LICENSE RENEWAL APPLICATION

Clinton Power Station, Unit 1

Facility Operating License No. NPF-62

TABLE OF CONTENTS

SECTION 1

Administrative Information

SECTION 2

SECTION 3

SECTION 4

<u>List of Appendices</u>

List of Tables

List of Figures

1.0 ADMINISTRATIVE INFORMATION

1.1 GENERAL INFORMATION - 10 CFR 54.19

1.1.1 NAMES OF APPLICANT

Constellation Energy Generation, LLC (CEG), hereby applies for a renewed operating license for Clinton Power Station, Unit 1 (CPS).

1.1.2 ADDRESSES OF APPLICANT

Constellation Energy Generation, LLC
200 Exelon Way
Kennett Square, PA 19348

1.1.3 DESCRIPTIONS OF BUSINESS OR OCCUPATION OF APPLICANT

Constellation Energy Generation, LLC is a Pennsylvania limited liability company which is wholly owned by Constellation Energy Corporation, a corporation formed under the laws of the Commonwealth of Pennsylvania. Constellation Energy Corporation, through its subsidiaries, is a major generator of electric power and a leading supplier of competitive electricity, with a current owned power generation portfolio of approximately 32,355 megawatts. Constellation Energy Generation, LLC owns and operates the largest nuclear fleet in the United States. Constellation Energy Generation, LLC is the licensed operator of CPS, which is the subject of this application. The current CPS, Unit 1 operating license will expire at midnight on April 17, 2027 (Facility Operating License No. NPF-62).

Constellation Energy Generation, LLC will continue as the licensed operator on the renewed operating license.

1.1.4 DESCRIPTIONS OF ORGANIZATION AND MANAGEMENT OF APPLICANT

Constellation Energy Generation, LLC

Constellation Energy Generation, LLC is a limited liability company organized under the laws of the Commonwealth of Pennsylvania with its principal place of business in Kennett Square, Pennsylvania. Constellation Energy Generation, LLC is wholly owned by Constellation Energy Corporation, a corporation organized under the laws of the Commonwealth of Pennsylvania with its headquarters and principal place of business in Chicago, Illinois. Constellation Energy Corporation is a publicly traded corporation whose shares are widely traded on the New York Stock Exchange. Constellation Energy Generation, LLC does not have a Board of Directors. All Principal Officers of Constellation Energy Generation, LLC are U.S. citizens. Constellation Energy Generation, LLC is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. The Principal Officers of Constellation Energy Generation, LLC, and their addresses, are presented below:

Principal Officers (Constellation Energy Generation, LLC and Nuclear Business Unit)		
Name	**Title**	**Address**
Bryan C. Hanson	Executive Vice President and Chief Generation Officer	1310 Point Street Baltimore, MD 21231
David P. Rhoades	Senior Vice President, Constellation Energy Generation; President and Chief Nuclear Officer	4300 Winfield Road Warrenville, IL 60555
Timothy K. Hanley	Chief Operating Officer, Fleet Operations	4300 Winfield Road Warrenville, IL 60555
Marri Marchionda-Palmer	Senior Vice President, Operations	4300 Winfield Road Warrenville, IL 60555
John P. Keenan	Senior Vice President, Operations	4300 Winfield Road Warrenville, IL 60555
Joseph E. Pacher	Senior Vice President, Operations	1503 Lake Road Ontario, NY 14519
Matthew J. Herr	Senior Vice President, Operations	200 Exelon Way Kennett Square, PA 19348
David O. Dardis	Executive Vice President and General Counsel	1310 Point Street Baltimore, MD 21231
Carrie Hill Allen	Senior Vice President and Deputy General Counsel, Regulatory Policy and Compliance	250 Massachusetts Avenue, NW, Suite 760 Washington, DC 20001
David M. Gullott	Vice President, Licensing and Regulated	4300 Winfield Road Warrenville, IL 60555
Norha Z. Plumey	Site Vice President, Clinton Power Station	8401 Power Road Clinton, IL 61727
Mark Newcomer	Senior Vice President Engineering and Technical Services	200 Exelon Way Kennett Square, PA 19348
Ronald J. DiSabatino Jr.	Vice President, Nuclear Engineering	200 Exelon Way Kennett Square, PA 19348

1.1.5 CLASS OF LICENSE, USE OF THE FACILITY, AND PERIOD OF TIME FOR WHICH THE LICENSE IS SOUGHT

Constellation Energy Company, LLC requests a license renewal of the Class 103 operating license for CPS, Unit 1 for a period of 20 years beyond the expiration of the current license to allow continued use of the facility for the commercial generation of electricity. CPS, Unit 1 license (NPF-62) expires at midnight on April 17, 2027.

In this application, Constellation Energy Generation, LLC also requests the renewal of specific licenses under 10 CFR Parts 30, 40, and 70 that are subsumed in or combined with the current operating license.

1.1.6 EARLIEST AND LATEST DATES FOR ALTERATIONS, IF PROPOSED

No physical plant alterations or modifications have been identified as necessary in connection with this application.

1.1.7 RESTRICTED DATA

With regard to the requirements of 10 CFR 54.17(f), this application does not contain any “Restricted Data,” as that term is defined in the Atomic Energy Act of 1954, as amended, or other defense information, and it is not expected that any such information will be part of the licensed activities.

In accordance with the requirements of 10 CFR 54.17(g), the applicant will not permit any individual to have access to, or any facility to possess restricted data or classified national security information until the individual and/or facility has been approved for such access under the provisions of 10 CFR Parts 25 and/or 95.

1.1.8 REGULATORY AGENCIES

Constellation Energy Generation, LLC recovers its share of the costs incurred from operating CPS in its own wholesale rates. The rates charged and services provided by Constellation Energy Generation, LLC are subject to regulation by the Federal Energy Regulatory Commission under the Federal Power Act.

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

1.1.9 LOCAL NEWS PUBLICATIONS

News publications in circulation near CPS that are considered appropriate to give reasonable notice of the application are as follows:

Bloomington Pantagraph
205 North Main Street
Bloomington, IL 61701
(309) 829-9000

Decatur Herald and Review
225 S. Main Street, No. 200
Decatur, IL 62523
(217) 429-5151

The State Journal-Register
421 South Grand Avenue W., Suite 1A
Springfield, IL 62704
(800) 322-0804

Champaign News-Gazette
2101 Fox Drive
Champaign, IL 61820
(217) 351-5252

The Clinton Journal
111 S. Monroe St.
Clinton, IL 61727
(217) 935-3171

1.1.10 CONFORMING CHANGES TO STANDARD INDEMNITY AGREEMENT

10 CFR 54.19(b) requires that “each application must 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-91) for CPS states, in Article VII, that the agreement "shall terminate at the time of expiration of that license specified in Item 3 of the Attachment, which is the last to expire; provided that, except as may otherwise be provided in applicable regulations or orders of the Commission, the term of this agreement shall not terminate until all the radioactive material has been removed from the location and transportation of the radioactive material from the location has ended as defined in subparagraph 5(b), Article I.” As updated in Amendment 3, Item 3 of the Attachment to the indemnity agreement lists license number NPF-62. Applicant requests that any necessary conforming changes be made to Article VII and Item 3 of the Attachment, and any other sections of the indemnity agreement as appropriate to ensure that the indemnity agreement continues to apply during both the term of the current license and the term of the renewed license. Applicant understands that no changes may be necessary for this purpose if the current CPS, Unit 1 license number is retained. Note that current Amendment 6 updated Item 1 of the Attachment to identify Constellation Energy Generation, LLC as the licensee.

1.2 <u>GENERAL LICENSE INFORMATION</u>

1.2.1 APPLICATION UPDATES, RENEWED LICENSES, AND RENEWAL TERM OPERATION

In accordance with 10 CFR 54.21(b), during NRC review of this application, annual updates to the application to reflect any change to the current licensing basis that materially affects the contents of the license renewal application will be provided.

In accordance with 10 CFR 54.21(d), Constellation Energy Generation, LLC will maintain a summary description in the CPS Updated Safety Analysis Report (USAR) of programs and activities that are required to manage the effects of aging for the systems, structures, and components determined to be subject to aging management during the period of extended operation, and summaries of the time-limited aging analyses evaluations.

1.2.2 INCORPORATION BY REFERENCE

There are no documents incorporated by reference as part of the application. Any document references, either in text or in Section 1.7 are listed for information only.

1.2.3 CONTACT INFORMATION

Any notices, questions, or correspondence in connection with this filing should be directed to:

Christopher D. Wilson
Director License Renewal
Constellation Energy Generation, LLC
200 Exelon Way
Kennett Square, PA 19348
Christopher.Wilson2@constellation.com

with copies to:

Scott L. Kauffman
License Renewal Engineering Manager
Constellation Energy Generation, LLC
200 Exelon Way
Kennett Square, PA 19348
Scott.Kauffman@constellation.com

1.3 PURPOSE

This document provides information required by 10 CFR 54 to support the application for a renewed license for CPS, Unit 1. The application contains technical information required by 10 CFR 54.21 and environmental information required by 10 CFR 54.23. The information contained herein is intended to provide the NRC with an adequate basis to make the findings required by 10 CFR 54.29.

1.4 DESCRIPTION OF THE PLANT

CPS was originally planned as a two-unit site, but only one of the two originally planned units was constructed. CPS, Unit 1 is a boiling water reactor (BWR) located in Harp Township, DeWitt County approximately six miles east of the city of Clinton in east-central Illinois. The CPS with its associated approximately 4900-acre man-made cooling reservoir (Lake Clinton) is an irregular U-shaped site. The majority of the site is located in the eastern half of DeWitt County with the arms of the lake extending into the northeastern area of the county. Lake Clinton was formed by the construction of a dam downstream from the confluence of Salt Creek and North Fork of Salt Creek about 56 miles east of where Salt Creek joins the Sangamon River. DeWitt County is approximately 60 miles northeast of Springfield, almost midway between the cities of Decatur to the south, Champaign to the east, Bloomington to the north, and Lincoln to the west. DeWitt County is almost equidistant between St. Louis and Chicago.

The power generation complex consists of several buildings. The principal structures located on the station site are the containment, auxiliary building, fuel building, turbine building, radwaste building, control building, diesel generator and HVAC building, circulating water screen house, service building, makeup water pump house, switchyard, outdoor storage tanks, permanent warehouse, and gatehouse.

CPS, Unit 1 is a boiling water reactor nuclear steam supply system designed and supplied by the General Electric Company and designated as a BWR/6, with a Mark III containment. The containment is a right cylindrical, reinforced concrete, steel-lined pressure vessel with a hemispherical dome. The drywell encloses the reactor pressure vessel and is a cylindrical reinforced concrete structure with a removable steel head. The pressure suppression pool is a steel-lined concrete cylinder and serves as a heat sink. The containment encloses the reactor system, drywell, and suppression pool.

CPS, Unit 1 was originally authorized to operate at a reactor core power level not in excess of 2894 megawatts thermal (MWt). In 2002, an Extended Power Uprate project was undertaken using NRC-approved BWR Extended Power Uprate guidelines and resulted in an increase in maximum reactor core power level to 3473 MWt. The bases for the increase in allowable power level included improvements in analytical techniques, fuel and core design, and plant hardware modifications; enabling power to be increased to approximately 20 percent above original licensed thermal power.

1.5 APPLICATION STRUCTURE

This license renewal application is structured in accordance with Regulatory Guide 1.188, “Standard Format and Content for Applications to Renew Nuclear Plant Operating Licenses,” Revision 2 and NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule,” Revision 6. In addition, Section 3, “Aging Management Review Results” and Appendix B, “Aging Management Programs” are structured to address the guidance provided in NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” Revision 2. NUREG-1800 references NUREG-1801, “Generic Aging Lessons Learned (GALL) Report,” Revision 2. NUREG-1801 was used to determine the adequacy of existing programs for purposes of managing aging and which existing programs should be augmented for license renewal. The results of the aging management review, using NUREG-1801, have been documented and are illustrated in table format in Section 3, “Aging Management Review Results” of this application.

The application is divided into the following major sections:

Section 1 – Administrative Information

This section provides the administrative information required by 10 CFR 54.17 and 10 CFR 54.19. It describes the plant and states the purpose for this application. Included in this section are the names, addresses, business descriptions, and organization and management descriptions of the applicant, as well as other administrative information. This section also provides an overview of the structure of the application, general references, and a listing of acronyms used throughout the application.

Section 2 – Structures and Components Subject to Aging Management Review

This section describes and justifies the methods used in the integrated plant assessment to identify those systems, structures, and components subject to an aging management review in accordance with the requirements of 10 CFR 54.21(a)(2). These methods consist of: 1) scoping, which identifies the systems, structures, and components that are within the scope of 10 CFR 54.4(a), and 2) screening under 10 CFR 54.21(a)(1), which identifies those in scope systems, structures, and components that perform their intended function without moving parts or a change in configuration or properties, and that are not subject to replacement based on a qualified life or specified time period.

Additionally, the scoping and screening results for systems and structures are described in this section. Scoping results are presented in Section 2.2, "Plant Level Scoping Results." Screening results are presented in Sections 2.3, 2.4, and 2.5.

The screening results consist of lists of passive long-lived mechanical and structural components that require aging management review. Brief descriptions of mechanical systems and structures within the scope of license renewal are provided as background information. Mechanical system and structure intended functions are provided for in scope systems and structures. For each in scope system and structure, components requiring an aging management review are identified; associated component intended functions are identified; and appropriate reference to the Section 3 table providing the aging management review results is made.

Selected components, such as component supports and passive electrical components, were more effectively scoped and screened as commodities. Under the commodity approach, these component groups were evaluated based upon common environments and materials. Commodities requiring an aging management review are presented in Sections 2.4 and 2.5. Component intended functions and reference to the applicable Section 3 table are provided.

Section 3 – Aging Management Review Results

10 CFR 54.21 (a)(3) requires a demonstration that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation. Section 3 presents the results of the aging management reviews. Section 3 provides the link between the scoping and screening results provided in Section 2, the aging management programs provided in Appendix B, and the TLAA evaluations provided in Section 4.

Aging management review results are presented in tabular form, in a format in accordance with NUREG-1800. For mechanical systems, aging management review results are provided in Sections 3.1 through 3.4 for the Reactor Vessel, Internals, and Reactor Coolant System; Engineered Safety Features; Auxiliary Systems; and Steam and Power Conversion Systems, respectively. Aging management review results for containments, structures, and component supports are provided in Section 3.5. Aging management review results for electrical and instrumentation and controls are provided in Section 3.6.

Tables are provided in each of these sections in accordance with NUREG-1800, which provide aging management review results for components, materials, environments, and aging effects which are addressed in NUREG-1801, and information regarding the degree to which the proposed aging management programs are consistent with those recommended in NUREG-1801.

Section 4 – Time-Limited Aging Analyses

Time-limited aging analyses (TLAAs), as defined in 10 CFR 54.3, are listed in this section. This section includes a screening of the generic TLAAs identified in NUREG-1800 and the results of a review of the current licensing basis for plant-specific TLAAs. This section includes a summary of the time-dependent aspects of the analyses. A demonstration is provided to show that the analyses remain valid for the period of extended operation, the analyses have been projected to the end of the period of extended operation, or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation, consistent with 10 CFR 54.21(c)(1)(i)-(iii).

Appendix A –Updated Safety Analysis Report Supplement

As required by 10 CFR 54.21(d), the Updated Safety Analysis Report (USAR) supplement contains a summary of activities credited for managing the effects of aging for the period of extended operation. In addition, summary descriptions of TLAA evaluations are provided. NUREG-1800, Table 3.0-1, "FSAR Supplement for Aging Management of Applicable Systems," was used as guidance for the content of the applicable aging management program summaries. Following issuance of the renewed license, the information contained in this appendix, as updated through the NRC review process, will be incorporated into the USAR.

Appendix B – Aging Management Programs

Appendix B describes the programs and activities that are credited for managing aging effects for components and structures during the period of extended operation based upon the aging management review results provided in Section 3 and the time-limited aging analyses results provided in Section 4.

Sections B.2 and B.3 discuss those programs that are contained in Section XI and Section X, respectively, of NUREG-1801. A description of the aging management program is provided, and a conclusion is drawn based upon the results of an evaluation to each of the ten elements provided in NUREG-1801. In some cases, exceptions and justifications for managing aging are provided for specific NUREG-1801 program elements. Additionally, operating experience related to the aging management program is provided.

Appendix C – Response to BWRVIP License Renewal Applicant Action Items

This Appendix provides the requested responses to applicant action items contained in the NRC safety evaluation reports associated with NRC approved Boiling Water Reactor Vessel and Internals Program reports.

Appendix D – Technical Specification Changes

This Appendix satisfies the requirement in 10 CFR 54.22 to identify technical specification changes or additions necessary to manage the effects of aging during the period of extended operation. There were no technical specification changes identified necessary to manage the effects of aging during the period of extended operation.

Appendix E – Environmental Information – Clinton Power Station, Unit 1

This Appendix satisfies the requirements of 10 CFR 54.23 to provide a supplement to the environmental report that complies with the requirements of subpart A of 10 CFR Part 51 for Clinton Power Station, Unit 1.

