Davis-Besse to throttle containment spray after the switchover to the sump. The delay time that could be realized if containment spray was throttled would be less than 10 minutes. This SAMA candidate is considered to be of very low benefit.
CP-18	nstall a redundant containment spray system.	Criterion C Excessive mplementation Cost	Significant modifications to the containment, if possible, are considered prohibitively expensive. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CP-19	nstall a redundant containment fan system.	Criterion D ery Low Benefit	Based on component basic event importance, containment fan coolers are not significant risk contributors at Davis-Besse. This SAMA candidate is considered to be very low benefit.
CP-20	nstall or use an independent power supply to the hydrogen control system using either new batteries, a non-safety grade portable generator, existing station batteries, or existing AC/DC independent power supplies, such as the security system diesel generator.	Criterion D ery Low Benefit	Davis-Besse has a very large dry containment. Hydrogen burn does not present a significant risk. This SAMA candidate is considered to be very low benefit.
CP-21	nstall a passive hydrogen control system.	Criterion D ery Low Benefit	LERF is dominated by containment bypass events such as SGTR and SLOCA. Failure of containment is not a significant contributor to LERF. This SAMA candidate is considered to be very low benefit.
CP-22	Erect a barrier that would provide enhanced protection of the containment walls (shell) from e ected core debris following a core melt scenario at high pressure.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at ermont ankee was estimated by Entergy Nuclear to require more than 12,000,000 in 2007. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
Enhancements elated to Coolin ater			
CW-01	Add redundant DC control power for service water pumps.	Criterion D ery Low Benefit	Based on the top 100 cutsets and component basic event importance, the most risk significant impact from service water pumps is failure to run. This would likely not be impacted by DC power failure. Failure of DC power would impact much more than service water and improving the reliability of DC power to only service water would have very limited value.
CW-02	Replace ECCS pump motors with air-cooled motors.	Criterion B Already mplemented	The ECCS pump motors at Davis-Besse are air-cooled. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CW-03	Enhance procedural guidance for use of cross-tied component cooling or service water pumps.	Criterion B Already mplemented	Procedure DB-OP-02523, Component Water System Malfunctions, provides steps to cross connect CCW. For example, CCW Loop 1 can be cross connected to HP Pump 2, LP Pump 2 and CTMT Hydrogen Analyzer 2. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CW-04	Add a redundant service water pump.	Criterion D ery Low Benefit	Davis-Besse has three service water pumps. n addition, the normally running cooling tower makeup pump is the preferred supply of service water following loss of service water.
CW-05	Enhance the screen wash system.	Criterion D ery Low Benefit	The Davis-Besse water supply from Lake Erie travels through a long canal before reaching the intake structure. There is a screen at the intake from Lake Erie. The long distance traveled through the canal results in a significant fraction of material passing through the initial screen settling out prior to reaching the intake structure.
CW-06	Cap downstream piping of normally closed CCW drain and vent valves.	Criterion D ery Low Benefit	Loss of CCW through drain and vent lines is not considered to be a significant contributor to loss of CCW. These lines are small, and any leakage would likely be low.
CW-07	Enhance loss of CCW (or loss of service water) procedures to facilitate stopping the RCPs.	Criterion B Already mplemented	Procedure DB-OP-02511, Loss of Service Water Pumps/System and procedure DP-OP-02523, Component Cooling Water System Malfunctions, call for tripping all RCPs when specific conditions are met. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CW-08	Enhance loss of CCW procedure to underscore the desirability of cooling down the RCS prior to seal LOCA.	Criterion D ery Low Benefit	Seal LOCA is not a concern at Davis-Besse if the RCPs are tripped. On loss of CCW, the makeup pumps can continue operation for at least one hour. Therefore, if operators trip the RCPs within one hour of loss of CCW, an RCP seal LOCA is not a risk concern.
CW-09	Additional training on loss of CCW.	Criterion D ery Low Benefit	Seal LOCA is not a concern at Davis-Besse if the RCPs are tripped. On loss of CCW, the makeup pumps can continue operation for at least one hour. Therefore, if operators trip the RCPs within one hour of loss of CCW, an RCP seal LOCA is not a risk concern.
CW-10	Provide hardware connections to allow another essential raw cooling water system to cool charging pump seals.	Criterion B Already mplemented	Davis-Besse has the capability to provide cooling to Train 2 ECCS components (including makeup pumps) and Train 2 decay heat coolers. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CW-11	On loss of essential raw cooling water, proceduralize shedding CCW loads to extend the CCW heat-up time.	Criterion B Already mplemented	Significant CCW loads are shed if CCW temperature limits are reached. Letdown flow is reduced on high letdown temperature. RCPs are tripped on high temperature. f an SFAS signal is generated, numerous non-essential CCW loads will be automatically isolated. f required, LP and HP pumps can operate for up to one hour without CCW cooling. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CW-12	ncrease charging pump lube oil capacity.	Criterion D ery Low Benefit	Davis-Besse makeup pumps can operate for at least one hour on loss of CCW.
CW-13	nstall an independent RCP seal in ection system, with dedicated diesel generator.	Criterion C Excessive mplementation Cost	Davis-Besse estimated the cost for a ma or safety-related modification with calculation support and procedure changes with engineering support and testing or training required to be 1,500,000. Once cost of the equipment is included in the implementation cost, it will exceed the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CW-14	nstall an independent RCP seal in ection system, without dedicated diesel generator.	Criterion C Excessive mplementation Cost	Davis-Besse estimated the cost for a ma or safety-related modification with calculation support and procedure changes with engineering support and testing or training required to be 1,500,000. Once cost of the equipment is included in the implementation cost, it will exceed the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CW-15	Use existing hydro test pump for RCP seal in ection.	Criterion D ery Low Benefit	Seal LOCA is not a concern at Davis-Besse if the RCPs are tripped. On loss of CCW, the makeup pumps can continue operation for at least one hour. Therefore, if operators trip the RCPs within one hour of loss of CCW, an RCP seal LOCA is not a risk concern.