1.6 ACRONYMS

Acronym	Meaning
AAC	Aluminum alloy conductor
AC	Alternating current
ACI	American Concrete Institute
ACSR	Aluminum conductor steel reinforced
ADS	Automatic depressurization system
ALE	Adverse localized environment
AMP	Aging Management Program
AMR	Aging Management Review
ANSI	American National Standards Institute
ARI	Alternate rod injection
ART	Adjusted Reference Temperature
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASR	Alkali-silica reaction
AST	Alternative Source Term
ASTM	American Society for Testing and Materials
ATWS	Anticipated transient without scram
AXM	Accident range radiation monitor
BER	Break exclusion region
BTP	Branch technical position
BWR	Boiling Water Reactor
BWROG	Boiling Water Reactor Owner’s Group
BWRVIP	Boiling Water Reactor Vessel and Internals Project
C (ºC)	Degrees Celsius
CAP	Corrective action program
CASS	Cast austenitic stainless steel
CC	Component cooling water
CCV	Concrete containment vessel
CCW	Closed Cycle Cooling Water
CEG	Constellation Energy Generation, LLC
CESP	Condensate effluent sample point
CF	Chemistry factor
CFR	Code of Federal Regulations
CISP	Condensate influent sample point

Acronym	Meaning
CLB	Current licensing basis
CLTP	Current licensed thermal power
CM	Containment monitoring
CMAA	Crane Manufacturers Association of America
CP	Condensate polisher
CPS	Clinton Power Station
CRD	Control Rod Drive
CRDSP	Control Rod Drive sample point
CRDRL	Control Rod Drive return line
CRV	Control Room Ventilation
CSS	Core support structure
CSE	Copper/copper sulfate reference electrode
CT	Current transformer
CUF	Cumulative usage factor
CUF_{en}	Environmentally adjusted cumulative usage factor
CW	Circulating water
DBA	Design basis accident
DBD	Design baseline document
DBE	Design basis event
DG	Diesel generator
DGWS	Diesel generator cooling water system
DM	Dissimilar weld
DO	Dissolved oxygen
DORT	Discrete Ordinates Transfer
DTM	Digital terrain model
EAC	Emergency alternating current
EAF	Environmentally-Assisted Fatigue
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EMA	Equivalent margin analysis
EMI	Electromagnetic interference
EFPY	Effective full-power years
EPRI	Electric Power Research Institute
EPC	Erosion in piping and components
EPA	Environmental Protection Agency
EPU	Extended power uprate

Acronym	Meaning
EQ	Environmental qualification
ERAT	Emergency reserve auxiliary transformer
ES	Extraction steam
ESF	Engineered safety features
EVT	Enhanced visual test
F (ºF)	Degrees Fahrenheit
FAC	Flow-accelerated corrosion
FASA	Focused area self-assessment
Fen	Environmentally assisted fatigue correction factor
FERC	Federal Energy Regulatory Commission
FP	Fire Protection
FPC	Fuel Pool Cooling and Storage
FPER	Fire Protection Evaluation Report
FPS	Fire protection system
FSER	Final Safety Evaluation Report
FSSD	Fire safe shutdown
FW	Feedwater
FWLC	Feedwater leakage control
FWSP	Feedwater sample point
GALL	Generic Aging Lessons Learned (GALL) Report
GE	General Electric
GEH	General Electric Hitachi
GL	Generic Letter
G-M	Geiger-Muller
GPS	Global positioning system
GSI	Generic safety issue
HAZ	Heat affected zone
HCU	Hydraulic control unit
HDPE	High-density polyethylene
HELB	High energy line break
HPCS	High Pressure Core Spray
HVAC	Heating, ventilation, and air conditioning
HVI	High-voltage insulators
HX	Heat exchanger
I&C	Instrumentation and controls

Acronym	Meaning
IASCC	Irradiation assisted stress corrosion cracking
ICMH	In-core monitor housing
IEEE	Institute of Electrical and Electronics Engineers
IGSCC	Intergranular stress corrosion cracking
ILRT	Integrated leak rate test
IN	Information Notice
INPO	Institute of Nuclear Power Operations
IPA	Integrated plant assessment
IR	Issue Report
IER	INPO Event Report
ISFSI	Independent spent fuel storage installation
ISI	Inservice inspection
ISG	Interim staff guidance
ISP	Integrated surveillance program
IVVI	In-vessel visual inspection
JP	Jet pump
KSI	Kilo pounds per square inch
kV	Kilovolt
LAS	Low alloy steel
LCM	Loss control manual
LER	Licensee event report
LRBD	License renewal boundary drawing
LLRT	Local leak rate test
LOCA	Loss-of-coolant accident
LOOP	Loss of offsite power
LPCI	Low pressure coolant injection
LPCS	Low Pressure Core Spray
LRA	License renewal application
LTP	Licensing Topical Report
MEB	Metal enclosed bus
MELB	Medium energy line break
MeV	Million electron Volts
MIC	Microbiologically influenced corrosion
MNPLR	Minimum pathway leakage rate
MPa	Mega-Pascal

Acronym	**Meaning**
MPT	Main power transformer
MSDT	Main steam drain tank
MSIV	Main steam isolation valve
MSIVLCS	Mains steam isolation valve leakage control system
MSL	Main steam line
MWt	Megawatts-thermal
MWe	Megawatts-electric
MWPH	Make-up water pump house
MXPLR	Maximum pathway leakage rate
NACE	National Association of Corrosion Engineers
NB	Nuclear Boiler
NCV	Non-cited violation
NDE	Nondestructive examination
NDT	Nil ductility temperature
NEI	Nuclear Energy Institute
NEIL	Nuclear Electric Insurance Limited
NER	Nuclear Event Report
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NMCA	Noble metal chemical addition
NPDES	National Pollutant Discharge Elimination System
NPS	Nominal pipe size
NPSH	Net positive suction head
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NSAC	Nuclear Safety Analysis Center
NSED	Nuclear Station Engineering Standard
NSR	Nonsafety-related
NSV	Nonsafety-Related Ventilation
NTTF	Near Term Task Force
OBE	Operational basis earthquake
OCCW	Open Cycle Cooling Water
OE	Operating experience
OG	Offgas
OEM	Original equipment manufacturer
OLNC	On-Line Noble ChemTM

Acronym	Meaning
OLTP	Original licensed thermal power
P&ID	Piping and instrumentation diagram
PCV	Primary Containment Ventilation
PEO	Period of extended operation
PH	Precipitation hardened
PM	Preventive maintenance
PMP	Probable maximum precipitation
PPB	Parts per billion
PS	Process sampling
PSI	Pounds per square inch
P-T	Pressure-temperature
PTLR	Pressure and temperature limits report
PWR	Pressurized Water Reactor
QA	Quality assurance
QATR	Quality assurance topical report
RAMA	Radiation analysis modeling application
RAT	Reserve auxiliary transformer
RCIC	Reactor Core Isolation Cooling
RCPB	Reactor Coolant Pressure Boundary
RCS	Reactor coolant system
RCSC	Research Council on Structural Connections
RG	Regulatory Guide
RIC	Recurring internal corrosion
RHR	Residual Heat Removal
RI-ISI	Risk informed inservice inspection
RMI	Reflective metallic insulation
RPS	Reactor Protection System
RT_{NDT}	nil-ductility reference temperature
RTD	Resistance temperature detector
RPT	Recirculation pump trip
RPV	Reactor pressure vessel
RVI	Reactor vessel internals
RWCU	Reactor Water Cleanup
SB	Shield building
SBO	Station blackout
SCC	Stress corrosion cracking

Acronym	Meaning
SCCM	Standard cubic centimeters per minute
SEN	Significant event notification
SER	Safety evaluation report
SGTS	Standby Gas Treatment System
SLC	Standby Liquid Control
SOER	Significant Operating Experience Report
SPCU	Suppression pool cleanup and transfer
SPMU	Suppression pool makeup
SR	Safety-related
SRM	Source range monitor
SRV	Safety relief valve
SRV	Safety-Related Ventilation
SRP	Standard Review Plan
SSA	Safe Shutdown Analysis
SSD	Safe shutdown
SSP	Supplemental surveillance program
SSCs	Systems, structures, and components
SSE	Safe shutdown earthquake
SX	Shutdown service water
TLAAs	Time-limited aging analyses
TS	Technical Specifications
UAT	Unit auxiliary transformer
USAR	Updated Safety Analysis Report
UHS	Ultimate heat sink
USE	Upper-shelf energy
UT	Ultrasonic test
VD	Diesel-generator ventilation
VF	Fuel building ventilation
VH	Shutdown service water pump room cooling
VP	Drywell cooling
VQ	Containment cooling
VR	Containment purge
VT	Visual test
VX	Switchgear heat removal
VY	ECCS equipment area cooling
WE	Reprocessing and disposal equipment drains

Acronym	Meaning
WF	Reprocessing and disposal floor drains
WO	Work order
WX	Solid radwaste reprocessing drains
WZ	Chemical radwaste reprocessing and disposal
WPC	Wear particle concentration
WS	Service water
XLPE	Cross linked polyethylene

1.7 GENERAL REFERENCES

1.7.1 10 CFR 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants”

1.7.2 NEI 95-10, Revision 6, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule,” June 2005

1.7.3 Regulatory Guide 1.188, Revision 2, “Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses”

1.7.5 NUREG-1800, Revision 2, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants”

1.7.6 NUREG-1801, Revision 2, “Generic Aging Lessons Learned (GALL) Report”

1.7.7 10 CFR 50.48, “Fire Protection”

1.7.8 10 CFR 50.49, “Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants”

1.7.9 10 CFR 50.62, “Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants”

1.7.10 10 CFR 50.63, “Loss of All Alternating Current Power”

1.7.11 10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants”

1.7.12 10 CFR 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants”

1.7.13 10 CFR 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions”

1.7.14 NUREG-0800, Section 9.5.1.1, Appendix B, “Supplemental Fire Protection Review Criteria for License Renewal,” Revision 5, March 2007

1.7.15 NUREG-0933, “Resolution of Generic Safety Issues,” U.S. Nuclear Regulatory Commission, Supplement 35, September 2021

1.7.16 EPRI Technical Report 1010639, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4, January 2006

1.7.17 EPRI Report 1013475, Plant Support Engineering: License Renewal Electrical Handbook, Revision 1 to EPRI Report 1003057, February 2007

1.7.18 EPRI Report 1015078, Plant Support Engineering: Aging Effects for Structures and Structural Components (Structural Tools), December 2007

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

For the systems, structures, and components (SSCs) within the scope of license renewal, 10 CFR 54.21(a)(1) requires the applicant to identify and list those structures and components subject to Aging Management Review (AMR). This section describes and justifies the process for identifying and listing those structures and components subject to aging management review in the Clinton Power Station (CPS) license renewal integrated plant assessment, as required by 10 CFR 54.21(a)(2).

The process is performed in two steps. *Scoping* refers to the process of identifying the plant systems and structures that are to be included within the scope of license renewal in accordance with 10 CFR 54.4. The intended functions that are the bases for including the systems and structures within the scope of license renewal are also identified during the scoping process. *Screening* is the process of identifying the in scope structures and components that are subject to an aging management review in accordance with 10 CFR 54.21(a)(1). A detailed description of the scoping and screening process is provided in Section 2.1.

The scoping and screening methodology is consistent with the guidelines presented in NEI 95-10, Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, Revision 6 (Reference 1.7.2). The plant level scoping results identify the systems and structures within the scope of license renewal in Section 2.2. The screening results identify components subject to aging management review in the following LRA sections:

- Section 2.3 for mechanical
- Section 2.4 for structures and component supports
- Section 2.5 for electrical

2.1 SCOPING AND SCREENING METHODOLOGY

2.1.1 INTRODUCTION

This introduction provides an overview of the scoping and screening process used at CPS. Subsequent sections provide details of how the process was implemented.

The initial step in the scoping process was to define the entire plant in terms of systems and structures. Each of these systems and structures were evaluated against the scoping criteria in 10 CFR 54.4, to determine if the system or structure is in scope for license renewal. A system or structure is included within the scope of license renewal if any portion of the system or structure meets one or more of the scoping criteria of 10 CFR 54.4. The intended function(s) that are the bases for including each system and structure within the scope of license renewal were also identified. Systems and structures determined to be within the scope of license renewal were then further evaluated to identify those structures and components that are required to perform or support the identified intended function(s).

License renewal system descriptions were developed for each in scope mechanical system and are included in Section 2.3. These descriptions include relevant information from system descriptions included in the USAR. The in scope boundaries of mechanical systems are depicted on the license renewal boundary drawings (LRBD) by the use of boundary flags which identify license renewal system boundaries and interfaces. The in scope boundaries of the mechanical systems are shown highlighted in green or red. Mechanical components that are required to perform or support safety-related functions or are required to demonstrate compliance with one of the five license renewal regulated events are shown highlighted in green. Nonsafety-related mechanical components that are required only to provide structural support to safety-related SSCs are shown highlighted in red. Nonsafety-related mechanical components that are included within the scope of license renewal only because component failure could prevent the accomplishment of a safety-related function due to potential spatial interaction with safety-related SSCs are also shown highlighted in red. The CPS license renewal application incorporates the latest guidance for consideration of spatial interaction, defined in NEI 95-10, Revision 6, Appendix F (Reference 1.7.2). Additional details on system scoping evaluations and boundary drawing development are provided in Section 2.1.5.

License renewal structure descriptions were developed for each in scope structure and are included in Section 2.4. These descriptions include relevant information from structure descriptions included in the USAR. Structures that support or protect SSCs that are included in scope under 10 CFR 50.4(a)(1) are highlighted in green on site plan drawings. Other in scope structures are highlighted in red. Additional details on structure scoping evaluations and boundary drawing development are provided in Section 2.1.5.

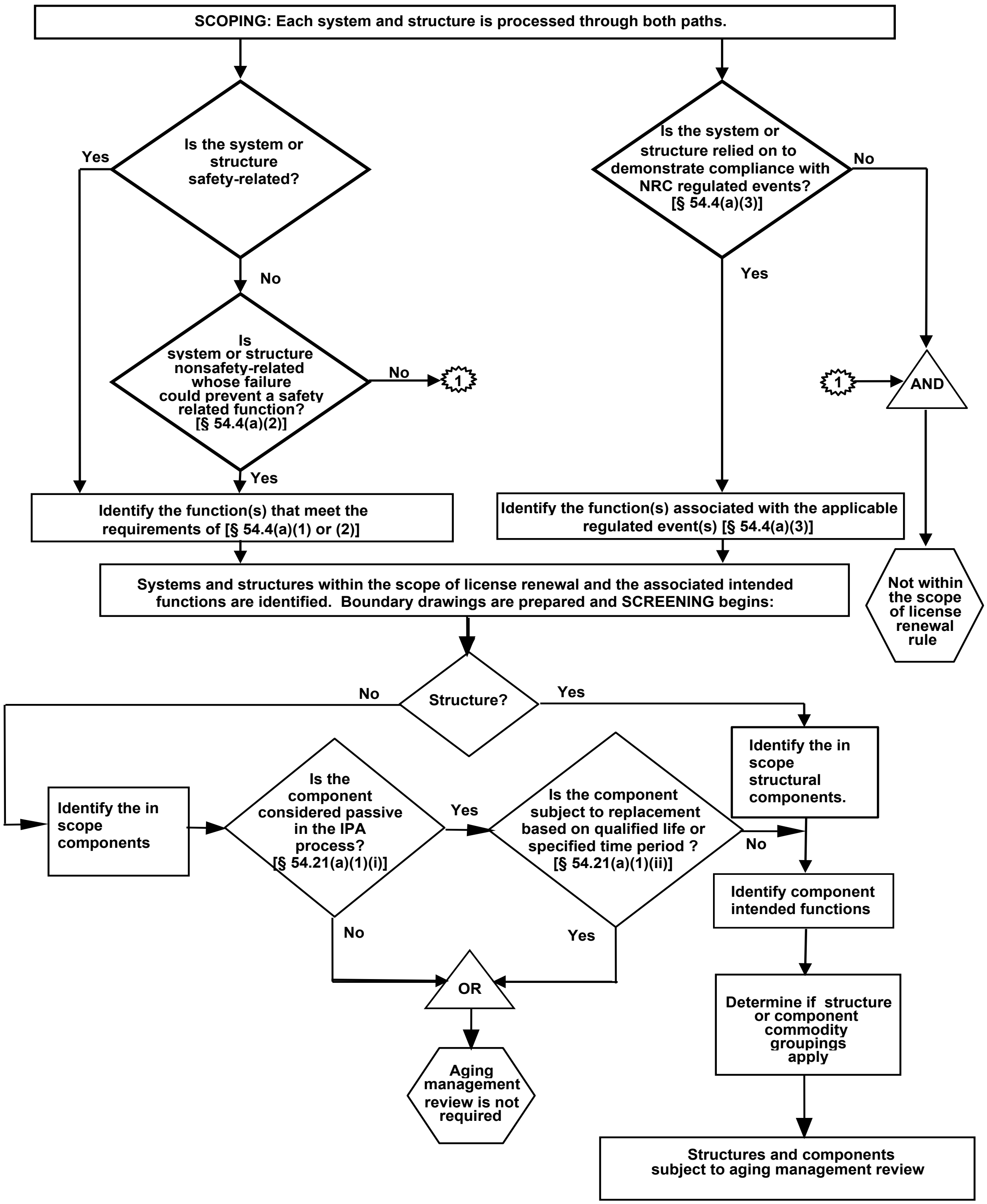
Electrical and Instrumentation and Control (I&C) systems were scoped similar to mechanical systems and structures in accordance with the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), and (a)(3). Electrical and I&C components within the in scope electrical and I&C systems were included within the scope of license renewal. Likewise, electrical and I&C components within the in scope mechanical systems were included within the scope of license renewal. The majority of the electrical and I&C components are active or are addressed as structural commodities (panels, conduit, cable trays, etc.). The passive, long-lived electrical and I&C components in scope for license renewal are addressed as commodity components independent of system associations. Therefore, electrical and I&C system descriptions are not included in the license renewal application. Additional details on electrical and I&C system scoping is provided in Section 2.1.5.

After completion of the scoping and boundary evaluations, the screening process identified the structures and components within the scope of license renewal that are passive, long-lived and subject to an Aging Management Review (AMR). In addition, the passive intended functions of structures and components subject to AMR were identified. Additional details on the screening process are provided in Section 2.1.6.

Selected components, such as component supports, hazard barriers and elastomers, electrical and instrumentation enclosures and raceways, and passive electrical components, were scoped and screened as commodities. As such, they were not evaluated with the individual system or structure but were evaluated collectively as a commodity group. Passive structural commodities are identified in Section 2.4 and passive electrical commodities are identified in Section 2.5. Commodity groups utilized are consistent with Table 2.1-5 of NUREG-1800, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (Reference 1.7.5).

Figure 2.1-1 provides a flowchart of the general scoping and screening process for mechanical systems, structures, and electrical systems.

Figure 2.1-1
Clinton Power Station Scoping and Screening Flowchart



2.1.2 INFORMATION SOURCES USED FOR SCOPING AND SCREENING

A number of different current licensing basis (CLB) and design basis information sources were utilized in the scoping and screening process. The CLB for CPS is consistent with the definition provided in 10 CFR 54.3. The significant source documentation is discussed below.

These source documents are available in hard copy or electronic format. Document records such as licensing correspondence and NRC Safety Evaluation Reports are available in a searchable database, such that applicable documents can be identified and located by searching the appropriate topic.

2.1.2.1 Updated Safety Analysis Report

The CPS Updated Safety Analysis Report (USAR), which is updated regularly in accordance with the requirements of 10 CFR 50.71(e), provided significant input for system and structure descriptions and functions.

2.1.2.2 Fire Protection Program

The following documents, in addition to USAR Subsection 9.5.1, discuss the Fire Hazards and major Fire Protection Program commitments and as such, constitute the bases for the Fire Protection Program at Clinton Power Station:

a. Clinton Power Station Unit 1 Fire Protection Evaluation Report (FPER).

b. Clinton Power Station Unit 1 Safe Shutdown Analysis (SSA).

The aforementioned documents are incorporated into the CPS USAR as Appendix E and F, respectively. The FPER and SSA describes the fire protection configuration for the confinement, detection, and suppression of fires, and demonstrates the capability to achieve and maintain safe shutdown conditions in the event of a fire, in support of the Fire Protection Program functions.

2.1.2.3 Environmental Qualification Master List

The scope of the electrical equipment and components that must be environmentally qualified for use in a harsh environment at CPS is identified in the Passport equipment database and in the Nuclear Station Engineering Standard (NSED) MS-02.00, “Maintenance of Equipment Qualification Program Manual.” The Passport equipment database is discussed in Section 2.1.2.6. The database includes a listing of equipment and components and includes fields that identify specific equipment information such as manufacturer, plant location, and qualification level. The Passport equipment database Environmental Qualification (EQ) data field is a mandatory, design-quality field, and is an accurate record of the CPS commitment to 10 CFR 50.49.

2.1.2.4 Maintenance Rule Database

The Maintenance Rule Database documents the results of Maintenance Rule scoping for CPS systems and structures. The Maintenance Rule Database provided an additional source of information to identify system and structure functions.

2.1.2.5 Engineering Drawings

Engineering drawings at CPS provide system, structure, and component configuration details and safety classification information. These drawings were utilized to determine SSC functional requirements and materials of construction in support of scoping and screening evaluations.