CW-16	nstall improved RCP seals.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Arkansas Nuclear One Unit 2 was estimated by Entergy Operations to require 2,500,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CW-17	nstall an additional CCW pump.	Criterion C Excessive mplementation Cost	Davis-Besse estimated installing a diverse CCW pump for 7,500,000 in 2009. This cost estimate bounds this SAMA candidate. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CW-18	Prevent make-up pump flow diversion through the relief valves.	Criterion D ery Low Benefit	The make-up system is continuously operating. Malfunctions of relief valves would be immediately detected during operation and corrected.
CW-19	Change procedures to isolate RCP seal return flow on loss of CCW, and provide (or enhance) guidance on loss of in ection during seal LOCA.	Criterion B Already mplemented	Procedure DB-OP-025 15, Reactor Coolant Pump and Motor Abnormal Operation, instructs the operators to isolate the seal return line if various conditions are present. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
CW-20	mplement procedures to stagger high pressure safety in ection pump use after a loss of service water.	Criterion B Already mplemented	Procedure DB-OP-02523 provides caution that HP , LP , and makeup pumps can be operated for one hour without CCW cooling. Operators are aware of limited running time of pumps without cooling water. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CW-21	Use fire prevention system pumps as a backup RCP seal in ection and high pressure make-up source.	Criterion B Already mplemented	The fire protection system is not a high pressure system capable of providing seal in ection. Davis-Besse has the capability to provide cooling to Train 2 ECCS components (including makeup pumps) and Train 2 decay heat coolers. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CW-22	mplement procedure and hardware modifications to allow manual alignment of the fire water system to the CCW system.	Criterion B Already mplemented	Davis-Besse has the capability to align fire protection water to cool the Train 2 ECCS pumps and decay heat removal heat exchanger. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CW-23	nstall a CCW header cross-tie.	Criterion B Already mplemented	Davis-Besse has the ability to align the standby CCW pump at either Train 1 or Train 2. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
CW-24	Replace the standby CCW pump with a pump diverse from the other two CCW pumps.	Criterion C Excessive mplementation Cost	The cost of implementing this at Davis-Besse was estimated by FirstEnergy to require more than 7,500,000 in 2009. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
CW-25	Provide the ability to cool make-up pumps using fire water in the event of loss of CCW.	Criterion B Already mplemented	Davis-Besse has the capability to align fire protection water to cool Train 2 Makeup pump. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
Enhancements elated to nternal Floodin			
FL-01	mprove inspection of rubber expansion oints on main condenser.	Criterion D ery Low Benefit	Based on the top 100 cutsets and component basic event importance, circulating water breaks are not a significant risk contributor at Davis-Besse.
FL-02	Modify swing direction of doors separating turbine building basement from areas containing safeguards equipment.	Criterion B Already mplemented	n defense against steam line breaks in the turbine building doors from the turbine building to areas containing safety equipment open such that they seal against the frame during steam line breaks. This configuration will also provide resistance to flood propagation from the turbine building to areas with safety related equipment. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
Enhancements elated to Fire is			
FR-01	Replace mercury switches in fire protection system.	Criterion D ery Low Benefit	nadvertent actuation of fire protection water is not considered risk significant and currently not modeled in the PRA. Any fire protection system water should be handled by existing drains and is not considered a significant flooding threat.
FR-02	Upgrade fire compartment barriers.	Criterion D ery Low Benefit	The Davis-Besse PEEE did not identify any weakness in the fire barrier performance.
FR-03	nstall additional transfer and isolation switches.	Criterion D ery Low Benefit	Currently isolation switches exist for a control evacuation. Some manual actions beyond operation of isolation switches are required (e.g., plugging connectors, removing/inserting fuse blocks). Adding additional transfer/isolation switches is not considered to be of significant benefit.
FR-04	Enhance fire brigade awareness.	Criterion D ery Low Benefit	The Davis-Besse PEEE did not identify any weakness in fire brigade performance.
FR-05	Enhance control of combustibles and ignition sources.	Criterion D ery Low Benefit	The Davis-Besse PEEE did not identify any weakness in the combustible control program.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
Enhancements elated to Feed ater and Condensate			
FW-01	nstall a digital feedwater upgrade.	Criterion B Already mplemented	Although Davis-Besse currently does not have a digital feedwater control system, it is planning to install one. This need not be considered further.
FW-02	Create ability for emergency connection of existing or new water sources to feedwater and condensate systems.	Criterion B Already mplemented	The fire water system can be used a backup to the AFW pump suction. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
FW-03	nstall an independent diesel for the CST make-up pumps.	Criterion D ery Low Benefit	Davis-Besse has the capability of replenishing the CST using fire protection water. This can be done even on loss of AC power. Adding diesel for condensate makeup pumps would not add much benefit.
FW-04	Add a MDFP.	Criterion B Already mplemented	The MDFP can supply steam generator following loss of MFW the TDAFW pumps. The MDFP can be supplied by either EDG in the event of a LOOP. n addition, the startup feed pump can be used to supply the steam generators in the loss of all AFW. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
FW-05	nstall manual isolation valves around the TDAFW pump steam admission valves.	Criterion D ery Low Benefit	The purpose of the SAMA candidate was to reduce dual turbine-driven pump maintenance unavailability. Although manual isolation valves do not exist, Davis-Besse has valves within the steam lines that allow isolation of one TDAFW pump for maintenance while leaving the second TDAFW pump available.
FW-06	nstall accumulators for TDAFW pump flow control valves.	Criterion A Not Applicable	Davis-Besse TDAFW pump flow control valves are solenoid-operated flow control valves that would not benefit from the use of an accumulator. Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.
FW-07	nstall a new CST (AFW storage tank).	Criterion D ery Low Benefit	Based on the top 100 cutsets and component basic event importance, failure of the CST or lack of condensate storage capacity is not significant risk contributor at Davis-Besse