2.1.2.6 Controlled Plant Component Database

CPS maintains a controlled plant component database that contains component level design and maintenance information. The plant component database is called the Passport equipment database. The Passport equipment database lists plant components at the level of detail for which discrete maintenance or modification activities typically are performed. The Passport equipment database provides a comprehensive listing of plant components and their quality classifications. Unique equipment component tag numbers identify each component in the database.

2.1.2.7 Other CLB References

NRC Safety Evaluation Reports include NRC staff review of CPS licensing submittals. Some of these documents may identify licensee commitments.

Licensing correspondence includes relief requests, Licensee Event Reports, and responses to NRC communications such as NRC bulletins, generic letters, or enforcement actions. Some of these documents may contain licensee commitments.

Engineering evaluations and calculations can provide additional information about the requirements or characteristics associated with the evaluated systems, structures, or components.

2.1.3 TECHNICAL BASIS DOCUMENTS

Technical basis documents were prepared in support of the license renewal project. Engineers experienced in nuclear plant systems, programs, and operations prepared the basis documents. Basis documents contain technical evaluations and bases for decisions or positions associated with license renewal requirements as described below. Basis documents were prepared, reviewed, and approved in accordance with controlled project procedures, and are based on the CLB source documents described in Section 2.1.2.

The following sections describe the technical basis documents associated with the CPS scoping and screening methodology.

2.1.3.1 License Renewal Systems and Structures List

One of the first steps necessary to begin the license renewal scoping process was to identify a comprehensive list of plant systems and structures to be evaluated for license renewal scoping. A basis document was prepared to establish this list and to document the basis for the list. While the Passport equipment database is the primary source for identifying plant systems and structures appropriate for License Renewal consideration, other sources of information were reviewed to validate that all plant systems and structures were identified. The following resources were evaluated for additional information and insight to ensure the list of plant systems and structures is complete: the Clinton USAR, plant P&IDs, the Maintenance Rule Database, and the Structural Monitoring Program, as well as plant walkdowns.

Once the plant systems and structures were identified, each of them was evaluated to determine how to organize them most effectively for license renewal consideration. Plant systems and structures were arranged into logical groupings for scoping reviews, and the groupings were defined as license renewal systems and structures.

Commodity groups were also established to facilitate a focused aging management review process. These commodity groups include component supports, insulation, structural, electrical, and other general categories which are common to many systems and structures. This allows for evaluation in one location rather than in each system or structure in which they are applicable.

Once the license renewal systems and structures are identified, the basis document grouped license renewal systems and structures into the following categories:

- Reactor Vessel, Internals, and Reactor Coolant System
- Engineered Safety Features
- Auxiliary Systems
- Steam and Power Conversion System
- Structures and Component Supports
- Electrical and I&C Systems

This grouping of the CPS license renewal systems and structures is based on the guidance of NUREG-1801, Generic Aging Lessons Learned (GALL) Report (Reference 1.7.6). The complete list of systems, structures, and commodity groups evaluated for license renewal is provided in Section 2.2 of this application.

Certain structures and equipment were excluded at the outset because they are not considered to be systems, structures, or components that are part of the CLB and do not have design or functional requirements related to the 10 CFR 54.4(a)(1), (a)(2), or (a)(3) scoping criteria. These include driveways and parking lots, temporary equipment, health physics equipment, portable measuring and testing equipment, tools, and motor vehicles.

2.1.3.2 Identification of Safety-Related Systems and Structures

Safety-related systems and structures are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1) scoping criterion. CPS plant systems and structures that have been designed to safety-related standards are identified in the USAR. CPS plant components that have been classified as safety-related are identified as "SR" in the controlled safety classification data field in the Passport equipment database. CPS safety classification procedures were reviewed against the license renewal "Safety-related" scoping criterion in 10 CFR 54.4(a)(1), to confirm that CPS safety-related classifications are consistent with license renewal requirements. This review is included in a technical basis document. The basis document also provides a summary list of the systems and structures that are safety-related at CPS. These systems and structures are included within the scope of license renewal in accordance with the 10 CFR 54.4(a)(1) scoping criterion.

The CPS safety classification procedure defines safety-related as follows:

Any system, structure or component that is necessary to ensure:

- *The integrity of the reactor coolant pressure boundary,*
- *The capability to shut down the reactor and maintain it in a safe condition, or*
- *The capability to prevent or mitigate the consequences of plant conditions that could result in potential offsite exposures that exceed guideline exposures of 10 CFR 100 or 10 CFR 50.67 as applicable.*

This definition is similar to the 10 CFR 54.4(a)(1) definition of safety-related SSCs, with the following clarifications:

Design Basis Events

The CPS procedure definition of safety-related does not specifically refer to design basis events, while 10 CFR 54.4(a)(1) refers to design basis events as defined in 10 CFR 50.49(b)(1). For CPS license renewal, an additional technical basis document was prepared to confirm that all applicable design basis events were considered. The basis document includes a review of all systems and structures that are relied upon to remain functional during and following design-basis events as defined in 10 CFR 50.49(b)(1). This includes confirming that design basis internal and external events including Design Basis Accidents (DBAs), Anticipated Operational Transients, Abnormal Operational Transients, and natural phenomena as described in the current licensing basis (CLB) are considered when scoping for license renewal. Safety-related systems and structures required to support 10 CFR 54.4(a)(1) functions are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). Nonsafety-related systems and structures required to support 10 CFR 54.4(a)(1) functions are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

Exposure Limits

The license renewal rule refers to exposure limits as defined in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, as applicable. These different exposure limit requirements appear in three different Code sections to address similar accident analyses performed by licensees for different reasons. The exposure limits in 10 CFR 50.34(a)(1) are applicable to facilities seeking a construction permit and are, therefore, not applicable to CPS license renewal.

The original USAR Chapter 15 accident analyses were performed to address 10 CFR 100 guidelines. For the postulated Fuel Handling Accident (FHA), Control Rod Drop Accident (CRDA), Main Steam Line Break (MSLB) accident outside containment, and Loss-of-Coolant Accident (LOCA), a new set of radiological consequence analyses are presented in support of a full scope implementation of Alternative Source Term (AST) methodology in accordance with Regulatory Guide 1.183. The dose consequences for these limiting design basis accidents result in doses that are within the guidelines of 10 CFR 50.67.

When supplemented with the broad review of CLB design basis events, the CPS procedure definition of “safety-related” is consistent with 10 CFR 54.4(a)(1), and results in a comprehensive list of safety-related systems and structures that were included within the scope of license renewal. This is consistent with the guidance in NUREG-1800, Section 2.1.3.1.1. Additional detail on the application of the 10 CFR 54.4(a)(1) scoping criterion is provided in Section 2.1.5.1.

2.1.3.3 10 CFR 54.4(a)(2) Scoping Criteria

All nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1), were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) requirements. To assure complete and consistent application of this scoping criterion, a technical basis document was prepared.

This license renewal scoping criteria requires consideration of the following:

1. Functional (a)(2) - A nonsafety-related SSC that is functionally relied upon in the CLB to (a) directly support a safety-related SSC in performing its 10 CFR 54.4(a)(1) function, or (b) directly mitigate the consequences of a Design Basis Event (DBE).

2. Spatial interaction - The effect(s) of nonsafety-related SSC failure on a safety-related component, such as pipe whip, jet impingement, general flooding, spray, and displacement/falling.

3. Structural interaction - Occurs in situations where a nonsafety-related piping system physically connects to a safety-related system and the nonsafety-related system is relied upon to provide physical support to the safety-related system up to and including an anchor.

The first item is addressed during the scoping process, by identifying the nonsafety-related systems and structures required to functionally support the accomplishment of a safety-related intended function under 10 CFR 54.4(a)(1), and then including these supporting systems and structures in scope of license renewal under 10 CFR 54.4(a)(2).

The remaining two items concern nonsafety-related systems with potential physical or spatial interaction with safety-related SSCs. Scoping of these systems is the subject of NEI 95-10, Appendix F. To assure complete and consistent application of 10 CFR 54.4(a)(2) requirements and NEI 95-10, a technical basis document was prepared. The basis document includes a review of the CLB references relevant to physical or spatial interactions.

The basis document describes the CPS approach to scoping of nonsafety-related systems with a potential for physical or spatial interaction with safety-related SSCs. The basis document provides appropriate guidance to assure that license renewal scoping for 10 CFR 54.4(a)(2) met the requirements of the license renewal rule and NEI 95-10. Additional detail on the application of the 10 CFR 54.4(a)(2) scoping criterion is provided in Section 2.1.5.2.

2.1.3.4 Scoping for Regulated Events

Technical basis documents were prepared to address license renewal scoping of SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Fire Protection, Environmental Qualification, Anticipated Transients Without Scram, and Station Blackout. The Commission’s regulations for pressurized thermal shock are not applicable to the CPS boiling water reactor design. These basis documents are summarized as follows:

Fire Protection

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) are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(3) requirements (Reference 1.7.7).

The scope of systems and structures required for the fire protection program to comply with the requirements of 10 CFR 50.48 includes:

- Systems and structures required to demonstrate post-fire safe shutdown capabilities (FSSD)
- Systems and structures required for fire protection (FP) (detection, suppression, and barriers)

The fire protection technical basis document summarizes results of a detailed review of the plant’s fire protection program documents that demonstrate compliance with the requirements of 10 CFR 50.48. The basis document provides a list of systems and structures credited in the plant’s fire protection program documents. For the listed systems and structures, the basis document also identifies appropriate CLB references. The identified systems and structures are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(3) scoping criteria.

The fire detection and suppression systems at CPS are plant-wide systems that protect a wide variety of plant equipment. Not all portions of these systems are required to demonstrate compliance with 10 CFR 50.48. Some portions of the fire detection and suppression systems protect plant areas in which a fire would not impact any equipment important to safety or significantly increase the risk of radioactive releases to the environment. Portions of the fire suppression and detection systems are not included within the scope of license renewal if (1) those portions of the system are provided to protect areas that do not contain any SSCs within the scope of license renewal and (2) those portions of the system can be isolated from the in scope portions of the system by closing the associated isolation valve. The isolation valve is included within the scope of license renewal.

Environmental Qualification

Criterion 10 CFR 54.4(a)(3) requires that 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 environmental qualification (10 CFR 50.49) be included within the scope of license renewal (Reference 1.7.8).

The CPS Environmental Qualification (EQ) program includes safety-related electrical and mechanical equipment and certain post-accident monitoring equipment, as defined in 10 CFR 50.49(b)(1) and 10 CFR 50.49(b)(3) respectively. This equipment is included within the scope of license renewal. There is no non-safety-related electrical equipment installed at CPS whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions, as defined in 10 CFR 50.49(b)(2) and, as such, none is included in the CPS EQ program.

The environmental qualification basis document summarizes the results of a review of CPS EQ program documents. The EQ basis document provides a list of systems that include EQ components. The EQ basis document also provides a list of structures that provide the physical boundaries for the postulated harsh environments and contain environmentally qualified electrical equipment. These systems and structures are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(3) scoping criteria.

Anticipated Transients Without Scram

Criterion 10 CFR 54.4(a)(3) requires that 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 anticipated transients without scram (10 CFR 50.62) be included within the scope of license renewal (Reference 1.7.9).

An Anticipated Transient Without Scram (ATWS) is an anticipated operational occurrence that generates an automatic scram signal, accompanied by a failure of the reactor protection system to automatically shut down the reactor. The ATWS rule (10 CFR 50.62) requires improvements in the design and operation of light-water cooled water reactors to reduce the likelihood of failure to automatically shut down the reactor, and to mitigate the consequences of an ATWS event. CPS Unit 1 is a boiling water reactor (BWR). For BWRs, the following requirements apply:

1. Each BWR must have an alternate rod injection (ARI) system with redundant scram air header exhaust valves. The ARI system must be independent of the existing reactor trip system.

2. Each BWR must have a standby liquid control system with defined boron injection capabilities. Standby liquid control system automatic initiation is not required for plants issued a construction permit before July 26, 1984, unless already installed. The CPS standby liquid control system is manually initiated.

3. Each BWR must have equipment to trip the recirculation pumps automatically under conditions indicative of an ATWS.

The ATWS basis document summarizes the results of a review of the CPS current licensing basis with respect to ATWS. The CPS design features to meet the requirements of 10 CFR 50.62 for ATWS mitigation include:

- Alternate Rod Insertion (ARI) system features to satisfy the requirements of 10 CFR 50.62(c)(3). The ARI plant system is included in the Control Rod Drive license renewal system.

- Standby Liquid Control (SLC) system to meet the requirements of 10 CFR 50.62(c)(4).

- ATWS Recirculation Pump Trip (RPT) system to satisfy the requirements of 10 CFR 50.62(c)(5). The ATWS-RPT function is included in the Reactor Recirculation license renewal system.

The ATWS basis document provides a list of the systems required by 10 CFR 50.62 to reduce the risk from ATWS events. The basis document also provides a list of structures that provide physical support and protection for the ATWS systems. These systems and structures are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(3) scoping criteria.

Station Blackout

Criterion 10 CFR 54.4(a)(3) requires that all systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63) be included within the scope of license renewal (Reference 1.7.10).

A station blackout (SBO) event is a complete loss of alternating current (AC) electric power to the essential and nonessential switchgear buses in a nuclear power plant (i.e., loss of the offsite electric power system concurrent with generator trip and unavailability of the onsite emergency AC power sources). SBO does not include the loss of available AC power to buses fed by station batteries through inverters or by alternate AC sources, nor does it assume a concurrent single failure or design basis accident. The SBO recovery path boundaries are shown in Figure 2.1-2.

The NUREG-1800 guidance on scoping of equipment relied on to meet the requirements of the SBO rule (10 CFR 50.63) for license renewal has been incorporated into the CPS scoping methodology. In accordance with this guidance, the SSCs required to cope with and recover from the SBO event are included within the scope of license renewal.

The required coping duration category for CPS was based upon the following factors:

1. Offsite Power Design – Plant offsite AC power design characteristic Group “P1”

2. Onsite Emergency AC Power Configuration – Emergency AC (EAC) power configuration Group “C”

3. Target Emergency Diesel Generator (EDG) Reliability – 0.95

Using the above factors and Table 3-8 in NUMARC 87-00 (Table 2 in Regulatory Guide 1.155), CPS is a four-hour coping duration plant.

Station Blackout occurs as a result of a Loss of Off-site Power (LOOP) in conjunction with a Loss of On-site AC Power (i.e., failure of Division 1 and Division 2 diesel generators). The Division 3 diesel generator is assumed to be available to support the operation of the high pressure core spray system and supply water to the reactor vessel from the suppression pool during the SBO. The Division 3 diesel generator is not considered an “Alternate AC” power source because Division 3 does not supply power to other safe shutdown loads. Therefore, even though the Division 3 diesel generator is available, the CPS coping analysis uses the AC-independent approach. The reactor core isolation cooling system is assumed to operate normally for coping with a Station Blackout, supplying water from the suppression pool to the reactor vessel.

Coping assessments were performed for:

1. Condensate inventory

2. Class 1E battery capacity

3. Compressed air

4. Loss of ventilation

5. Containment isolation

In each case, the ability to successfully cope with an SBO for the four-hour coping duration was demonstrated.

The SBO event is defined as the loss of offsite and onsite AC electric power to the essential and non-essential switchgear buses in a nuclear power plant. Both the offsite and onsite power systems are relied upon to meet the requirements of the SBO rule. For purposes of the license renewal rule, the NRC has determined that a portion of the offsite power system that is used to connect the plant to the offsite power source should be included within the scope of the rule. The path typically includes the switchyard circuit breakers that connect to the offsite system power transformers (system auxiliary transformers), the transformers themselves, the intervening overhead or underground circuits between circuit breakers and transformers and transformers and onsite electrical distribution system, and the associated control circuits and structures. Ensuring that the appropriate offsite power system long-lived passive components and structures that are part of this circuit path are subject to an aging management review assures that the bases underlying the SBO requirements are maintained over the period of extended operation.

For CPS, recovery from an SBO event is accomplished via existing offsite and onsite power sources. Onsite power is included within the scope of license renewal on the basis of the requirements under 10 CFR 54.4(a)(1) (safety-related systems). The following offsite power sources as considered in the scoping of long-lived passive components and structures required for SBO recovery:

<u>138-kV Offsite Power System</u>

138-kV offsite power system provides power to the station by one, two-terminal transmission line. This line connects the station to the Ameren Illinois grid at the South Bloomington and Clinton Route 54 Substations. Electrical power can be fed to the station through this line from South Bloomington or North Decatur (via Clinton Route 54 Substation) or both. The line terminates directly (through a circuit switcher B018) at the emergency reserve auxiliary transformer (ERAT), which transforms the electrical power to 4160-V auxiliary bus voltage and is included in scope. The license renewal boundary includes circuit switcher B018, where the 138-kV offsite power source boundary terminates.

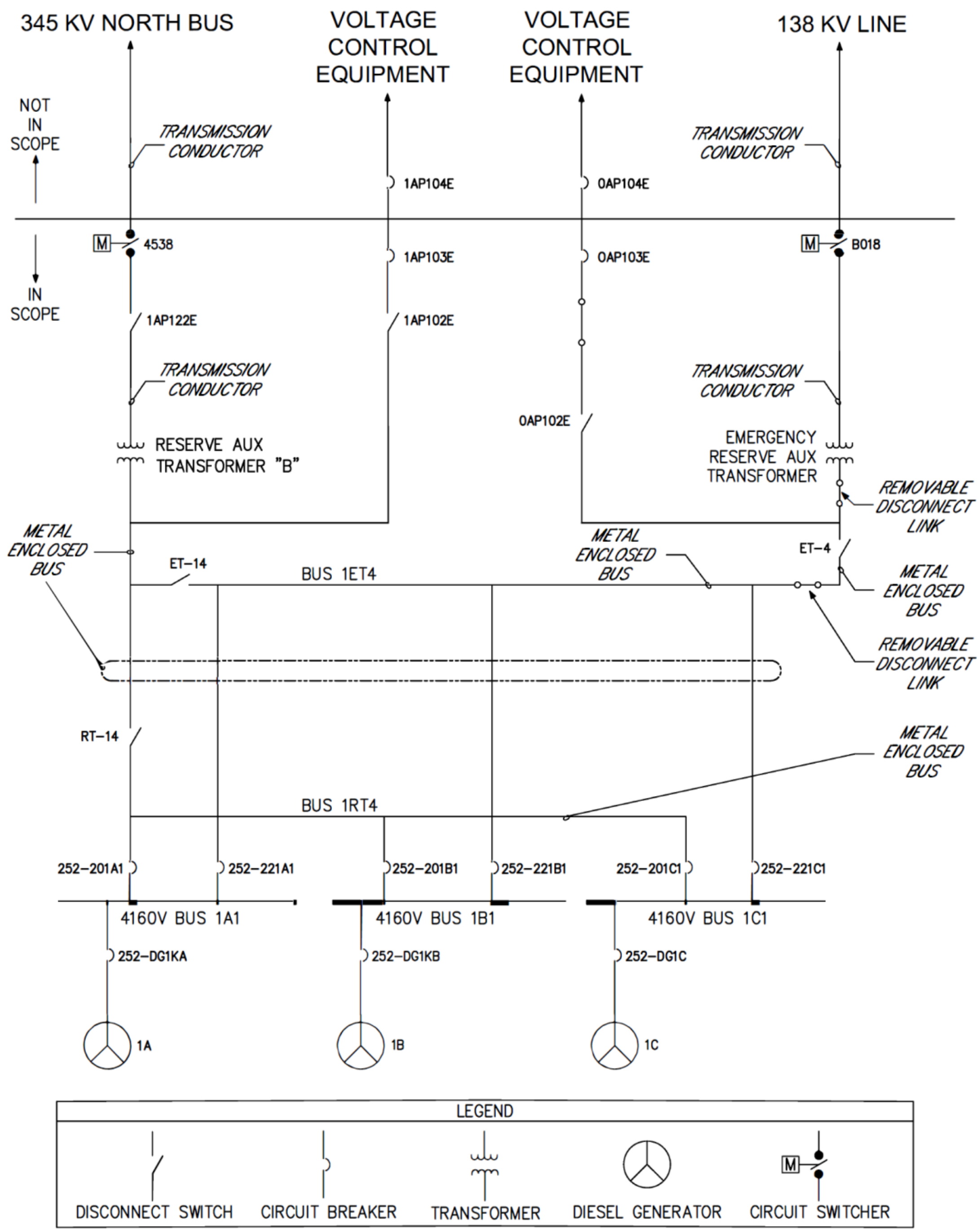
<u>345-kV Offsite Power System</u>

The 345-kV offsite power system provides power to the station through three transmission lines. These lines connect the station to the Ameren Illinois Company grid at Brokaw, Goose Creek-Oreana, and Oreana Substations. All three lines terminate at the station switchyard ring bus between circuit switcher 4538 and disconnect switch 1AP122E, powering reserve auxiliary transformers (RAT) A, B and C, which in turn transforms the electrical power to the 6900-V and 4160-V auxiliary bus voltages. RAT B provides offsite power from the 345-kV source to the safety-related 4160-V busses and is in scope. RAT A and RAT C are not required for SBO recovery and are not in scope. The license renewal boundary includes circuit switcher 4538, where the 345-kV offsite power source boundary terminates.

This boundary is consistent with NRC standard review plan for license renewal, NUREG-1800, section 2.5.2.1.1 for the boundary for the station blackout recovery path. The NUREG states that the in scope plant system portion of the offsite power system that is used to connect the offsite power source is the equipment out to the first circuit breaker with the offsite distribution system at distribution voltage. This typically includes equipment in the switchyard with the boundary point being a component that operates at transmission system distribution voltage. The associated control circuits and structures are included in scope for license renewal. See Figure 2.1-2 for the CPS SBO recovery path boundary.

Figure 2.1-2 also shows CPS connections to the 138 kV and 345 kV transmission systems. Offsite power is supplied to the switchyard from the transmission network. From the switchyard, one 345 kV circuit provides AC power to each 4.16 kV ESF bus. An electrically and physically independent 138 kV power source provides a second completely independent circuit to each 4.16 kV ESF bus. The SBO basis document summarizes the results of a review of the CPS current licensing basis with respect to station blackout. The basis document provides lists of systems and structures credited in CPS SBO evaluations. For the listed systems and structures, the basis document also identifies appropriate CLB references. These systems and structures are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(3) scoping criteria.

Figure 2.1-2
CLINTON SBO RECOVERY POWER PATH



2.1.4 INTERIM STAFF GUIDANCE DISCUSSION

The NRC has encouraged applicants for license renewal to address Interim Staff Guidance (ISG) issues in license renewal applications. The following is a discussion of ISGs reviewed that have not been incorporated in NUREG-1800 or NUREG-1801 as of September 2023.

LR-ISG-2011-01 Aging Management of Stainless Steel Structures and Components in Treated Borated Water, Revision 1

This LR-ISG provides interim guidance to applicants for license renewal as to one acceptable approach to managing the aging effects of stainless steel structures and components exposed to treated borated water. New guidance has also been provided for BWR spent fuel storage racks for which there is currently no specific guidance in the GALL Report for the loss of material aging effect. CPS incorporates the guidance presented in this LR-ISG for BWRs and utilizes the One-Time Inspection (B.2.1.21) program and Water Chemistry (B.2.1.2) program to manage loss of material of stainless spent fuel storage racks exposed to treated water in the Fuel Pool Cooling and Storage System. Results are provided in Section 3, Aging Management Review Results.

LR-ISG-2011-02 Aging Management Program for Steam Generators

This guidance does not apply because CPS is a boiling water reactor.

LR-ISG-2011-03 Generic Aging Lessons Learned (GALL) Report Revision 2 AMP XI.M41, “Buried and Underground Piping and Tanks”

This LR-ISG provides interim guidance to applicants for license renewal as to one acceptable approach to managing the aging effects of buried and underground piping and tanks within the scope of license renewal. LR-ISG-2011-03 revises the guidance provided in NUREG-1801, Revision 2, XI.M41, “Buried and Underground Piping and Tanks” program. The CPS Selective Leaching (B.2.1.22) program, External Surfaces Monitoring of Mechanical Components (B.2.1.24) program and Buried and Underground Piping and Tanks (B.2.1.28) program incorporate the guidance presented in this LR-ISG.

LR-ISG-2011-04 Updated Aging Management Criteria for Reactor Vessel Internal Components of Pressurized Water Reactors

This guidance does not apply because CPS is a boiling water reactor.

LR-ISG-2011-05 Ongoing Review of Operating Experience

This LR-ISG provides interim guidance to applicants for license renewal revising NUREG-1800 acceptance criteria and review procedures to better address the ongoing review of operating experience with respect to license renewal aging management programs. The CPS license renewal application incorporates the guidance presented in this LR-ISG. Ongoing review of operating experience is addressed in Appendix A, Section A.1.6 and Appendix B, Section B.1.4.

LR-ISG-2012-01 Wall Thinning Due to Erosion Mechanisms

This LR-ISG provides interim guidance to applicants for license renewal as to one acceptable approach to managing the aging effect of wall thinning due to various erosion mechanisms in piping and components within the scope of license renewal. LR-ISG-2012-01 revises the guidance provided in NUREG-1801, Revision 2, XI.M17, "Flow-Accelerated Corrosion" program. The CPS Flow-Accelerated Corrosion (B.2.1.10) program incorporates the guidance presented in this LR-ISG.

LR-ISG-2012-02 Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation

This LR-ISG provides interim guidance to applicants for license renewal as to one acceptable approach to managing the effects of aging. The ISG addresses recurring internal corrosion, representative minimum sample size for internal inspections, fire water system blockage, revised scope and inspection for tanks, corrosion under insulation, volumetric examination of underground piping, and pressurization of elastomers. The CPS Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program, Fire Water System (B.2.1.17) program, Aboveground Metallic Tanks (B.2.1.18) program, External Surfaces Monitoring of Mechanical Components (B.2.1.24) program, Open-Cycle Cooling Water System (B.2.1.12) program, Selective Leaching (B.2.1.22) program and Closed Treated Water Systems (B.2.1.13) program incorporate the guidance presented in this LR-ISG.

LR-ISG-2013-01 Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In scope Piping, Piping Components, Heat Exchangers, and Tanks

This LR-ISG provides interim guidance to applicants for license renewal as to one acceptable approach to managing loss of coating integrity due to blistering, cracking, flaking, peeling, or physical damage of Service Level III (augmented) coatings. LR-ISG-2013-01 provides for a new NUREG-1801 aging management program for Service Level III (augmented) coatings. CPS will implement the Internal Coatings/Linings for In-scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42) program for managing the loss of coating integrity in Service Level III (augmented) coatings which incorporates the guidance presented in this LR-ISG.

LR-ISG-2015-01 Changes to Buried and Underground Piping and Tank Recommendations

This ISG replaces aging management program (AMP) XI.M41, "Buried and Underground Piping and Tanks," and the associated Updated Safety Analysis Report Summary Description in LR-ISG-2011-03, "Changes to the Generic Aging Lessons Learned (GALL) Report, Revision 2 Aging Management Program (AMP) XI.M41, 'Buried and Underground Piping and Tanks'." In addition, recommendations contained within AMP XI.M41 related to reductions in the extent of inspections to manage selective leaching in buried components were relocated to AMP XI.M33, "Selective Leaching." This LRA is consistent with the recommendations of LR-ISG-2015-01 in the AMR tables in Section 3, and in the program evaluations in Appendix B, section B.2.1.22 and section B.2.1.28.

LR-ISG-2016-01 Changes to Aging Management Guidance for Various Steam Generator Components

This ISG addresses aging management of PWR components. This guidance does not apply because CPS is a boiling water reactor.

Subsequent License Renewal (i.e., 60 to 80 years of operation) guidance documents are not applicable to the CPS initial license renewal application. However, these documents are treated as operating experience that may be relevant. This operating experience has been considered in the CPS integrated plant assessment (IPA) and applied as appropriate, on a limited basis. The AMR results in Section 3 may include a plant-specific note for line items that include clarification from SLR operating experience. Similarly, AMP descriptions in Appendix B indicate when an element(s) of the program is clarified by SLR operating experience.

2.1.5 SCOPING PROCEDURE

The scoping process is the systematic approach used to identify the CPS systems, structures, and components within the scope of license renewal. The scoping process was initially performed at the system and structure level, in accordance with the scoping criteria identified in 10 CFR 54.4(a). System and structure functions and intended functions were identified from a review of the source CLB documents. In scope boundaries were established and documented in the system and structure scoping reports, based on the identified intended functions. The in scope boundaries form the basis for identification of the in scope components, which is the first step in the screening process described in Section 2.1.6. The system and structure scoping results are provided in Section 2.2.

The CPS scoping process began with the development of a comprehensive list of plant systems and structures, as described in Section 2.1.3.1. The systems and structures were grouped into one of the following categories:

- Reactor Vessel, Internals, and Reactor Coolant System
- Engineered Safety Features
- Auxiliary Systems
- Steam and Power Conversion System
- Structures and Component Supports
- Electrical and I&C Systems

Each CPS system and structure was then scoped for license renewal using the criteria of 10 CFR 54.4(a). These criteria are briefly identified as follows:

- Title 10 CFR 54.4(a)(1) – Safety-Related
- Title 10 CFR 54.4(a)(2) – Nonsafety-Related affecting safety-related
- Title 10 CFR 54.4(a)(3) – Regulated Events:
    - Fire Protection (10 CFR 50.48)
    - Environmental Qualification, EQ (10 CFR 50.49)

- Pressurized Thermal Shock (10 CFR 50.61) (PWRs only)
- Anticipated Transient Without Scram, ATWS (10 CFR 50.62)
- Station Blackout, SBO (10 CFR 50.63)

The application of each of these criteria is discussed in Section 2.1.5.1, Section 2.1.5.2, and Section 2.1.5.3 below:

2.1.5.1 Safety-Related – 10 CFR 54.4(a)(1)

In accordance with 10 CFR 54.4(a)(1), the systems, structures, and components within the scope of license renewal include:

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 shutdown 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 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, as applicable.

At CPS, the safety-related plant components are identified in controlled engineering drawings and in the Passport equipment database. The safety-related classifications in the CPS Passport equipment database were populated using a controlled procedure, with classification criteria consistent with the above 10 CFR 54.4(a)(1) criteria. The classification criteria differences have been evaluated in a license renewal basis document as described in Section 2.1.3.2 and accounted for during the license renewal scoping process.

Safety-related classifications for systems and structures are based on system and structure descriptions and analyses in the USAR, on Table 3.2-1 of the USAR, or on design basis documents such as engineering drawings, design specifications, evaluations, or calculations. Systems and structures that are identified as safety-related in the USAR or in design basis documents have been classified as satisfying the criteria of 10 CFR 54.4(a)(1) and have been included within the scope of license renewal. The Passport equipment database listing of safety-related components was also reviewed to identify the systems and structures included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1) criteria.

2.1.5.2 Nonsafety-Related Affecting Safety-Related – 10 CFR 54.4(a)(2)

In accordance with 10 CFR 54.4(a)(2), the systems, structures, and components within the scope of license renewal include:

- All nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1)(i), (ii), or (iii).

This scoping criterion requires an assessment of nonsafety-related SSCs with respect to the following application or configuration categories:

- Functional support for safety-related SSC 10 CFR 54.4(a)(1) functions
- Connected to and provide structural support for safety-related SSCs
- Potential for spatial interactions with safety-related SSCs

Each of these three categories is discussed as follows:

Functional Support for Safety-Related SSC 10 CFR 54.4(a)(1) Functions

This category addresses nonsafety-related SSCs that are required to function in support of a safety-related SSC intended function. The functional requirement distinguishes this category from the other categories, where the nonsafety-related SSCs are required only to maintain adequate integrity to preclude structural failure or spatial interactions. The nonsafety-related SSCs that were included within the scope of license renewal to functionally support a safety-related SSC in performing a 10 CFR 54.4(a)(1) intended function are identified on the license renewal boundary drawings in green.

The USAR and other CLB documents were reviewed to identify nonsafety-related systems required to support satisfactory accomplishment of a safety-related function. Nonsafety-related systems credited in CLB documents to support a safety-related function have been included within the scope of license renewal. CPS classifies systems that are required to perform or support a safety-related function as safety-related, with the following exception:

- The Plant Drainage System is designed to preclude cross-flooding of the standby diesel generator cubicles and the nuclear safety-related ECCS compartments.

- Nonsafety-related Main Steam System SSCs provide for post-accident containment plate out of MSIV bypass leakage.

The standby diesel generator cubicles floor drainage and the ECCS compartment floor drainage portions of this nonsafety-related system were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

The nonsafety-related volumes associated with horizontal runs of seismically qualified main steam line piping credited for aerosol and iodine removal were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

As an additional confirmation of scoping to meet 10 CFR 54.4(a)(2) criteria, a supporting system review was completed as part of the scoping process. The scoping process was performed on a system basis. For systems included within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(1), the scoping evaluation included the identification of any additional systems, including nonsafety-related systems, which support the system functions. If any of these identified supporting systems were required to support a 10 CFR 54.4(a)(1) function, that supporting system would need to be included in scope with the support function identified as a 10 CFR 54.4(a)(2) intended function for license renewal. The review confirmed that, except as identified above, the CPS systems required to support 10 CFR 54.4(a)(1) functions are classified safety-related, and as such included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). The identification of supporting systems was not required for structures since structural intended functions do not rely on supporting systems.

The next two 10 CFR 54.4(a)(2) scoping categories are the subject of NEI 95-10, Appendix F. The guidance requires that, when demonstrating that failures of nonsafety-related systems would not adversely impact the ability to maintain intended functions, a distinction must be made between nonsafety-related systems that are directly connected to safety-related systems and provide support for safety-related SSCs, and those that are not directly connected to safety-related systems and have the potential for spatial interactions with safety-related SSCs. The methodology as described below for the identification of CPS SSCs that satisfy the 10 CFR 54.4(a)(2) scoping criterion was based on a review of applicable CLB documents, as well as plant-specific and industry operating experience.

Connected to and Provide Structural Support for Safety-Related SSCs

For nonsafety-related SSCs directly connected to safety-related SSCs the nonsafety-related piping and supports, up to and including the first seismic or equivalent anchor (such as a series of supports that have been evaluated as a part of a plant-specific piping design analysis to ensure that forces and moments are restrained in three orthogonal directions) beyond the safety/nonsafety interface, are within the scope of license renewal per 10 CFR 54.4(a)(2). The “first seismic or equivalent anchor” is defined such that the failure in the nonsafety-related pipe run beyond the first seismic or equivalent anchor will not render the safety-related portion of the piping unable to perform its intended function under CLB design conditions.

An alternative to specifically identifying a seismic anchor or equivalent anchor that supports the safety-related/nonsafety-related piping interface is to include enough of the nonsafety-related piping run to ensure these anchors are included and thereby ensure the piping and anchor intended functions are maintained. The intended function consists of two facets 1) providing structural support for the safety-related/nonsafety-related interface and 2) ensuring unacceptable nonsafety-related piping loads are not transferred through the safety-related/nonsafety-related interface. In accordance with NEI 95-10, Appendix F, the following methods (a) thru (g) were considered to define end points for the portion of nonsafety-related piping attached to safety-related piping to be included in the scope of license renewal. In these cases, the nonsafety-related piping was included in scope for 10 CFR 54.4(a)(2) up to one of the following:

a. A combination of restraints or supports that encompasses at least two supports in each of three orthogonal directions.

b. A base-mounted component (e.g., pump, heat exchanger, tank, etc.) that is a rugged component and is designed not to impose loads on connecting piping. The license renewal scope includes the base-mounted component as it has a support function for the safety-related piping.

c. A flexible connection that is considered a pipe stress analysis model end point when the flexible connection effectively decouples the piping system (i.e., does not support loads or transfer loads across it to connecting piping).

d. A free end of nonsafety-related piping, such as a drain pipe that ends at an open floor drain.

e. For nonsafety-related piping runs that are connected at both ends to safety-related piping, the entire run of nonsafety-related piping is included in scope.

f. A point where buried piping exits the ground. The buried portion of the piping should be included in the scope of license renewal. A determination that the buried piping is well founded on compacted soil that is not susceptible to liquefaction must be documented.

g. A smaller branch line where the moment of inertia ratio of the larger piping to the smaller piping is equal to or greater than the acceptable ratio defined by the current licensing basis, because significantly smaller piping does not impose loads on larger piping and does not support larger piping. The moment of inertia ratio used was 3 to 1.

These scoping boundaries are determined from review of the physical installation details, design drawings, or seismic analysis calculations.

Failure in the nonsafety-related piping beyond the above anchor locations would not impact structural support for the safety-related piping. The associated piping and components included within the scope of license renewal are identified on the license renewal boundary drawings in red. Symbols identifying the anchor locations and the seismic analysis boundaries that define the structural support boundary for safety-related piping systems are shown on the license renewal boundary drawings in blue. Note that if the connected nonsafety-related piping system contains water, steam or oil, then the in scope boundary may extend beyond the locations described above due to potential for spatial interaction with safety-related SSCs.

Potential for Spatial Interactions with Safety-Related SSCs

Nonsafety-related systems that are not connected to safety-related piping or components or are outside the structural support boundary for the attached safety-related piping system and have a spatial relationship such that their failure could adversely impact the performance of a safety-related SSC intended function, must be evaluated for license renewal scope in accordance with 10 CFR 54.4(a)(2) requirements. The structures of concern for potential spatial interaction were identified based on a review of the CLB to determine which structures contained active or passive safety-related SSCs. Plant walkdowns were performed, as required, to confirm that all structures containing safety-related SSCs were identified.

As described in NEI 95-10, Appendix F, there are two options when performing this scoping evaluation: a mitigative option and a preventive option.

Mitigative Option: The mitigative option involves crediting plant mitigative features to protect safety-related SSCs from failures of nonsafety-related SSCs. Plant mitigative features considered include pipe whip restraints, jet impingement shields, spray and drip shields, seismic supports, flood barriers, and physical barriers (e.g., floors, walls, doors, conduit). This option requires a demonstration that the mitigating features are adequate to protect safety-related SSCs from failures of nonsafety-related SSCs regardless of failure location. If this level of protection can be demonstrated, then only the mitigative features need be included within the scope of license renewal. Where possible, mitigative features were used to prevent spatial interaction between safety-related SSCs and nonsafety-related SSCs. No credit was taken for separation by distance alone without a mitigative feature capable of preventing the spatial interaction. The mitigative features were included in the scope of license renewal.