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
FW-08	Modify the TDAFW pump to be self-cooled.	Criterion B Already mplemented	The TDAFW pumps are self-cooled, with service water cooling available as a backup. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
FW-09	Proceduralize local manual operation of AFW system when control power path is lost.	Criterion B Already mplemented	Procedure DB-OP-02521 addresses manual control of AFW in the event of loss of AC and DC power. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
FW-10	Provide hookup for portable diesel generators to power the TDAFW pump after station batteries are depleted.	Criterion B Already mplemented	A portable generator is placed on the turbine deck and cables are run to provide power for steam generator level information. The TDAFW pump is then run manually at the pump. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
FW-11	Use fire water system as a backup for steam generator inventory.	Criterion B Already mplemented	Davis-Besse has the ability to align fire protection water to the AFW system. n addition, service water will automatically be aligned to the AFW system on low system pressure. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
FW-12	Change failure position of condenser make-up valve if the condenser make-up valve fails open on loss of air or power.	Criterion D ery Low Benefit	On loss of air or electric power, several components required for secondary heat removal would be lost, therefore the state of the condenser make-up valve is not relevant.
FW-13	Provide a passive, secondary-side heat-re ection loop consisting of a condenser and heat sink.	Criterion C Excessive mplementation Cost	The cost of implementing a similar SAMA candidate at Shearon Harris was estimated by Carolina Power Light Company to require 1,700,000 in 2005. The cost associated with the implementation of this SAMA candidate exceeds the attainable benefit for all SAMA candidates. Therefore, this SAMA candidate is not considered cost beneficial to implement at Davis-Besse.
FW-14	Modify the startup feedwater pump so that it can be used as a backup to the AFW system, including during an SBO.	Criterion B Already mplemented	The startup feed pump can be used to supply the steam generators in the loss of all AFW. The startup feed pump can be supplied by emergency AC from the EDGs or the SBO diesel generator using bus ties. Therefore, this SAMA candidate is already implemented.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
FW-15	Replace existing pilot-operated relief valves with larger ones, such that only one is required for successful feed and bleed.	Criterion D ery Low Benefit	Failure of the POR to open only shows up in the Level 1 importance with a RRW of 1.006 (cutoff 1.005). t does not show up in the top cutsets or the LERF importance list. Therefore, it is udged to be very low benefit.
FW-16	Perform surveillances on manual valves used for backup AFW pump suction.	Criterion B Already mplemented	These valves are cycled, cleaned and lubricated annually. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
Enhancements elated to eatin entilation and Air Conditionin AC			
H -01	Provide a redundant train or means of ventilation.	Criterion F Considered for Further Evaluation	Loss of switchgear ventilation is a risk significant contributor for Davis-Besse. Therefore, this SAMA candidate is considered for further evaluation.
H -02	Add a diesel building high temperature alarm or redundant louver and thermostat.	Criterion B Already mplemented	Davis-Besse has a diesel building high temperature alarm installed. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
H -03	Stage backup fans in switchgear rooms.	Criterion F Considered for Further Evaluation	Loss of switchgear ventilation is a risk significant contributor for Davis-Besse. Therefore, this SAMA candidate is considered for further evaluation.
H -04	Add a switchgear room high temperature alarm.	Criterion D ery Low Benefit	The high voltage switchgear rooms do not require forced ventilation. Low voltage switchgear rooms require forced ventilation. Operators monitor the temperature of the low voltage switchgear rooms during their plant tours. Loss of ventilation to the low voltage switchgear is shown to not be risk significant.
H -05	Create ability to switch emergency feedwater room fan power supply to station batteries in an SBO.	Criterion D ery Low Benefit	Loss of ventilation to AFW is not a risk significant contributor at Davis-Besse.
H -06	Provide procedural guidance for establishing an alternate means of room ventilation to the service water pump room.	Criterion D ery Low Benefit	Service Water ventilation includes four 50% fans. Loss of service water ventilation is not a significant risk contributor at Davis-Besse.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
Enhancements elated to nstr ment Air and Nitro en l			
A-01	Provide cross-unit connection of uninterruptible compressed air supply (multi-unit).	Criterion A Not Applicable	Davis-Besse is a single unit site. Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.
A-02	Modify procedure to provide ability to align diesel power to more air compressors.	Criterion D ery Low Benefit	Service Air and nstrument Air are not significant risk contributors based on top cutsets and risk importance measures.
A-03	Replace service and instrument air compressors with more reliable compressors that have self-contained air cooling by shaft-driven fans.	Criterion D ery Low Benefit	Service Air and nstrument Air are not significant risk contributors based on top cutsets and risk importance measures.
A-04	nstall nitrogen bottles as backup gas supply for POR .	Criterion A Not Applicable	The POR s at Davis-Besse are electric powered. Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.
A-05	mprove POR s pneumatic components.	Criterion A Not Applicable	The POR s at Davis-Besse are electric powered. Therefore, the intent of the SAMA candidate is not applicable to Davis-Besse.
Enhancements elated to eismic is			
SR-01	ncrease seismic ruggedness of plant components.	Criterion D ery Low Benefit	The Seismic ualifications Utility Group (S UG) previously identified the need for additional seismic restraints in the plant. These restraints have already been added.
SR-02	Provide additional restraints for CO_2 tanks.	Criterion D ery Low Benefit	The CO_2 tanks are located outdoors. These tanks supply only the turbine generator. No other components are protected with CO_2. A seismic failure of the CO_2 tanks has minimal risk.
Other Enhancements			
OT-01	nstall digital large break LOCA protection system.	Criterion D ery Low Benefit	Large break LOCA is not a significant risk contributor (0.2% CDF). Davis-Besse has a Containment Leakage Detection System (FLUS) to identify leaks from vessel penetrations and nozzles.