Preventive Option: The preventive option involves identifying the nonsafety-related SSCs that have a spatial relationship such that failure could adversely impact the performance of a safety-related SSC intended function and including the identified nonsafety-related SSC within the scope of license renewal without consideration of plant mitigative features. The preventive option was used for scoping systems located in the Auxiliary Building, Control Building, Primary Containment, Diesel Generator Building, Fuel Building, Screen House, and portions of the Radwaste Building, Turbine Building, and Yard Structures. All liquid filled nonsafety-related SSCs located in these structures were assumed to be located in proximity to safety-related SSCs where potential spatial interaction could occur and were therefore included in scope.

Nonsafety-related piping and components that contain water, oil, or steam, and are located inside structures that contain safety-related SSCs, are included in scope for potential spatial interaction under criterion 10 CFR 54.4(a)(2), unless, as described above, they are located in an area where there is no concern with spatial interaction due to crediting plant mitigative features. High-energy lines (normal operating service conditions above 200 degrees F and above 275 psig) with potential spatial interaction are included in the scope of license renewal under 10 CFR 54.4(a)(1) or (a)(2) depending on their safety classification. Safety-related high-energy lines are in scope under 10 CFR 54.4(a)(1), and nonsafety-related high-energy lines are in scope under 10 CFR 54.4(a)(2). Potential spatial interaction due to leakage or spray is assumed for moderate/low-energy liquid systems (normal operating service conditions less than or equal to 200 degrees F or less than or equal to 275 psig) for system pressure as low as atmospheric.

Air and gas systems (non-liquid) are not a hazard to other plant equipment and have therefore been determined not to have spatial interactions with safety-related SSCs. SSCs containing air or gas cannot adversely affect safety-related SSCs due to leakage or spray, since gas systems contain no liquids that could spray or leak onto safety-related systems to cause shorts or other malfunctions. CPS operating experience was reviewed and confirmed that there have been no failures due to aging in systems containing air or gas that have adversely impacted the accomplishment of a safety function. As described in NEI 95-10, Appendix F, paragraph 5.2.2.2.2 for moderate/low energy liquid systems, physical impact from pipe whip or jet impingement do not occur and need not be considered. This same conclusion can be applied to systems containing air or gas. Thus, the nonsafety-related systems containing air or gas need not be included in the scope of license renewal for spatial interaction. The supports are included in scope to prevent the nonsafety-related piping from falling down and potentially impacting safety-related SSCs.

The piping systems included in the scope of license renewal under 10 CFR 54.4(a)(2) for potential spatial interaction with safety-related SSCs are identified on the license renewal boundary drawings in red.

Scoping of Abandoned Equipment

Abandoned equipment is not included within the scope of license renewal if it has been confirmed to be isolated (cut/capped), vented, and drained. If this confirmation cannot be made, the system or portions thereof, are included within the scope of license renewal for aging management if there is the potential for 10 CFR 54.4(a)(2) spatial or structural interaction. Abandoned equipment is not relied on to perform any function delineated in 10 CFR 54.4(a)(1) or (a)(3) as it is nonoperational. However, failure of abandoned equipment could potentially impact the performance of the safety-related function of surrounding equipment if the abandoned equipment contains water, steam, or oil. If the abandoned equipment excluded from scope has been vented, fluids drained, and isolated (cut/capped), this equipment does not perform a 10 CFR 54.4(a)(2) intended function for license renewal. In addition, disconnection of wiring for power, control, or parameter indication and air supplies is not necessary to assure that the abandoned equipment has no potential spatial interaction with surrounding equipment.

2.1.5.3 Regulated Events – 10 CFR 54.4(a)(3)

In accordance with 10 CFR 54.4(a)(3), the systems, structures, and components within the scope of license renewal include:

> *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).*

The regulation for pressurized thermal shock (10 CFR 50.61) is applicable to pressurized water reactors only, and therefore not applicable to CPS which is a boiling water reactor. For each of the other four regulations, a technical basis document was prepared to provide input into the scoping process. Each of the regulated event basis documents (described in Section 2.1.3.4) identify the systems and structures that are relied upon to demonstrate compliance with the applicable regulation. The basis documents also identify the source documentation used to determine the scope of components within the system that are credited to demonstrate compliance with each of the applicable regulated events. Guidance provided by the technical basis documents was incorporated into the system and structure scoping evaluations, to determine the SSCs credited for each of the regulated events. SSCs credited in the regulated events have been classified as satisfying criteria of 10 CFR 54.4(a)(3) and have been included within the scope of license renewal.

2.1.5.4 System and Structure Intended Functions

For the systems and structures within the scope of license renewal, the intended functions that are the bases for including them within the scope of license renewal are identified and documented in the scoping evaluation. The system or structure intended functions are based on the applicable CLB reference documents. For systems, the system level intended function descriptions associated with 10 CFR 54.4(a)(1) were standardized based on nuclear safety criteria for boiling water reactors as documented in industry standard ANSI/ANS-52.1-1983. The use of standardized 10 CFR 54.4(a)(1) functions provided for consistent function application and appropriate level of detail for system level intended function descriptions. The component level intended functions are the passive component functions that are necessary to support the system or structure intended function(s). The structure and component intended functions are further described in Section 2.1.6.2.

2.1.5.5 Scoping Boundary Determination

Systems and structures that are included within the scope of license renewal are then further evaluated to determine the population of in scope structures and components. This part of the scoping process is also a transition from the scoping process to the screening process. The process for evaluating mechanical systems is different from the process for structures, primarily because the plant design document formats are different. Mechanical systems are depicted primarily on the system piping and instrumentation diagrams (P&ID) that show the system components and their functional relationships, while structures are depicted on physical drawings. Electrical and I&C components of in scope electrical and in scope mechanical systems are placed into commodity groups and are screened as commodities. Scoping boundaries for mechanical systems, structures, and electrical systems are, therefore, described separately.

Mechanical Systems

For mechanical systems, the mechanical components that support the system intended functions are included within the scope of license renewal and are depicted on the applicable system piping and instrumentation diagram. Mechanical system piping and instrumentation diagrams are marked up to create license renewal boundary drawings showing the in scope passive components. Components that are required to perform or support a safety-related function, or a function that demonstrates compliance with one of the license renewal regulated events, are identified on the system piping and instrumentation diagrams by green lines. Nonsafety-related components that are connected to safety-related components and are required to provide structural support at the safety/nonsafety interface, or components whose failure could prevent satisfactory accomplishment of a safety-related function due to spatial interaction with safety-related SSCs, are identified by red lines. A computer sort and download of associated system components from the equipment database confirms the scope of components in the system. Plant walkdowns were performed when required for additional confirmation.

Structures

For structures, the structural components that support the intended functions are included in the scope of license renewal. The structural components are identified from a review of applicable plant design drawings of the structure, applicable USAR sections, and design basis documentation. Plant walkdowns were performed when required for additional confirmation. Structural bolting required to support the structure proper is evaluated with the structure. Structural bolting supporting the intended function of a component support or structural commodity component is evaluated with the component support or structural commodity component. A site plan layout drawing is marked up to create a license renewal boundary drawing showing the structures within the scope of license renewal in green.

Electrical Systems

Electrical and I&C systems, and electrical components within mechanical systems, did not require further system evaluations to determine which components were required to perform or support the identified intended functions. A bounding scoping approach is used for electrical equipment. All electrical components within in scope systems were included within the scope of license renewal. In scope electrical components were placed into commodity groups and were evaluated as commodities during the screening process as described in Section 2.1.6.

2.1.6 SCREENING PROCEDURE

Once the SSCs within the scope of license renewal have been determined, the next step is to determine which structures and components are subject to an aging management review.

2.1.6.1 <u>Identification of Structures and Components Subject to AMR</u>

The requirement to identify structures and components subject to an aging management review is specified in 10 CFR 54.21(a)(1), which states:

Each application must contain the following information:

(a) An integrated plant assessment (IPA). The IPA must –

(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.

Structures and components that perform an intended function without moving parts or without a change in configuration or properties are defined as passive for license renewal. Passive structures and components that are not subject to replacement based on a qualified life or specified time period are defined as long-lived for license renewal. The screening procedure is the process used to identify the passive, long-lived structures and components within the scope of license renewal that are subject to aging management review.

NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” 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. In the few cases where a passive component is determined not to be long-lived, such determination is documented in the screening evaluation and, if applicable, on the associated license renewal boundary drawing.

The CPS structures and components subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21(a)(1) described above. The process implemented to meet these requirements for mechanical systems, structures, and electrical commodities is described as follows:

Mechanical Systems

The mechanical system screening process began with the results from the scoping process. For in scope mechanical systems, the completed scoping packages include written descriptions and marked up system piping and instrumentation diagrams that clearly identify the in-scope system boundary for license renewal. The marked-up system piping and instrumentation diagrams are called license renewal system boundary drawings. These system boundary drawings were reviewed to identify the passive, long-lived components. Component listings from the Passport equipment database were also reviewed to confirm that all system components were considered. In cases where the system piping and instrumentation diagram did not provide sufficient detail, such as for some large vendor supplied components (e.g., compressors, emergency diesel generators), the associated component drawings or vendor manuals were also reviewed. Plant walkdowns were performed when required for confirmation. Mechanical components are screened with the system in which they were scoped.

Some mechanical components, when combined, are considered a complex assembly. A complex assembly is a predominantly active assembly where the performance of its components is closely linked to that of the intended function of the entire assembly, such that testing and monitoring of the assembly is sufficient to identify degradation of these components. An example of a complex assembly are the diesel generators. Complex assemblies are considered active and can be excluded from the requirements of AMR. However, to the extent that complex assemblies include piping or components that interface with external equipment, or components that cannot be adequately tested or monitored as part of the complex assembly, those components are identified and subject to aging management review. This follows the screening methodology for complex assemblies as described in Table 2.1-2 of NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants.”

Structures

The structure screening process also began with the results from the scoping process. For in scope structures, the completed scoping packages include written descriptions of the structure. If only selected portions of the structure are in scope, the in scope portions are described in the scoping evaluation. The associated structure drawings were reviewed to identify the passive, long-lived structures and components, structure types, and component types. Plant walkdowns were performed when required for confirmation.

Electrical Commodities

Screening of electrical and I&C components within the in scope electrical, I&C, and mechanical systems used a bounding approach as described in NEI 95-10. Electrical and I&C components for the in scope systems were assigned to commodity groups. The commodities subject to an aging management review are identified by applying the criteria of 10 CFR 54.21(a)(1). This method provides the most efficient means for determining the electrical commodities subject to an aging management review since many electrical and I&C components and commodities are active.

Electrical and I&C components such as resistance temperature detectors (RTDs), sensors, thermocouples, and transducers as well as electric heaters primarily serve an electrical function; however, they can also serve a mechanical pressure boundary function. According to Appendix B of NEI 95-10, the electrical portions of these components are active per 10 CFR 54.21(a)(1)(i) and are therefore not subject to aging management review. Only the pressure boundary of such an in scope component is subject to aging management review.

The sequence of steps and special considerations for identification of electrical commodities that require an aging management review is as follows:

1. Electrical and I&C components and commodities in systems within the scope of license renewal at CPS were identified and listed. The listing provided by NUREG-1800, Table 2.1-5, is the basis for this list. Electrical and I&C components and commodities were organized into groups such as circuit breakers, switches, and cables. Individual specific components were not identified. The electrical commodities were identified from a review of plant documents, controlled drawings, the Passport equipment database, and interface with the parallel mechanical screening efforts.

2. Following the identification of the electrical commodities, the criterion of 10 CFR 54.21(a)(1)(i) was applied to identify commodities that perform their functions without moving parts or without a change in configuration or properties (referred to as “passive” components). These commodities were identified utilizing the guidance of NUREG-1800, Table 2.1-5.

3. The passive electrical commodities were reviewed to determine if the commodity performs a license renewal intended function. If an electrical commodity does not perform a license renewal intended function, it was not considered further and, therefore, is not subject to an aging management review.

4. The screening criterion found in 10 CFR 54.21(a)(1)(ii) excludes those commodities that are subject to replacement based on a qualified life or specific time period from the requirements of an aging management review. The 10 CFR 54.21(a)(1)(ii) screening criterion was applied to those commodities that were not previously eliminated by the application of the 10 CFR 54.21(a)(1)(i) screening criterion. Components and commodities included in the plant environmental qualification (EQ) program are replaced on a specified interval based on a qualified life. Components and commodities in the EQ program do not meet the “long-lived” criterion of 10 CFR 54.21(a)(1)(ii) and are considered “short-lived” per the regulatory definition and are, therefore, not subject to an aging management review.

5. Components and commodities which support or interface with electrical components and commodities, for example, cable trays, conduits, instrument racks, panels and enclosures, are evaluated as structural components in Section 2.4.

The electrical commodities that require an aging management review are the separate electrical commodities that are not part of a larger active component.

The passive commodities that are not subject to replacement based on a qualified life or specified time period are subject to an aging management review. For CPS, the electrical commodities that require an aging management review are identified in Section 2.5.

2.1.6.2 Intended Function Definitions

The intended functions that the components and structures must fulfill are those functions that are the bases for including them within the scope of license renewal. A component intended function is defined as a passive component function that must be performed in order for the system or structure to be able to perform the system or structure intended function(s). For example, pressure boundary failure of a component would cause loss of inventory from the system, and the system would subsequently be unable to perform its intended function(s). Structures and components may have multiple intended functions. CPS has considered multiple intended functions where applicable, consistent with the staff guidance provided in Table 2.1-3 of NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants.”

Table 2.1-1 provides expanded definitions of structure and component passive intended functions identified in this application.

Table 2.1-1 Passive Structure and Component Intended Function Definitions

Intended Function	Definition
Absorb Neutrons	Absorb neutrons.
Direct Flow	Provide spray shield or curbs for directing flow, which may include protective features for medium energy line breaks (MELB). Also applies to diffusers credited for fluid diffusion/dissipation, e.g., HVAC diffusers.
Electrical Continuity	Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current, or signals.
Expansion/Separation	Provide for thermal expansion and/or seismic separation.
Filter	Provide filtration or foreign material exclusion.
Fire Barrier	Provide rated fire barrier to confine or retard fire from spreading to or from adjacent areas of the plant.
Flood Barrier	Provide flood protection barrier (internal and external flood event). This may include protective features for medium energy line breaks (MELB).
Heat Transfer	Provide heat transfer.
HELB/MELB Shielding	Provide shielding against high energy line breaks (HELB), and protective features for medium energy line breaks (MELB).
Insulate (Electrical)	Insulate and support an electric conductor.
Leakage Boundary	Nonsafety-related component that maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs. This function includes the required structural integrity when the nonsafety-related leakage boundary piping is also attached to safety-related piping.
Maintain Adhesion	Provides adhesion to the substrate.
Mechanical Closure	Provide closure of components. Typically used with bolting.
Missile Barrier	Provide missile barrier (internal or external missiles).
Pipe Whip Restraint	Provide pipe whip restraint.

Table 2.1-1 Passive Structure and Component Intended Function Definitions

Intended Function	Definition
Pressure Boundary	Provide pressure-retaining boundary so that sufficient flow at adequate pressure is delivered, or provide fission product barrier for containment pressure boundary. The Pressure Boundary function envelopes the Structural Integrity and Leakage Boundary functions to ensure structural/spatial interactions cannot cause failure of safety-related SSCs.
Pressure Relief	Provide overpressure protection.
Shelter and Protection	Provide shelter/protection to safety-related components.
Shielding	Provide shielding against radiation.
Spray	Convert fluid into spray.
Structural Integrity (Attached)	Nonsafety-related component that maintains mechanical and structural integrity to provide structural support to attached safety-related piping.
Structural Pressure Barrier	Provide pressure boundary or essentially leak tight barrier to protect public health and safety in the event of any postulated design basis events.
Structural Support	Provide structural support for structures and components within the scope for 10 CFR 54.4(a)(1), (a)(2), or (a)(3) or provide structural integrity to preclude nonsafety-related component interactions that could prevent satisfactory accomplishment of a safety-related function.
Structural Support to maintain core configuration and flow distribution	Provide structural support of fuel assemblies, control rods, and incore instrumentation, to maintain core configuration and flow distribution.
Thermal Insulation	Control of heat loss to preclude overheating of nearby safety-related SSCs.
Thermal Insulation Jacket Integrity	Prevent moisture absorption and provide physical support of thermal insulation.
Throttle	Provide flow restriction.
Vibration Isolation	Provide flexible support to minimize impact of vibration.
Water retaining boundary	Provide an essentially leak-tight boundary.

2.1.6.3 Stored Equipment

Credit is taken for actions required to restore operability to FSSD equipment which has failed as a result of fire-induced damage. In all cases, such credit is taken only to accomplish a function required for cold shutdown. Equipment that is stored on site for installation or use in achieving cold shutdown is considered to be within the scope of license renewal. For each repair credited, a procedure has been written and is available to cover the repair, and the quantity and specific type of materials required by the analysis and the procedure are stored onsite. Stored equipment may also be used as directed by emergency operating procedures. Periodic surveillances are performed to verify that the equipment and materials are at the designated location, in the quantity specified, and in good condition and capable of performing the intended function. Tools and supplies used to place the stored equipment in service are not within the scope of license renewal.

2.1.6.4 Consumables

The evaluation process for consumables is consistent with the guidance provided in NUREG-1800, Table 2.1-3. Consumables have been divided into the following four groups for the purpose of license renewal: (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.

- Group (a) subcomponents (packing, gaskets, component seals, and O-rings): Managing loss of leak tightness due to degraded packing, gaskets, component seals, and O-rings for the pressure boundary and leakage boundary intended functions is not required. It is unlikely that leakage from packing, gaskets, component seals, and O-rings would result in failure of the system to deliver sufficient flow at adequate pressure. In regard to leakage, CPS routinely conducts tours of the operating spaces. When leakage is detected, it is entered into the corrective action program. The leakage is corrected by replacing the packing, gaskets, component seals, and O-rings as consumables.
- Group (b) structural sealants: AMRs were required for structural sealants in structures within the scope of license renewal. A summary of the AMR results is presented in Section 3.5.
- Group (c) subcomponents (oil, grease, and component filters): These subcomponents are short-lived and are periodically replaced. Various plant procedures are used in the replacement of oil, grease, and filters in components that are in scope for license renewal. Therefore, these subcomponents are not subject to an AMR.
- Group (d) consumables (system filters, fire extinguishers, fire hoses, and air packs): System ventilation filters are replaced in accordance with plant procedures based on vendor manufacturers' requirements and system testing. Fire extinguishers, self-contained breathing air packs and fire hoses are within the scope of license renewal but are not subject to aging management because they are replaced based on condition. These components are periodically inspected in accordance with NFPA 10 for

portable fire extinguishers, ANSI Z88.2-1992 for self-contained breathing air packs, and NFPA 1962 for fire hoses. These require replacement of equipment based on their condition or performance during testing and inspection. The periodic inspections are implemented by controlled CPS procedures. These components are subject to replacement based on requirements implemented by controlled procedures and are therefore not long-lived and not subject to an aging management review.