Table E. -1 alitative creenin o A A Candidates contin ed

A A	odi ication otential Enhancement	creenin Criteria	Basis or creenin odi ication Enhancements
OT-02	Enhance procedures to mitigate large break LOCA.	Criterion B Already mplemented	Large break LOCAs must be mitigated by automatic actions. Also, review of the top cutsets and component basic event importance verified that a large break LOCA is not a significant risk contributor at Davis-Besse. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
OT-03	nstall computer-aided instrumentation system to assist the operator in assessing post-accident plant status.	Criterion B Already mplemented	The Davis-Besse computer system includes a Safety Parameter and Display System (SPDS) and a Post Accident Monitoring System (PAMS). Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
OT-04	mprove maintenance procedures.	Criterion D ery Low Benefit	Davis-Besse has a qualified Maintenance Rule program in place. No deficiencies in maintenance practices have been identified.
OT-05	ncrease training and operating experience feedback to improve operator response.	Criterion D ery Low Benefit	No deficiencies in operator training or feedback are identified.
OT-06	Develop procedures for transportation and nearby facility accidents.	Criterion B Already mplemented	Davis-Besse already has procedures to respond to off-site events such as chemical and oil spills or other events that could impact the station or personnel. Therefore, the intent of the SAMA candidate has already been implemented at Davis-Besse.
OT-07	nstall secondary side guard pipes up to the MS s.	Criterion D ery Low Benefit	Steam line breaks are not a significant contributor to LERF. The derived benefit would not ustify the implementation cost required.

Table E.7-1: Summary of PRA Cases

Case #	Description	Model Approach	Enhanced Internal Events CDF (1/yr)
AC/DC-01	Provide additional DC battery capacity.	The off-site power non-recovery probabilities were recalculated based on seven hours of battery life.	9.4E-06
AC/DC-03	Add a portable, diesel-driven battery charger to existing DC system.	Removed the station batteries' dependence on charging to prevent the batteries from being depleted.	7.8E-06
AC/DC-14	Install a gas turbine generator.	Made the SBO diesel generator and corresponding HRA events perfectly reliable.	9.0E-06
AC/DC-19	Use fire water system as a backup source for diesel cooling.	Each EDG was modeled independent of cooling from the CCW system.	9.8E-06
AC/DC-21	Develop procedures to repair or replace failed 4kV breakers.	All 4kV breakers were made perfectly reliable.	9.7E-06
AC/DC-25	Provide a dedicated DC power system (battery/battery charger) for TDAFW control.	Made the TDAFW system independent of the station DC power.	8.5E-06
AC/DC-26	Provide an alternator/generator that would be driven by each TDAFW pump to provide DC control power.	Made the TDAFW system independent of the station DC power.	8.5E-06
AC/DC-27	Increase the size of the SBO fuel oil tank.	Operator actions to refuel the tank were made perfectly reliable.	1.0E-05
CB-21	Install pressure measurements between the two DHR suction valves in the line from the RCS hot leg.	Removed all latent failures of the upstream DHR suction valve.	1.0E-05
CC-01	Install an independent active or passive HPI system.	Made one train of HPI perfectly reliable.	1.0E-05
CC-04	Add a diverse LPI system.	Made one train of LPI perfectly reliable.	1.0E-05
CC-05	Provide capability for alternate LPI via diesel-driven fire pump.	Made one train of LPI perfectly reliable and independent of AC/DC power.	1.0E-05
CC-19	Provide automatic switchover of HPI and LPI suction from the BWST to containment sump for LOCAs.	HRA events for switchover were made perfectly reliable.	9.9E-06

Table E.7-1: Summary of PRA Cases (continued)

Case #	Description	Model Approach	Enhanced Internal Events CDF (1/yr)
HV-01	Provide a redundant train or means of ventilation.	Low voltage switchgear room ventilation was made perfectly reliable.	1.0E-05
HV-03	Stage backup fans in switchgear rooms.	Low voltage switchgear room ventilation was made perfectly reliable.	1.0E-05

Table E.7-2: Internal Events Benefit Results for Analysis Cases

Case	AC/DC-01 (DCBattery)	AC/DC-03 (Battery Charger)	AC/DC-14 (GasTurbineGen)	AC/DC-19 (FireWaterBackup)	AC/DC-21 (RepairBreakers)
Off-site Annual Dose (rem)	2.0E+00	1.8E+00	1.8E+00	2.0E+00	2.0E+00
Off-site Annual Property Loss ($)	$1,588	$1,430	$1,464	$1,591	$1,593
Comparison CDF[4]	1.0E-05	1.0E-05	1.0E-05	1.0E-05	1.0E-05
Comparison Dose (rem)	2.0E+00	2.0E+00	2.0E+00	2.0E+00	2.0E+00
Comparison Cost ($)	$1,600	$1,600	$1,600	$1,600	$1,600
Enhanced CDF	9.4E-06	7.8E-06	9.0E-06	9.8E-06	9.7E-06
Reduction in CDF	**6.00%**	**22.00%**	**10.00%**	**2.00%**	**3.00%**
Reduction in Off-site Dose	**0.00%**	**10.00%**	**10.00%**	**0.00%**	**0.00%**
Immediate Dose Savings (On-site)	$49	$178	$81	$16	$24
Long Term Dose Savings (On-site)	$212	$777	$353	$71	$106
Total Accident Related Occupational Exposure **(AOE)**	$260	$955	$434	$87	$130
Cleanup/Decontamination Savings (On-site)	$7,942	$29,120	$13,236	$2,647	$3,971
Replacement Power Savings (On-site)	$8,035	$29,462	$13,392	$2,678	$4,018
Averted Costs of On-site Property Damage **(AOSC)**	$15,977	$58,581	$26,628	$5,326	$7,988
Total On-site Benefit	**$16,237**	**$59,536**	**$27,062**	**$5,412**	**$8,119**
Averted Public Exposure **(APE)**	$0	$4,908	$4,908	$0	$0
Averted Off-site Damage Savings **(AOC)**	$147	$2,086	$1,669	$110	$86
Total Off-site Benefit	**$147**	**$6,994**	**$6,577**	**$110**	**$86**
Total Benefit (On-site + Off-site)	**$16,384**	**$66,530**	**$33,639**	**$5,523**	**$8,204**