2.1.7 GENERIC SAFETY ISSUES

In accordance with the guidance in NEI 95-10 and Appendix A.3 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," review of NRC generic safety issues (GSIs) as part of the license renewal process is required to satisfy 10 CFR 54.29. This guidance suggests that GSIs involving issues related to license renewal aging management reviews or TLAAs should be addressed in the license renewal application. Based on Nuclear Energy Institute (NEI) and NRC guidance, NUREG-0933 "Resolution of Generic Safety Issues," Supplement 35 (Reference 1.7.15), and more recent NRC Generic Issue Management Control System Reports, the following GSIs are addressed for CPS license renewal:

- GSI 186, Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants - This GSI addresses heavy load issues related to crane design and operation. Aging effects are not central to these issues. The issue does not involve time-limited aging analyses, including typical crane-related TLAAs such as cyclic loading analyses. This issue is now closed. (Reference ML113050589)

- GSI-189, Susceptibility of Ice Condenser Containments to Early Failure from Hydrogen Combustion During a Severe Accident - In response to GSI-189, Clinton committed to enhancing the capability of the containment hydrogen igniters by including a method to supply alternate power to the surviving hydrogen igniter system for beyond design basis events (Reference ML071510562). This issue was closed out following NRC verification that Clinton completed the plant modifications it committed to accomplish as documented in Clinton Power Station NRC Integrated Inspection Report 05000461/2008-003, dated July 22, 2008 (Reference ML082040722).

- GSI-191, Assessment of Debris Accumulation on PWR Sump Performance - This issue is not applicable to CPS. CPS is a BWR.

- GSI-193, BWR ECCS Suction Concerns - The Generic Issues Review Panel completed an assessment and found this issue does not present a significant safety hazard. No further regulatory actions are required. This issue is now closed. (Reference ML16207A507)

- GSI-199, Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States for Existing Plants - This GSI addresses how current estimates of the seismic hazard level at some nuclear sites in the central and eastern United States might be higher than the values used in their original designs and previous evaluations. Aging effects are not central to this issue. This issue does not involve time-limited aging analyses. Activities associated with this issue are covered by 10 CFR 50.54(f) Japan Near Term Task Force (NTTF) Recommendations. (Reference ML17054C552)

- GSI-204, Flooding of Nuclear Power Plant Sites Following Upstream Dam Failures - This GSI addresses the potential flooding effects from upstream dam failure(s) on nuclear power plant sites, spent fuel pools, and sites undergoing decommissioning with spent fuel stored in spent fuel pools. Aging effects are not central to this issue. This issue does not involve time-limited aging analyses. Activities associated with this issue are covered by 10 CFR 50.54(f) Japan Near Term Task Force (NTTF) Recommendations. (Reference ML20260H122)

Therefore, there are no GSIs involving issues related to aging management reviews or TLAAs that need to be addressed as part of the CPS license renewal application.

2.1.8 CONCLUSION

The scoping and screening methodology described above was used for the CPS IPA to identify the systems, structures, and components that are within the scope of license renewal and that are subject to an aging management review. The methodology is consistent with and satisfies the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

2.2 PLANT LEVEL SCOPING RESULTS

Table 2.2-1 lists the Clinton Power Station systems, structures and commodity groups that were evaluated to determine if they were within the scope of license renewal, using the methodology described in Section 2.1. A reference to the section of the application that contains the scoping and screening results is provided for each in scope system, structure, and commodity group in the Table.

Table 2.2-1 Plant Level Scoping Results

System, Structure or Commodity Group	In Scope for License Renewal?	Reference
Reactor Vessel, Internals, and Reactor Coolant System		
Reactor Coolant Pressure Boundary System	Yes	2.3.1.1
Reactor Vessel	Yes	2.3.1.2
Reactor Vessel Internals	Yes	2.3.1.3
Engineered Safety Features		
High Pressure Core Spray System	Yes	2.3.2.1
Low Pressure Core Spray System	Yes	2.3.2.2
Reactor Core Isolation Cooling System	Yes	2.3.2.3
Residual Heat Removal System	Yes	2.3.2.4
Standby Gas Treatment System	Yes	2.3.2.5
Auxiliary Systems		
Auxiliary Steam System	No	USAR 1.2.2.8.13
B.5.b and Flex Equipment	No	USAR – none applicable
Closed Cycle Cooling Water System	Yes	2.3.3.1
Combustible Gas Control System	Yes	2.3.3.2
Compressed Air System	Yes	2.3.3.3
Control Rod Drive System	Yes	2.3.3.4
Control Room Ventilation System	Yes	2.3.3.5
Cranes, Hoists, and Refueling Equipment System	Yes	2.3.3.6
Demineralized Water Makeup System	Yes	2.3.3.7
Diesel Generator and Auxiliaries System	Yes	2.3.3.8
Electrical Penetration Pressurization System	No	USAR – none applicable

Table 2.2-1 Plant Level Scoping Results

System, Structure or Commodity Group	In Scope for License Renewal?	Reference
Fire Protection System	Yes	2.3.3.9
Fuel Pool Cooling and Storage System	Yes	2.3.3.10
Nonsafety-Related Ventilation System	Yes	2.3.3.11
Open Cycle Cooling Water System	Yes	2.3.3.12
Plant Drainage System	Yes	2.3.3.13
Primary Containment Ventilation System	Yes	2.3.3.14
Process Radiation Monitoring System	Yes	2.3.3.15
Process Sampling and Post Accident Monitoring System	Yes	2.3.3.16
Radwaste System	Yes	2.3.3.17
Reactor Water Cleanup System	Yes	2.3.3.18
Safety-Related Ventilation System	Yes	2.3.3.19
Standby Liquid Control System	Yes	2.3.3.20
Suppression Pool Cleanup System	Yes	2.3.3.21
Steam and Power Conversion System		
Condensate System	Yes	2.3.4.1
Feedwater System	Yes	2.3.4.2
Main Generator and Auxiliary System	No	USAR 8.3.1, 10.2.2
Main Steam System	Yes	2.3.4.3
Main Turbine and Auxiliaries System	No	USAR 10.2.2, 10.4
Structures and Component Supports		
Auxiliary Building	Yes	2.4.1
Component Supports Commodity Group	Yes	2.4.2

Table 2.2-1 Plant Level Scoping Results

System, Structure or Commodity Group	In Scope for License Renewal?	Reference
Control Building	Yes	2.4.3
Cooling Lake	Yes	2.4.4
Diesel Generator Building	Yes	2.4.5
Fuel Building	Yes	2.4.6
Insulation Commodities Group	Yes	2.4.7
Miscellaneous Not In Scope Structures	No	Comment 1
Primary Containment	Yes	2.4.8
Radwaste Building	Yes	2.4.9
Screen House	Yes	2.4.10
Structural Commodity Group	Yes	2.4.11
Switchyard Structures	Yes	2.4.12
Tank Foundation and Dikes	Yes	2.4.13
Turbine Building	Yes	2.4.14
Yard Structures	Yes	2.4.15
Electrical Components		
Area Radiation Monitoring System	No	USAR 1.2.2.10.2
Communication System	Yes	USAR 9.5.2
Grounding and Cathodic Protection System	No	USAR 9.5.4.2
Heat Trace System	Yes	USAR 7.6.1, 9.3.7.2, 11.2, 11.4
Leak Detection System	Yes	USAR 1.2.2.3.6
Miscellaneous Electrical System	Yes	USAR 7.1.2, 7.3.1, 11.5.2, 11.5.4

Table 2.2-1 Plant Level Scoping Results

System, Structure or Commodity Group	In Scope for License Renewal?	Reference
Miscellaneous Instrumentation System	Yes	USAR 3.7.4, 7.2.1.1
Neutron Monitoring System	Yes	USAR 7.6.1.5
Offsite Power System	Yes	USAR 8.1, 8.2, 10.2
Onsite Power System	Yes	USAR 7.4, 8.3, 15.9
Plant Computer System	Yes	USAR 7.7.1, 7.7.2
Plant Lighting System	Yes	USAR 9.5.3
Plant Security System	No	USAR – none applicable
Reactor Protection System	Yes	USAR 7.1.1.2, 7.2
Remote Shutdown System	Yes	UFSAR 7.1.2.1.36, 7.4.2.4

Comments:

1. The Miscellaneous Not In Scope Structures are nonsafety-related and provide support, shelter, and protection for personnel, stored materials, or nonsafety-related systems, structures, and components (SSCs) that do not perform an intended function for license renewal. These nonsafety-related structures are also separated from safety-related systems, structures, and components such that the structures' failure would not impact a safety-related function.

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL

2.3.1 REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

The following systems are addressed in this section:

- Reactor Coolant Pressure Boundary System (2.3.1.1)
- Reactor Vessel (2.3.1.2)
- Reactor Vessel Internals (2.3.1.3)

2.3.1.1 Reactor Coolant Pressure Boundary System

Description

The Reactor Coolant Pressure Boundary System (RCPB) contains and transports fluids coming from or going to, the reactor core. The RCPB system includes all those pressure-containing components including pressure vessels, piping, pumps, and valves which are:

a. Part of the reactor coolant system, or

b. Connected to the reactor coolant system, up to and including any, and all, of the following:

    1. The outermost containment isolation valve in system piping which penetrates the primary containment,

    2. The second of the two valves normally closed during normal reactor operation in system piping which does not penetrate the primary containment, and

    3. The reactor coolant system safety/relief valves.

The RCPB includes all ASME Class 1 piping including portions in the following plant systems: nuclear boiler, main steam, feedwater, recirculation, reactor core isolation cooling (RCIC), residual heat removal (RHR), reactor water cleanup (RWCU), low pressure core spray (LPCS), standby liquid control (SLC), high pressure core spray (HPCS), and neutron monitoring.

The RCPB also includes the ASME Class 2 and Class 3 portions of the nuclear boiler instrumentation system from the ASME Class 1 interface to pressure-retaining instruments, the control rod drive (CRD) system seal purge supply to the reactor recirculation pumps, and the reactor recirculation system sample piping.

The RCPB is described in detail in USAR Chapter 5. The RCPB boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Reactor Coolant Pressure Boundary System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Reactor Coolant Pressure Boundary System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Reactor Coolant Pressure Boundary System also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide reactor coolant pressure boundary. The nuclear safety functions of the RCPB are (1) to form a barrier against uncontrolled release of reactor coolant and radioactive material to primary containment and provide geometry that ensures core cooling for any event and (2) to provide system pressure relief. 10 CFR 54.4(a)(1)

2. Provide primary containment boundary. The nuclear safety function of the RCPB is to contain radioactive material leakage or releases from equipment located within the primary containment. The RCPB maintains the primary containment boundary through the containment isolation valves. 10 CFR 54.4(a)(1)

3. Sense process conditions and generate signals for reactor trip or engineered safety features actuation. The nuclear safety function of the RCPB is to sense process conditions and generate signals for reactor trip and engineered safety features operation if process conditions exceed specified limits. Includes indication used for manual actuation of safety-related equipment. The RCPB includes instrumentation and process controls which provide signals for reactor trip and engineered safety features. 10 CFR 54.4(a)(1).

4. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. Includes nonsafety-related SSCs with the potential for spatial or structural interaction with safety-related SSCs that perform a 10 CFR 54.4(a)(1) function. Also includes nonsafety-related SSCs that are functionally relied upon to (a) directly support a safety-related SSC in performing its 10 CFR 54.4(a)(1) function, or (b) directly mitigate the consequences of a Design Basis Event (DBE). The RCPB includes nonsafety-related fluid filled lines which have the potential to interact with safety-related SSCs. 10 CFR 54.4(a)(2).

5. Relied upon 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). The RCPB includes fire safe shutdown functions. The RCPB provides the flow path for reactor coolant makeup and decay heat removal and maintains the reactor coolant pressure boundary in support of reactor safe shutdown. 10 CFR 54.4(a)(3)

6. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The RCPB includes systems that contain electrical equipment subject to the requirements of 10 CFR 50.49, the EQ rule. The RCPB also includes structures that provide the physical boundaries of the postulated harsh environments and contain environmentally qualified electrical equipment. The RCPB contains safety-related components located in areas with harsh environments and therefore have environmental qualifications. 10 CFR 54.4(a)(3)

7. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients Without Scram (10 CFR 50.62). The RCPB includes systems and equipment to reduce the risk from ATWS. The RCPB components receive the recirculation pump trip signal and provides the flow path and maintains the pressure boundary for standby liquid control injection. 10 CFR 54.4(a)(3)

8. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The RCPB includes systems and equipment to cope with a complete loss of offsite and onsite power. The RCPB provides the flow path for reactor coolant makeup and decay heat removal and maintains the reactor coolant pressure boundary in support of reactor safe shutdown. 10 CFR 54.4(a)(3)

USAR References
1.2.2.3.3
3.11
Table 3.2-1
5.0
5.1
5.2.2
5.2.2.4
5.8
5.22
5.26
5.4.8.2
7.3.1
7.4
7.7.1.25
9.3.5
Table 15.9-4
15A.6.6.3
Appendix F Table 1.8-2

License Renewal Boundary Drawings
LR-CPS-M05-1002, Sheet 1
LR-CPS-M05-1002, Sheet 2
LR-CPS-M05-1004, Sheet 1
LR-CPS-M05-1032, Sheet 3
LR-CPS-M05-1046, Sheet 4
LR-CPS-M05-1046, Sheet 6
LR-CPS-M05-1046, Sheet 7
LR-CPS-M05-1047, Sheet 3
LR-CPS-M05-1047, Sheet 8
LR-CPS-M05-1070, Sheet 1
LR-CPS-M05-1071, Sheet 1
LR-CPS-M05-1071, Sheet 2
LR-CPS-M05-1072, Sheet 1
LR-CPS-M05-1072, Sheet 2
LR-CPS-M05-1072, Sheet 3
LR-CPS-M05-1072, Sheet 4
LR-CPS-M05-1073, Sheet 1
LR-CPS-M05-1074, Sheet 1
LR-CPS-M05-1075, Sheet 1
LR-CPS-M05-1075, Sheet 2
LR-CPS-M05-1075, Sheet 3
LR-CPS-M05-1076, Sheet 1

LR-CPS-M05-1076, Sheet 4
LR-CPS-M05-1077, Sheet 1
LR-CPS-M05-1078, Sheet 2
LR-CPS-M05-1079, Sheet 1
LR-CPS-M05-1079, Sheet 2

Table 2.3.1-1 Reactor Coolant Pressure Boundary System
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Leakage Boundary
Bolting (Closure)	Mechanical Closure
Flexible Connection	Leakage Boundary
	Pressure Boundary
Flow Device	Pressure Boundary
	Throttle
Flow Device (Main Steam Flow Restrictor)	Throttle
Heat Exchanger (HPU Oil Cooler) Tubes	Leakage Boundary
Heat Exchanger (Recirculation Pump Motor Winding Cooler) Tubes	Leakage Boundary
Heat Exchanger (Recirculation Pump Oil Cooler) Shell Side Components	Leakage Boundary
Heat Exchanger (Recirculation Pump Seal Inner Tube) Tubes	Pressure Boundary
Heat Exchanger (Recirculation Pump Seal Outer Tube) Tube Side Components	Pressure Boundary
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
Piping, piping components: Class 1 piping, fittings and branch connections < NPS 4”	Pressure Boundary
Pump Casing (Recirculation)	Pressure Boundary
Reactor Vessel Flange Leak Detection Line	Pressure Boundary
Tanks (HPU Reservoir)	Leakage Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.1.2-1 Reactor Coolant Pressure Boundary System
Summary of Aging Management Evaluation

2.3.1.2 Reactor Vessel

Description

The Reactor Vessel system is designed to contain pressure and heat in the core and transfer this heat to the reactor coolant. The Reactor Vessel consists of the cylindrical vessel shell, bottom head, vessel support skirt, top head, nozzles and safe ends, and closure studs and nuts. The Reactor Vessel is a component within the nuclear boiler (NB) plant system. The NB system includes the reactor vessel as well as piping and instrumentation used to monitor reactor vessel conditions. All nuclear boiler plant system components beyond the reactor vessel nozzle safe ends are evaluated as a part of the Reactor Coolant Pressure Boundary.

The purpose of the Reactor Vessel is to maintain the reactor vessel pressure boundary, provide structural support for the reactor vessel internals and core and, along with the Reactor Vessel Internals, provide a floodable volume. The Reactor Vessel provides a boundary to separate fission products from the environment.

The Reactor Vessel is described in detail in USAR Section 5.3. The Reactor Vessel boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Reactor Vessel meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Reactor Vessel is not in scope under 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system would not prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Reactor Vessel also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63). The Reactor Vessel is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49).