[4] The sum of the Containment Systems State frequencies calculated by the Level 2 PRA model is slightly different than the CDF calculated by the Level 1 PRA due to the delete term approximation and the additional systems included in the Level 2 models.

Table E.7-2: Internal Events Benefit Results for Analysis Cases (continued)

Case	AC/DC-25 (DedDCPower)	AC/DC-26 (Generator_TDAFW)	AC/DC-27 (SBO_DieselTank)	CB-21 (DHR_valves)	CC-01 (HPI_System)
Off-site Annual Dose (rem)	2.0E+00	2.0E+00	2.0E+00	1.8E+00	2.0E+00
Off-site Annual Property Loss ($)	$1,579	$1,579	$1,600	$1,516	$1,589
Comparison CDF[4]	1.0E-05	1.0E-05	1.0E-05	1.0E-05	1.0E-05
Comparison Dose (rem)	2.0E+00	2.0E+00	2.0E+00	2.0E+00	2.0E+00
Comparison Cost ($)	$1,600	$1,600	$1,600	$1,600	$1,600
Enhanced CDF	8.5E-06	8.5E-06	1.0E-05	1.0E-05	1.0E-05
Reduction in CDF	**15.00%**	**15.00%**	**0.00%**	**0.00%**	**0.00%**
Reduction in Off-site Dose	**0.00%**	**0.00%**	**0.00%**	**10.00%**	**0.00%**
Immediate Dose Savings (On-site)	$121	$121	$0	$0	$0
Long Term Dose Savings (On-site)	$529	$529	$0	$0	$0
Total Accident Related Occupational Exposure **(AOE)**	$651	$651	$0	$0	$0
Cleanup/Decontamination Savings (On-site)	$19,854	$19,854	$0	$0	$0
Replacement Power Savings (On-site)	$20,088	$20,088	$0	$0	$0
Averted Costs of On-site Property Damage **(AOSC)**	$39,942	$39,942	$0	$0	$0
Total On-site Benefit	**$40,593**	**$40,593**	**$0**	**$0**	**$0**
Averted Public Exposure **(APE)**	$0	$0	$0	$4,908	$0
Averted Off-site Damage Savings **(AOC)**	$258	$258	$0	$1,031	$135
Total Off-site Benefit	**$258**	**$258**	**$0**	**$5,939**	**$135**
Total Benefit (On-site + Off-site)	**$40,850**	**$40,850**	**$0**	**$5,939**	**$135**

[4] The sum of the Containment Systems State frequencies calculated by the Level 2 PRA model is slightly different than the CDF calculated by the Level 1 PRA due to the delete term approximation and the additional systems included in the Level 2 models.

Table E.7-2: Internal Events Benefit Results for Analysis Cases (continued)

Case	CC-04 (LPI_pump)	CC-05 (LPI_Diesel_pump)	CC-19 (BWST_to_Sump)	HV-01 (Redundant_HVAC)	HV-03 (Backup_fans)
Off-site Annual Dose (rem)	2.0E+00	2.0E+00	2.0E+00	2.0E+00	2.0E+00
Off-site Annual Property Loss ($)	$1,600	$1,600	$1,599	$1,599	$1,599
Comparison CDF[4]	1.0E-05	1.0E-05	1.0E-05	1.0E-05	1.0E-05
Comparison Dose (rem)	2.0E+00	2.0E+00	2.0E+00	2.0E+00	2.0E+00
Comparison Cost ($)	$1,600	$1,600	$1,600	$1,600	$1,600
Enhanced CDF	1.0E-05	1.0E-05	9.9E-06	1.0E-05	1.0E-05
Reduction in CDF	**0.00%**	**0.00%**	**1.00%**	**0.00%**	**0.00%**
Reduction in Off-site Dose	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
Immediate Dose Savings (On-site)	$0	$0	$8	$0	$0
Long Term Dose Savings (On-site)	$0	$0	$35	$0	$0
Total Accident Related Occupational Exposure **(AOE)**	$0	$0	$43	$0	$0
Cleanup/Decontamination Savings (On-site)	$0	$0	$1,324	$0	$0
Replacement Power Savings (On-site)	$0	$0	$1,339	$0	$0
Averted Costs of On-site Property Damage **(AOSC)**	$0	$0	$2,663	$0	$0
Total On-site Benefit	**$0**	**$0**	**$2,706**	**$0**	**$0**
Averted Public Exposure **(APE)**	$0	$0	$0	$0	$0
Averted Off-site Damage Savings **(AOC)**	$0	$0	$12	$12	$12
Total Off-site Benefit	**$0**	**$0**	**$12**	**$12**	**$12**
Total Benefit (On-site + Off-site)	**$0**	**$0**	**$2,718**	**$12**	**$12**

[4] The sum of the Containment Systems State frequencies calculated by the Level 2 PRA model is slightly different than the CDF calculated by the Level 1 PRA due to the delete term approximation and the additional systems included in the Level 2 models.

Table E.7-3: Total Benefit Results for Analysis Cases

	AC/DC-01 (DCBattery)	**AC/DC-03** (Battery Charger)	**AC/DC-14** (GasTurbineGen)	**AC/DC-19** (FireWaterBackup)	**AC/DC-21** (RepairBreakers)	**AC/DC-25** (DedDCPower)	**AC/DC-26** (Generator_TDAFW)
Internal Events	$16,384	$66,530	$33,639	$5,523	$8,204	$40,850	$40,850
Fires, Seismic, Other	$49,153	$199,590	$100,916	$16,568	$24,613	$122,551	$122,551
Total Benefit	$65,537	$266,120	$134,554	$22,091	$32,818	$163,402	$163,402

	AC/DC-27 (SBO_DieselTank)	**CB-21** (DHR_valves)	**CC-01** (HPI_System)	**CC-04** (LPI_pump)	**CC-05** (LPI_Dieselpump)	**CC-19** (BWST_to_Sump)	**HV-01** (Redundant_HVAC)
Internal Events	$0	$5,939	$135	$0	$0	$2,718	$12
Fires, Seismic, Other	$0	$17,819	$405	$0	$0	$8,155	$37
Total Benefit	$0	$23,755	$540	$0	$0	$10,874	$49

	HV-03 (Backup_fans)
Internal Events	$12
Fires, Seismic, Other	$37
Total Benefit	$49

Table E.7-4: Implementation Cost Estimates

SAMA Candidate ID	Potential Enhancement	Cost Estimate
AC/DC-01	Provide additional DC battery capacity.	$1,750,000
AC/DC-03	Add a portable, diesel-driven battery charger to existing DC system.	$330,000
AC/DC-14	Install a gas turbine generator.	$2,000,000
AC/DC-19	Use fire water system as a backup source for diesel cooling.	$700,000
AC/DC-21	Develop procedures to repair or replace failed 4kV breakers.	$100,000
AC/DC-25	Provide a dedicated DC power system (battery/battery charger) for the TDAFW control valve and NNI-X for steam generator level indication.	$2,000,000
AC/DC-26	Provide an alternator/generator that would be driven by each TDAFW pump.	$2,000,000
AC/DC-27	Increase the size of the SBO fuel oil tank.	$550,000
CB-21	Install pressure measurements between the two DHR suction valves in the line from the RCS hot leg.	$550,000
CC-01	Install an independent active or passive HPI system.	$6,500,000
CC-04	Add a diverse LPI system.	$5,500,000
CC-05	Provide capability for alternate LPI via diesel-driven fire pump.	$6,500,000
CC-19	Provide automatic switchover of HPI and LPI suction from the BWST to containment sump for LOCAs.	$1,500,000
HV-01	Provide a redundant train or means of ventilation.	$50,000
HV-03	Stage backup fans in switchgear rooms.	$400,000