Intended Functions

1. Provide reactor coolant pressure boundary. The Reactor Vessel forms a barrier against the release of reactor coolant and radioactive material to the Primary Containment and provide geometry that ensures core cooling for any event. 10 CFR 54.4(a)(1)

2. Maintain reactor core assembly geometry. The nuclear safety function of the Reactor Vessel to maintain reactor core assembly geometry for any event to ensure core cooling, core reactivity control, and the integrity of the fuel cladding as a radioactive material barrier. The Reactor Vessel provides support to the Reactor Vessel Internals and maintains a floodable volume within the reactor. 10 CFR 54.4(a)(1)

3. Provides structural support or restraint to SSCs in the scope of license renewal. The reactor vessel support skirt provides structural support for the reactor vessel. 10 CFR 54.4(a)(1)

4. Relied upon 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). The Reactor Vessel provides the flow path and maintains the reactor coolant pressure boundary for reactor safe shutdown. 10 CFR 54.4(a)(3)

5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62). The Reactor Vessel provides the flow path and maintains the reactor coolant pressure boundary for standby liquid control injection. 10 CFR 54.4(a)(3)

6. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The Reactor Vessel provides the flow path and maintains the pressure boundary for reactor safe shutdown. 10 CFR 54.4(a)(3)

<u>USAR References</u>
3.9.3.4.1.2
3.9.5
5.1
5.3
7.1.2.1.19
9.3.5
15.9
Appendix F Section 1.8

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1002, Sheet 1
LR-CPS-M05-1004, Sheet 1
LR-CPS-M05-1071, Sheet 1
LR-CPS-M05-1071, Sheet 2
LR-CPS-M05-1072, Sheet 1
LR-CPS-M05-1072, Sheet 2
LR-CPS-M05-1072, Sheet 3
LR-CPS-M05-1073, Sheet 1
LR-CPS-M05-1074, Sheet 1
LR-CPS-M05-1075, Sheet 1
LR-CPS-M05-1075, Sheet 2
LR-CPS-M05-1075, Sheet 3
LR-CPS-M05-1078, Sheet 2
LR-CPS-M05-1079, Sheet 2

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

Component Type	Intended Function
Bolting (Head Spray, Head Vent, Spare Nozzle)	Mechanical Closure
Bottom Head	Pressure Boundary
N1 Recirculation Outlet Nozzle	Pressure Boundary
N1 Recirculation Outlet Nozzle Safe End and Weld	Pressure Boundary
N10 Control Rod Drive Return Line Nozzle (Capped)	Pressure Boundary
N11 Core Differential Pressure and Liquid Control Nozzle Safe Ends and Welds	Pressure Boundary
N11 Core Differential Pressure and Liquid Control Nozzle and Nozzle Sleeve	Pressure Boundary
N12 through N14 Instrumentation Nozzles	Pressure Boundary
N15 Bottom Head Drain Nozzle	Pressure Boundary
N15 Bottom Head Drain Nozzle Sleeve	Direct Flow
N16 Vibration Instrumentation Nozzle	Pressure Boundary
N17 Seal Leak Detection Nozzle	Pressure Boundary
N18 Core Differential Pressure Nozzle	Pressure Boundary
N18 Core Differential Pressure Nozzle Safe Ends and Welds	Pressure Boundary
N2 Recirculation Inlet Nozzle	Pressure Boundary
N2 Recirculation Inlet Nozzle Safe End Extension	Pressure Boundary
N2 Recirculation Inlet Nozzle Safe End and Weld	Pressure Boundary
N2 Recirculation Inlet Nozzle Thermal Sleeve	Direct Flow
N2 Recirculation Inlet Nozzle Thermal Sleeve Extension	Direct Flow
N3 Steam Outlet Nozzle and Safe End	Pressure Boundary
N4 Feedwater Nozzle Safe End Extension	Pressure Boundary
N4 Feedwater Nozzle Safe End and Welds	Pressure Boundary
N4 Feedwater Nozzles	Pressure Boundary
N5 Core Spray Nozzle	Pressure Boundary
N5 Core Spray Nozzle Safe End Extension	Pressure Boundary
N5 Core Spray Nozzle Safe End and Welds	Pressure Boundary
N5 Core Spray Nozzle Thermal Sleeve	Direct Flow
N5 Core Spray Nozzle Thermal Sleeve Extension	Direct Flow
N6 RHR/LPCI Nozzle	Pressure Boundary
N6 RHR/LPCI Nozzle Safe End Extension	Pressure Boundary
N6 RHR/LPCI Nozzle Safe End and Welds	Pressure Boundary
N6 RHR/LPCI Nozzle Thermal Sleeve	Direct Flow
N6 RHR/LPCI Nozzle Thermal Sleeve Extension	Direct Flow
N7 Head Cooling RCIC and Vent Nozzle and Blind Flange	Pressure Boundary
N8 Head Vent Spare Nozzle and Blind Flange	Pressure Boundary
N9 Jet Pump Instrumentation Nozzle	Pressure Boundary

Component Type	Intended Function
N9 Jet Pump Instrumentation Nozzle Safe End and Welds	Pressure Boundary
Reactor Vessel Closure Flange Assembly Components	Mechanical Closure
Reactor Vessel Components in the Beltline Region	Pressure Boundary
Support Skirt and Attachment Welds	Structural Support
Top Head and Flange	Pressure Boundary
Vessel Penetrations and Welds	Pressure Boundary
Vessel Shell Attachment Welds	Structural Support to maintain core configuration and flow distribution
Vessel Shell and Welds	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.1.2-2 Reactor Vessel
Summary of Aging Management Evaluation

2.3.1.3 Reactor Vessel Internals

Description

The Reactor Vessel Internals is a normally operating system within the Reactor Vessel that is designed to control the generation of heat in the reactor core, to transfer this heat to the reactor coolant, and to supply dry steam to the Main Steam System. The Reactor Vessel Internals include fuel assemblies that generate heat in the core, control rods and control rod drive (CRD) assemblies that control reactivity in the core, and neutron flux detector assemblies that monitor core reactivity. The major reactor internal components are the core (fuel, channels, control blades, and incore instrumentation), the core support structure (including the shroud, access hole covers, top guide and core plate), the shroud head and steam separator assembly, the steam dryer assembly, the feedwater spargers, the high pressure and low pressure core spray spargers, and the jet pumps. The fuel assemblies (including fuel rods and channel), control blades, incore instrumentation, shroud head and steam separator assembly, and steam dryers are removable when the reactor vessel is opened for refueling or maintenance.

The purpose of the Reactor Vessel Internals is to maintain reactor core assembly geometry, to achieve and maintain the reactor core subcritical for any mode of normal operation or event, to control reactivity in the nuclear reactor core, and to maintain core thermal and hydraulic limits. The purpose of the fuel assemblies is to allow efficient heat transfer from the nuclear fuel to the reactor coolant, to maintain structural integrity, and to provide a fission product barrier. The purpose of the control rods and CRD assemblies is to absorb neutrons in the reactor core to control reactivity. The core shroud, shroud support, core plate, top guide, fuel supports, and control rod guide tubes provide structural support for the reactor core, control rod assemblies, and the incore instrumentation. The configuration of the core shroud, core plate, and jet pump assemblies directs coolant flow through the core and maintains a floodable volume of coolant around the fuel. The high pressure and low pressure core spray piping and spargers and low pressure coolant injection (LPCI) couplings supply and distribute coolant within the shroud during accident conditions. The core plate differential pressure and standby liquid control injection line provides an alternate flowpath for injecting neutron absorber into the reactor core when the normal method via the high pressure core spray (HPCS) injection sparger is unavailable. The steam dryer assembly removes moisture from the wet steam leaving the steam separators. The Reactor Vessel Internals system is required for plant start-up, normal plant operations, normal shutdown, transient, and accident conditions.

The Reactor Vessel Internals are described in detail in USAR Section 4.1.2. There are no license renewal boundary drawings associated with this system.

Reason for Scope Determination

The Reactor Vessel Internals meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Reactor Vessel Internals meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Reactor Vessel Internals also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout

(10 CFR 50.63). The Reactor Vessel Internals is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49).

Intended Functions

1. Maintain reactor core assembly geometry. The nuclear safety function of the reactor core and internals is to maintain reactor core assembly geometry for any event to ensure core cooling, core reactivity control, and the integrity of the fuel cladding as a radioactive material barrier. 10 CFR 54.4(a)(1)

2. Introduce negative reactivity to achieve and maintain subcritical reactor condition. The nuclear safety function of the reactivity control systems is to achieve and maintain the reactor core subcritical (e.g., control rods, control rod drives). 10 CFR 54.4(a)(1)

3. Introduce emergency negative reactivity to make the reactor subcritical. The nuclear safety function of the reactivity control systems is to introduce negative reactivity (e.g., control rod drive scram components and SLC piping) or limit the introduction of positive reactivity. 10 CFR 54.4(a)(1)

4. Sense process conditions and generate signals for reactor trip or engineered safety features actuation. The IRMs and APRMs monitor neutron flux and provide logic signals to the RPS to initiate a scram to prevent fuel clad damage as a result of over-power transients. The ARPM system also generates a simulated thermal power signal. Both upscale neutron flux and upscale simulated thermal power are conditions which provide scram logic signals. 10 CFR 54.4(a)(1)

5. Provide emergency core cooling where the equipment provides coolant directly to the core. The nuclear safety function of the emergency core cooling systems (ECCS) is to provide coolant to the reactor for any event that requires engineered safety features actuation when other means of providing coolant are not sufficient to adequately cool the reactor core. The LPCI couplings and the high pressure and low pressure core spray piping and spargers distribute emergency core cooling flow within the shroud to the reactor core. 10 CFR 54.4(a)(1)

6. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The nonsafety-related steam dryer could interact with safety-related components. 10 CFR 54.4(a)(2)

7. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients Without Scram (10 CFR 50.62). The preferred injection path of sodium pentaborate solution to the reactor vessel from the SLC system is by the HPCS system sparger. An alternate flow path to the reactor vessel is provided through the core plate differential pressure line and the SLC sparger near the bottom of the core shroud. 10 CFR 54.4(a)(3)

8. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The Reactor Vessel Internals system includes CRD assemblies and control rod blades that are required to achieve and maintain safe shutdown of the

reactor. 10 CFR 54.4(a)(3)

9. Relied upon 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). The Reactor Vessel Internals system includes CRD assemblies and control rod blades that are required to achieve and maintain safe shutdown of the reactor. Additionally, the Reactor Vessel Internals system maintains a reactor core coolable geometry. 10 CFR 54.4(a)(3)

USAR References
1.2.2.3.2
1.2.2.4.2
3.9.5
3.9.5.1.1.3
3.9.5.2
3.9.5.3.1
4.1.2
4.1.3
4.5.2

License Renewal Boundary Drawings
None

Table 2.3.1-3 Reactor Vessel Internals
Components Subject to Aging Management Review

Component Type	Intended Function
Control Rod Drive Guide Tube	Structural Support to maintain core configuration and flow distribution
Core Plate DP/SLC Line	Direct Flow
Core Shroud (including repairs) and Core Plate: Core Shroud (upper, central, lower)	Structural Support to maintain core configuration and flow distribution
Core Shroud (including repairs) and Core Plate: Shroud support structure (shroud support cylinder, shroud support plate, shroud support legs)	Structural Support to maintain core configuration and flow distribution
Core Shroud and Core Plate: Access hole cover (welded covers)	Direct Flow
Core Shroud and Core Plate: Core plate, Core plate bolts, Core plate wedges	Structural Support to maintain core configuration and flow distribution
Core Shroud and Core Plate: LPCI coupling	Direct Flow
Core Spray Lines and Spargers: Core spray lines (headers), Spray rings, Spray nozzles, Thermal sleeves	Direct Flow
Fuel Supports and Control Rod Drive Assemblies: Orificed Fuel Support	Structural Support to maintain core configuration and flow distribution
	Throttle
Instrumentation: Intermediate range monitor (IRM) dry tubes, Source range monitor (SRM) dry tubes, Incore neutron flux monitor guide tubes	Pressure Boundary
	Structural Support to maintain core configuration and flow distribution
Jet Pump Assemblies: Adapter lower ring	Direct Flow
Jet Pump Assemblies: Castings	Direct Flow
Jet Pump Assemblies: Holddown beam	Direct Flow
Jet Pump Assemblies: Inlet riser, brace and sleeve, elbow, wedge, diffuser, holddown beam bolt	Direct Flow
Steam Dryer	Structural Integrity (Attached)
Top Guide	Structural Support to maintain core configuration and flow distribution

The aging management review results for these components are provided in:

Table 3.1.2-3 Reactor Vessel Internals
Summary of Aging Management Evaluation

2.3.2 ENGINEERED SAFETY FEATURES

The following systems are addressed in this section:

- High Pressure Core Spray System (2.3.2.1)
- Low Pressure Core Spray System (2.3.2.2)
- Reactor Core Isolation Cooling System (2.3.2.3)
- Residual Heat Removal System (2.3.2.4)
- Standby Gas Treatment System (2.3.2.5)

2.3.2.1 High Pressure Core Spray System

Description

The High Pressure Core Spray (HPCS) System is a standby high pressure emergency core cooling system (ECCS) designed to prevent excessive fuel cladding temperatures following any break in the reactor coolant pressure boundary piping. The HPCS System accomplishes this by delivering water into the reactor pressure vessel (RPV) over a wide range of pressures. For small breaks that do not result in rapid reactor depressurization, the HPCS system spray maintains reactor water level and depressurizes the vessel enabling the low pressure cooling systems to function. For large breaks, the HPCS system sprays the top surface of the core to cool the core until sufficient water accumulates in the vessel to reflood the core.

The HPCS System consists of a single, motor-driven pump and associated piping, valves, controls and instrumentation. The principal active HPCS equipment is located outside the primary containment. Suction piping is provided from the Reactor Core Isolation Cooling (RCIC) System storage tank and the suppression pool. Such an arrangement provides the capability to use reactor grade water from the RCIC storage tank when the HPCS system functions to back up the RCIC system. In the event that the RCIC storage water supply becomes exhausted or is not available, automatic switchover to the suppression pool water source will assure a closed cooling water supply for continuous operation of the HPCS system. After the HPCS injection piping enters the vessel, it divides and enters the shroud at two points near the top of the shroud. A semicircular sparger is attached to each outlet. Nozzles are spaced around the spargers to spray the water radially over the core and into the fuel assemblies.

The HPCS discharge line to the reactor is provided with two isolation valves. These valves and the other Class 1 SSCs of the HPCS System are included in the Reactor Coolant Pressure Boundary (RCPB) license renewal system. HPCS SSCs located within the reactor vessel are included in the Reactor Vessel Internals license renewal system. The suppression pool suction strainers are included in the Residual Heat Removal license renewal system.

HPCS System operation is initiated automatically by a low-water level signal or a high drywell pressure signal, indicative of a loss-of-coolant accident. The system can also be placed in operation manually. The system is designed to operate from normal offsite auxiliary power or from a standby diesel-generator supply if offsite power is not available.

The HPCS System is described in detail in USAR Sections 1.2.2.4.8, 6.3.2.2.1 and 7.3.1.1.1.3. The HPCS System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The High Pressure Core Spray System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The High Pressure Core Spray System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The High Pressure Core Spray System also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. The HPCS System includes safety-related primary containment isolation valves on the HPCS suction from the suppression pool and the HPCS full flow test and minimum flow line, and instrumentation penetrations.
   10 CFR 54.4(a)(1)

2. Provide emergency core cooling where the equipment provides coolant directly to the core. The HPCS System provides core cooling following a break in the reactor coolant pressure boundary by delivering water from the suppression pool or RCIC storage tank through nozzles in a circular sparger located above and around the core periphery.
   10 CFR 54.4(a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The HPCS System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs. 10 CFR 54.4(a)(2)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Anticipated Transients Without Scram (10 CFR 50.62). The HPCS System is used to maintain RPV water level during an ATWS. 10 CFR 54.4(a)(3)

5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The HPCS System includes environmentally qualified components. 10 CFR 54.4(a)(3)

6. Relied upon 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). The HPCS System provides reactor pressure vessel makeup in support of safe shutdown method 3. 10 CFR 54.4(a)(3)

7. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Station Blackout (10 CFR 50.63). The HPCS System is credited for reactor cooling and make-up for Station Blackout coping. 10 CFR 54.4(a)(3)

USAR References
1.2.2.4.8
6.3.2.2.1
7.3.1.1.1.3
7.4
15.9
15A.6.6.3
Appendix 15A
Appendix F

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1074 Sheet 1
LR-CPS-M05-1079 Sheet 2
LR-CPS-M05-1047 Sheet 1

Table 2.3.2-1 High Pressure Core Spray System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Flow Device	Pressure Boundary
	Throttle
Gearbox (HPCS Water Leg Pump)	Pressure Boundary
Piping elements	Pressure Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
Pump Casing (HPCS Pump)	Pressure Boundary
Pump Casing (HPCS Water Leg Pump)	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.2.2-1 High Pressure Core Spray System
Summary of Aging Management Evaluation

2.3.2.2 Low Pressure Core Spray System

Description

The Low Pressure Core Spray (LPCS) System is a standby emergency core cooling system (ECCS) system designed to provide cooling to the reactor core only when the reactor vessel pressure is low, as is the case for large LOCA break sizes. However, when the LPCS System operates in conjunction with the automatic depressurization system (ADS) then the effective core cooling capability of the LPCS System is extended to all break sizes because the ADS will rapidly reduce the reactor vessel pressure to the LPCS System operating range.

The LPCS System consists of a centrifugal pump, a spray sparger in the reactor vessel above the core (separate from the HPCS System sparger); piping and valves to convey water from the suppression pool to the sparger; and associated controls and instrumentation. The LPCS System injection piping enters the vessel, divides, and enters the core at two points near the top of the shroud. A semicircular sparger is attached to each outlet. Nozzles are spaced around the sparger to spray the water radially over the core and into the fuel assemblies.

The LPCS System includes a water-leg pump designed to maintain the LPCS pump discharge piping in a condition that is sufficiently full. The LPCS System shares this water leg pump with the “A” loop of RHR.

The LPCS Class 1 isolation valves and the other Class 1 SSCs of the LPCS System are included in the Reactor Coolant Pressure Boundary (RCPB) license renewal system. LPCS System SSCs located within the reactor vessel are included in the Reactor Vessel Internals license renewal system. The suppression pool suction strainers are included in the Residual Heat Removal license renewal system.

LPCS System operation is initiated automatically by a low water level signal in the reactor vessel or a high drywell pressure signal, indicative of a loss-of-coolant accident. The system can also be placed in operation manually. The system is designed to operate from normal offsite auxiliary power or from a standby diesel-generator supply if offsite power is not available.

The LPCS System is described in detail in USAR Sections 1.2.2.4.8, 6.3.2.2.3, and 7.3.1.1.1.5. The LPCS System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Low Pressure Core Spray System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Low Pressure Core Spray System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Low Pressure Core Spray System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and 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), and Station Blackout (10 CFR 50.63). The Low Pressure Core Spray System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provide primary containment boundary. The LPCS System includes safety-related primary containment isolation valves on the LPCS suction from the suppression pool and the LPCS relief valve discharge piping. 10 CFR 54.4(a)(1)

2. Provide emergency core cooling where the equipment provides coolant directly to the core. The LPCS System provides core cooling following a break in the reactor coolant pressure boundary by delivering water from the suppression pool through nozzles in a circular sparger located above and around the core periphery. 10 CFR 54.4(a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The LPCS System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs. 10 CFR 54.4(a)(2)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The LPCS System includes environmentally qualified components. 10 CFR 54.4(a)(3)

5. Relied upon 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). The LPCS System provides reactor pressure vessel makeup in support of safe shutdown methods 1, 3, and R. 10 CFR 54.4(a)(3)

6. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Station Blackout (10 CFR 50.63). The LPCS System is credited for manual containment isolation for Station Blackout coping. 10 CFR 54.4(a)(3)

USAR References
1.2.2.4.8
6.3.2.2.3
6.3.2.2.5
7.3.1.1.1.5
15.9
Appendix F

License Renewal Boundary Drawings
LR-CPS-M05-1073, Sheet 1
LR-CPS-M05-1047, Sheet 5
LR-CPS-M05-1075, Sheet 1

Table 2.3.2-2 Low Pressure Core Spray System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Flow Device	Pressure Boundary
	Throttle
Piping, piping components	Leakage Boundary
	Pressure Boundary
Pump Casing (LPCS Pump)	Pressure Boundary
Pump Casing (LPCS/RHR A WTR Leg Pump)	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.2.2-2 Low Pressure Core Spray System
Summary of Aging Management Evaluation

2.3.2.3 Reactor Core Isolation Cooling System

Description

The Reactor Core Isolation Cooling (RCIC) System is a non-ECCS standby mechanical system designed to ensure that sufficient reactor water inventory is maintained in the reactor vessel to allow for adequate core cooling. This capability prevents reactor fuel from overheating when (1) the reactor vessel is isolated and maintained in the hot standby condition, (2) the reactor vessel is isolated and accompanied by loss of the coolant flow from the reactor feedwater system, or (3) a complete plant shutdown under conditions of loss of normal feedwater system is started before the reactor is depressurized to a level where the shutdown coolant system can be placed into operation.

The RCIC System consists of a turbine, pump, piping and piping components, valves, and instrumentation designed to assure that sufficient reactor water inventory is maintained in the reactor vessel to permit adequate core cooling to take place. The turbine driven RCIC pump will supply demineralized make-up water from the RCIC storage tank to the reactor vessel. At the minimum storage tank level, an automatic, safety grade switchover to the suppression pool will occur to maximize the utilization of the RCIC injection source and minimize the potential demand for ECCS operation. The turbine will be driven with a portion of the decay heat steam from the reactor vessel and will exhaust to the suppression pool.

The RCIC discharge line to the reactor and the RCIC steam supply are provided with isolation valves. These valves and the other Class 1 SSCs of the RCIC System are included in the Reactor Coolant Pressure Boundary (RCPB) license renewal system. The suppression pool suction strainers are included in the Residual Heat Removal license renewal system.