Table E.7-5: Final Results of Cost-Benefit Evaluation

SAMA Candidate ID	Modification	Estimated Benefit	2009 Estimate Cost	Conclusion
AC/DC-01	Provide additional DC battery capacity.	$65,537	$1,750,000	Not Cost Effective
AC/DC-03	Add a portable, diesel-driven battery charger to existing DC system.	$266,120	$330,000	Not Cost Effective
AC/DC-14	Install a gas turbine generator.	$134,554	$2,000,000	Not Cost Effective
AC/DC-19	Use fire water system as a backup source for diesel cooling.	$22,091	$700,000	Not Cost Effective
AC/DC-21	Develop procedures to repair or replace failed 4kV breakers.	$32,818	$100,000	Not Cost Effective
AC/DC-25	Provide a dedicated DC power system (battery/battery charger) for the TDAFW control valve and NNI-X for steam generator level indication.	$163,402	$2,000,000	Not Cost Effective
AC/DC-26	Provide an alternator/generator that would be driven by each TDAFW pump.	$163,402	$2,000,000	Not Cost Effective
AC/DC-27	Increase the size of the SBO fuel oil tank.	$0	$550,000	Not Cost Effective
CB-21	Install pressure measurements between the two DHR suction valves in the line from the RCS hot leg.	$23,755	$550,000	Not Cost Effective
CC-01	Install an independent active or passive HPI system.	$540	$6,500,000	Not Cost Effective
CC-04	Add a diverse LPI system.	$0	$5,500,000	Not Cost Effective
CC-05	Provide capability for alternate LPI via diesel-driven fire pump.	$0	$6,500,000	Not Cost Effective
CC-19	Provide automatic switchover of HPI and LPI suction from the BWST to containment sump for LOCAs.	$10,874	$1,500,000	Not Cost Effective
HV-01	Provide a redundant train or means of ventilation.	$49	$50,000	Not Cost Effective
HV-03	Stage backup fans in switchgear rooms.	$49	$400,000	Not Cost Effective

Table E.8-1: Final Results of the Sensitivity Cases

SAMA Candidate ID	Repair Case	Low Discount Rate Case	High Discount Rate Case	On-site Dose Case	On-site Cleanup Case	Replacement Power Case	Multiplier Case	2009 Estimated Cost	Conclusion
AC/DC-01	$39,825	$98,897	$44,950	$66,591	$76,126	$87,110	$98,306	$1,750,000	Not Cost Effective
AC/DC-03	$171,842	$402,477	$184,578	$269,984	$304,946	$345,221	$399,180	$330,000	Cost Effective
AC/DC-14	$91,701	$203,926	$94,302	$136,310	$152,203	$170,509	$201,831	$2,000,000	Not Cost Effective
AC/DC-19	$13,521	$33,344	$15,171	$22,442	$25,621	$29,282	$33,137	$700,000	Not Cost Effective
AC/DC-21	$19,962	$49,524	$22,513	$33,345	$38,112	$43,604	$49,227	$100,000	Not Cost Effective
AC/DC-25	$99,122	$246,559	$112,037	$166,036	$189,874	$217,334	$245,103	$2,000,000	Not Cost Effective
AC/DC-26	$99,122	$246,559	$112,037	$166,306	$189,874	$217,334	$245,103	$2,000,000	Not Cost Effective
AC/DC-27	$0	$0	$0	$0	$0	$0	$0	$550,000	Not Cost Effective
CB-21	$23,755	$36,674	$18,183	$23,755	$23,755	$23,755	$35,632	$550,000	Not Cost Effective
CC-01	$540	$833	$413	$540	$540	$540	$810	$6,500,000	Not Cost Effective
CC-04	$0	$0	$0	$0	$0	$0	$0	$5,500,000	Not Cost Effective
CC-05	$0	$0	$0	$0	$0	$0	$0	$6,500,000	Not Cost Effective
CC-19	$6,588	$16,407	$7,454	$11,049	$12,639	$14,469	$16,311	$1,5000,000	Not Cost Effective
HV-01	$49	$76	$38	$49	$49	$49	$74	$50,000	Not Cost Effective
HV-03	$49	$76	$38	$49	$49	$49	$74	$400,000	Not Cost Effective

Table E.8-1: Final Results of the Sensitivity Cases (continued)

SAMA Candidate ID	Evacuation Speed	Off-site Economic Cost	2009 Estimated Cost	Conclusion
AC/DC-01	$67,501	$85,169	$1,750,000	Not Cost Effective
AC/DC-03	$268,083	$285,752	$330,000	Cost Effective
AC/DC-14	$136,517	$154,186	$2,000,000	Not Cost Effective
AC/DC-19	$24,054	$41,723	$700,000	Not Cost Effective
AC/DC-21	$34,781	$52,450	$100,000	Not Cost Effective
AC/DC-25	$165,365	$183,034	$2,000,000	Not Cost Effective
AC/DC-26	$165,365	$183,034	$2,000,000	Not Cost Effective
AC/DC-27	$1,963	$19,632	$550,000	Not Cost Effective
CB-21	$25,718	$43,387	$550,000	Not Cost Effective
CC-01	$2,503	$20,172	$6,500,000	Not Cost Effective
CC-04	$1,963	$19,632	$5,500,000	Not Cost Effective
CC-05	$1,963	$19,632	$6,500,000	Not Cost Effective
CC-19	$12,837	$30,506	$1,5000,000	Not Cost Effective
HV-01	$2,012	$19,681	$50,000	Not Cost Effective
HV-03	$2,012	$19,681	$400,000	Not Cost Effective

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