The RCIC System is described in detail in USAR Sections 1.2.2.4.7 and 5.4.6. The RCIC System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Reactor Core Isolation Cooling System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Reactor Core Isolation Cooling System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Reactor Core Isolation Cooling System also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Remove residual heat from the reactor coolant system. The RCIC system provides coolant flow to the reactor vessel. 10 CFR 54.4 (a)(1)

2. Provide primary containment boundary. The RCIC System includes safety-related primary containment isolation valves on the suction from the suppression pool, turbine

exhaust line, and the minimum flow pump discharge line. 10 CFR 54.4 (a)(1)

3. Sense process conditions and generate signals for reactor trip or engineered safety features actuation. The RCIC System includes instrumentation that provides signals for interlocks, automatic controls, and to initiate credited manual actions. 10 CFR 54.4(a)(1)

4. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The RCIC System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Auxiliary Building. The RCIC System also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping. 10 CFR 54.4(a)(2)

5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients Without Scram (10 CFR 50.62). The RCIC System is used to maintain RPV water level during an ATWS. 10 CFR 54.4(a)(3)

6. Relied upon 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). The RCIC System and RCIC storage tank provides for reactor pressure vessel makeup for SSD Methods 1 and R. The RCIC storage tank provides a water source for the High Pressure Core Spray (HPCS) System for reactor pressure vessel makeup for SSD Method 3. 10 CFR 54.4(a)(3)

7. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The RCIC system includes environmentally qualified electrical components. 10 CFR 54.4(a)(3)

8. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The station blackout coping method uses the RCIC System to provide makeup water for core cooling using the RCIC storage tank as a backup water supply to the suppression pool. 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.4.7
5.4.6
15.9
15A.6.6.3
Figure 15A.6-51
Appendix F

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1047, Sheet 6
LR-CPS-M05-1075, Sheet 4
LR-CPS-M05-1079, Sheet 1
LR-CPS-M05-1079, Sheet 2
LR-CPS-M05-9079, Sheet 1

LR-CPS-M10-9079, Sheet 2

Table 2.3.2-3 Reactor Core Isolation Cooling System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Flow Device	Pressure Boundary
	Throttle
Gearbox (RCIC Water Leg Pump)	Pressure Boundary
Heat Exchanger (Lube Oil Cooler) Shell Side Components	Pressure Boundary
Heat Exchanger (Lube Oil Cooler) Tube Sheet	Pressure Boundary
Heat Exchanger (Lube Oil Cooler) Tube Side Components	Pressure Boundary
Heat Exchanger (Lube Oil Cooler) Tubes	Heat Transfer
	Pressure Boundary
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Piping, piping components: Insulated	Pressure Boundary
Pump Casing (Main Oil Pump)	Pressure Boundary
Pump Casing (RCIC Pump)	Pressure Boundary
Pump Casing (Water Leg Pump)	Pressure Boundary
Rupture Disks	Pressure Boundary
Tanks (RCIC Oil Governor Reservoir)	Pressure Boundary
Tanks (RCIC Storage Tank)- Aboveground Metallic	Pressure Boundary
Turbine Casings (RCIC Turbine)	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary
Valve Body: Insulated	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.2.2-3 Reactor Core Isolation Cooling System
Summary of Aging Management Evaluation

2.3.2.4 Residual Heat Removal System

Description

The Residual Heat Removal (RHR) System is a heat removal system designed to a) remove decay and sensible heat during and after plant shutdown, b) inject water into the reactor vessel, following a loss-of-coolant accident (LOCA), to reflood the core independent of other core cooling systems, c) remove heat from containment, following a LOCA, to limit the increase in containment pressure, d) removes suppression pool heat under normal and post-LOCA conditions, e) provides fuel pool cooling assist during periods of high heat load, and f) provides keep-fill water to the Feedwater (FW) System to limit post-LOCA leakage.

The RHR System is composed of three independent loops. Each loop contains its own motor driven pump, piping, valves, instrumentation and controls. Each loop has a suction source from the suppression pool and is capable of discharging water to the reactor vessel via a separate nozzle, or back to the suppression pool via a full flow test line. In addition, the A and B loops have heat exchangers which are cooled by shutdown service water. Loops A and B can also take suction from the reactor recirculation system suction and can discharge into the reactor via the feedwater line, or to the upper containment pools. The A and B loops are connected to the feedwater system and have the capability to create a water seal on the feedwater system containment isolation check valves. The A loop can also take suction from the fuel pool cooling system surge tanks and return to the fuel pools for supplementing the fuel pool cooling capacity when required. The suppression pool suction strainers are included in the Residual Heat Removal license renewal system. The RHR System has multiple modes as described below.

The residual heat removal mode or shutdown cooling mode maintains the reactor core in a cold shutdown condition and meets the requirements for long-term heat removal. This mode is used to remove decay heat, prevent thermal stratification, and cool the reactor for maintenance and refueling. It also provides a flowpath for core cooling during emergency situations when the normal injection flow path is unavailable. The shutdown service water system takes water from the RPV, cools it in a heat exchanger, and then returns the water to the RPV where it is forced through the reactor core.

The low pressure coolant injection (LPCI) mode is credited as an emergency core cooling system. The function of LPCI is to cool the reactor core by flooding the reactor pressure vessel (RPV) following a loss of coolant accident (LOCA) in time to maintain the fuel cladding below the prescribed temperature limits. LPCI takes water from the suppression pool and injects water directly into the core region of the vessel. The LPCI mode is automatically initiated by low reactor water level or high drywell pressure, indicative of a LOCA, or can be placed in service manually.

The suppression pool cooling mode is used to cool the suppression pool during normal and emergency situations. The purpose of this mode is to remove the heat that gets transferred to the suppression pool during a LOCA, to control the pool temperature during normal operation of the safety/relief valves and the RCIC system, and to reduce the pool temperature following an isolation transient. The suppression pool cooling mode is manually initiated.

The containment spray mode is used to spray into the containment and suppression pool vapor space to reduce internal pressure to below design limits during a LOCA. The containment spray mode is automatically initiated by high drywell and high containment pressure, indicative of a LOCA, or can be placed in service manually. The containment spray system may also serve as an iodine removal method to reduce releases to the environment following a LOCA, although no credit for iodine removal is taken for dose analysis purposes.

The feedwater leakage control mode (FWLC) provides keep-fill water to the feedwater system to limit leakage after a LOCA. FWLC mode will create a water seal at the outboard feedwater check valves and gate valves following a LOCA and then divert flow from the RHR LPCI, Suppression Pool Cooling and Containment Spray Modes to the feedwater headers without reducing flows in those modes below the modes functional design basis. The FWLC mode is initiated manually approximately 20 minutes after a LOCA.

The fuel pool cooling assist mode uses the RHR loop A heat exchanger to assist in cooling the fuel pool during times of heavy heat load. The fuel pool cooling assist mode is manually initiated.

The RHR Class 1 containment isolation valves and the other Class 1 SSCs of the RHR System are included in the Reactor Coolant Pressure Boundary (RCPB) license renewal system.

The RHR System is described in detail in USAR Sections 1.2.2.3.4, 5.4.7, and 6.3.2.2.4. The RHR System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Residual Heat Removal System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Residual Heat Removal System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Residual Heat Removal System also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. The RHR System provides safety-related primary containment isolation capability on containment spray discharge, suppression pool suction, and test return lines penetrating the primary containment. 10 CFR 54.4(a)(1)

2. Remove residual heat from the reactor coolant system. The RHR System removes sensible and decay heat from the reactor primary system. 10 CFR 54.4(a)(1)

3. Provide emergency core cooling where the equipment provides coolant directly to the core. The RHR System provides water from the suppression pool to be injected directly into the core region of the reactor vessel after a LOCA. 10 CFR 54.4(a)(1)

4. Provide emergency heat removal from primary containment and provide containment pressure control. The RHR System provides for maintaining the suppression pool temperature below required limits after a LOCA. The RHR System also provides for spraying primary containment post-accident. 10 CFR 54.4(a)(1)

5. Sense process conditions and generate signals for reactor trip or engineered safety features actuation. The RHR System provides for associated actuation and system protection logic for engineered safety features operation. 10 CFR 54.4(a)(1)

6. Ensure adequate cooling in the spent fuel pool to maintain stored fuel within acceptable temperature limits. The RHR System provides additional cooling capacity for fuel pool cooling. 10 CFR 54.4(a)(1)

7. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The RHR System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Auxiliary Building. 10 CFR 54.4(a)(2)

8. Relied upon 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). The RHR System provides decay heat removal, reactor water inventory, and suppression pool cooling for Fire Safe Shutdown. Different loops of RHR are credited for Safe Shutdown (SSD) methods 1, 2, 3, and R. 10 CFR 54.4(a)(3)

9. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The RHR system includes environmentally qualified electrical components. 10 CFR 54.4(a)(3)

10. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Station Blackout (10 CFR 50.63). The RHR suppression pool cooling is used following the coping period and recovery of AC sources. 10 CFR 54.4(a)(3)

11. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Anticipated Transients Without Scram (10 CFR 50.62). The RHR suppression pool cooling mode removes decay heat from the suppression pool after blowdown and the shutdown cooling mode maintains core cooling during an ATWS event. 10 CFR 54.4(a)(3)

USAR References
1.2.2.3.4
1.2.2.4.8
1.2.2.4.9.2
1.2.2.4.9.3
5.4.7
6.3.2.2.4
7.3.1
15.9
15A.6.6.3
Appendix F

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1004, Sheet 1
LR-CPS-M05-1047, Sheet 4
LR-CPS-M05-1047, Sheet 5
LR-CPS-M05-1047, Sheet 6
LR-CPS-M05-1047, Sheet 7
LR-CPS-M05-1047, Sheet 9
LR-CPS-M05-1052, Sheet 1
LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1052, Sheet 4
LR-CPS-M05-1073, Sheet 1
LR-CPS-M05-1074, Sheet 1
LR-CPS-M05-1075, Sheet1
LR-CPS-M05-1075, Sheet2
LR-CPS-M05-1075, Sheet3
LR-CPS-M05-1075, Sheet4
LR-CPS-M05-1076, Sheet 4
LR-CPS-M05-1079, Sheet 2

Table 2.3.2-4 **<u>Residual Heat Removal System</u>**
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Flexible Connection	Pressure Boundary
Flow Device	Pressure Boundary
	Throttle
Heat Exchanger (RHR Heat Exchanger) Shell Side Components	Pressure Boundary
Heat Exchanger (RHR Heat Exchanger) Tube Sheet	Pressure Boundary
Heat Exchanger (RHR Heat Exchanger) Tube Side Components	Pressure Boundary
Heat Exchanger (RHR Heat Exchanger) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (Seal Cooler) Shell Side Components	Pressure Boundary
Heat Exchanger (Seal Cooler) Tubes	Heat Transfer
	Pressure Boundary
Hoses	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
Pump Casing (RHR Pump)	Pressure Boundary
Pump Casing (Water Leg Pump)	Pressure Boundary
Spray Nozzles	Spray
Strainer (Element)	Filter
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.2.2-4 Residual Heat Removal System
Summary of Aging Management Evaluation

2.3.2.5 Standby Gas Treatment System

Description

The Standby Gas Treatment System (SGTS) is a standby system that is automatically or manually started to treat air exhausted from the containment gas control boundary, fuel building, steam tunnel, and ECCS pump rooms. Two completely redundant parallel process systems are provided that consist of identical Seismic Category I, 100 percent capacity equipment trains for the station. The SGTS is utilized to reduce iodine and particulate concentrations in gases leaking from the primary containment and which are potentially present in the secondary containment following an accident. The SGTS is capable of maintaining the secondary containment at 0.25 inch H2O negative pressure with respect to the outdoors. Each equipment train contains a fan, demister, prefilter, electric heater, two high efficiency particulate filter banks (water- and fire-resistant), two charcoal iodine adsorbers (fire resistant), and a device to measure and control flow. The SGTS radiation monitors are included in the Miscellaneous Electrical Systems license renewal system.

This system also includes the SGTS room coolers and the hydrogen recombiner room coolers, shown on the SGTS P&ID M05-1105 sheets 4 and 5, respectively.

The SGTS is described in detail in USAR Section 6.5.1. The SGTS boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Standby Gas Treatment System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Standby Gas Treatment System is not in scope under 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system would not prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Standby Gas Treatment System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Station Blackout (10 CFR 50.63). The Standby Gas Treatment System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Control and treat radioactive materials released to the secondary containment. The SGTS maintains a negative pressure within the secondary containment, and filters the exhaust air to reduce iodine and particulate concentrations in gases prior to their elevated release point. 10 CFR 54.4(a)(1)

2. Maintain emergency temperature limits within areas containing safety related components. The SGTS and hydrogen recombiner area room coolers provide cooling to the SGTS and hydrogen recombiner rooms to support safe shutdown of the station following a design basis accident. 10 CFR 54.4(a)(1)

3. Control combustible gas mixtures in the primary containment atmosphere. The SGTS

can be used to remove the hydrogen-air mixture from primary containment as a backup to the hydrogen recombiner system. 10 CFR 54.4(a)(1)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout. (10 CFR 50.63) The SGTS is relied upon to be operable for recovery following a station blackout event. 10 CFR 54.4(a)(3)

5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The SGTS contains components that are environmentally qualified. 10 CFR 54.4(a)(3)

USAR References
1.2.2.4.12
3.11
15.9
6.2.3.3.1
6.2.5.1.2
6.5.1
7.1.2.1.14
7.3.1.1.5.6
7.3.2.9
9.2.1.2
Table 9.2-3

License Renewal Boundary Drawings
LR-CPS-M05-1052, Sheet 1
LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1054, Sheet 28
LR-CPS-M05-1054, Sheet 31
LR-CPS-M05-1054, Sheet 32
LR-CPS-M05-1105, Sheet 1
LR-CPS-M05-1105, Sheet 2
LR-CPS-M05-1105, Sheet 3
LR-CPS-M05-1105, Sheet 4

Table 2.3.2-5 Standby Gas Treatment System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Ducting and Components	Filter
	Pressure Boundary
Flexible Connection	Pressure Boundary
Flow Device	Pressure Boundary
	Throttle
Heat Exchanger (Hydrogen Recombiner Room and SGTS Room Coolers) Fins	Heat Transfer
Heat Exchanger (Hydrogen Recombiner Room and SGTS Room Coolers) Tube Side Components	Pressure Boundary
Heat Exchanger (Hydrogen Recombiner Room and SGTS Room Coolers) Tubes	Heat Transfer
	Pressure Boundary
Piping, piping components	Pressure Boundary
Valve Body	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.2.2-5 Standby Gas Treatment System
Summary of Aging Management Evaluation

2.3.3 AUXILIARY SYSTEMS

The following systems are addressed in this section:

- Closed Cycle Cooling Water System (2.3.3.1)
- Combustible Gas Control System (2.3.3.2)
- Compressed Air System (2.3.3.3)
- Control Rod Drive System (2.3.3.4)
- Control Room Ventilation System (2.3.3.5)
- Cranes, Hoists, and Refueling Equipment System (2.3.3.6)
- Demineralized Water Makeup System (2.3.3.7)
- Diesel Generator and Auxiliaries System (2.3.3.8)
- Fire Protection System (2.3.3.9)
- Fuel Pool Cooling and Storage System (2.3.3.10)
- Nonsafety-Related Ventilation System (2.3.3.11)
- Open Cycle Cooling Water System (2.3.3.12)
- Plant Drainage System (2.3.3.13)
- Primary Containment Ventilation System (2.3.3.14)
- Process Radiation Monitoring System (2.3.3.15)
- Process Sampling and Post Accident Monitoring System (2.3.3.16)
- Radwaste System (2.3.3.17)
- Reactor Water Cleanup System (2.3.3.18)
- Safety-Related Ventilation System (2.3.3.19)
- Standby Liquid Control System (2.3.3.20)
- Suppression Pool Cleanup System (2.3.3.21)

2.3.3.1 Closed Cycle Cooling Water System

Description

The Closed Cycle Cooling Water (CCW) System is a normally operating system designed to provide cooling water to various plant components. The CCW consists of the following plant systems: component cooling water, plant chilled water, and turbine building closed cooling water.

Component Cooling Water System

The component cooling water system is a closed-loop system which is designed to cool station auxiliary equipment over the full range of normal reactor operation, normal shutdown, and testing conditions. The closed loop provides a barrier between nonessential contaminated systems and the plant service water discharged to the environment. Heat is removed from the closed loop by the plant service water system. Since the component cooling water system may not be available under emergency conditions, it is designed with the capability to transfer safety-related fuel pool cooling heat exchangers to the shutdown service water system during loss of offsite power or LOCA conditions. The portion of the component cooling water system that provides the flow path for shutdown service water to the fuel pool heat exchangers during accident conditions is safety-related. Additional safety-related portions of the component cooling water system penetrating the containment are designed to permit containment isolation under all station conditions. A radiation monitor is provided in the component cooling water system to indicate inleakage into the system from potentially radioactive systems. The radiation monitor is evaluated with the Process Radiation Monitoring System.

Plant Chilled Water System

The plant chilled water system supplies chilled water to area coolers and fan-coil units in the drywell, and the containment, turbine, radwaste, fuel, and auxiliary building’s ventilation systems. The plant chilled water system is nonsafety-related, except for components associated with the containment isolation portion of the system.

Turbine Building Closed Cooling Water

The turbine building closed cooling water system includes nonsafety-related components located within the Turbine Building and Radwaste Building, which do not have the potential for spatial interaction with safety-related components. Therefore, the turbine building closed cooling water system portion of the CCW is not in scope of license renewal.

The CCW System is described in detail in USAR Sections 9.2.2, 9.2.7, and 9.2.8.3. The CCW System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Closed Cycle Cooling Water System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Closed Cycle Cooling Water System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Closed Cycle Cooling Water System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49). The Closed Cycle Cooling Water System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62) and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. The Closed Cycle Cooling Water System includes primary containment isolation valves and associated piping. 10 CFR 54.4(a)(1)

2. Provide heat removal for safety-related heat exchangers. The Closed Cycle Cooling Water System provides the flow path for safety-related shutdown service water to the fuel pool cooling heat exchangers under accident conditions. 10 CFR 54.4(a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Closed Cycle Cooling Water System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Auxiliary Building, Fuel Building, Control Building, Diesel Generator Building, and Primary Containment. 10 CFR 54.4(a)(2)

4. Relied upon 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). The Closed Cycle Cooling Water System includes components which are required to function during a Fire Safe Shutdown event. 10 CFR 54.4(a)(3)

5. Relied upon in safety analyses for plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Closed Cycle Cooling Water System includes components which are environmentally qualified. 10 CFR 54.4(a)(3)

USAR References
1.2.2.8.1.1
1.2.2.8.1.2
1.2.2.8.8
9.2.2
9.2.7
9.2.8.3

License Renewal Boundary Drawings
LR-CPS-M05-1032, Sheet 1
LR-CPS-M05-1032, Sheet 2
LR-CPS-M05-1032, Sheet 3
LR-CPS-M05-1032, Sheet 4
LR-CPS-M05-1032, Sheet 6
LR-CPS-M05-1042, Sheet 5
LR-CPS-M05-1045, Sheet 7

LR-CPS-M05-1045, Sheet 11
LR-CPS-M05-1046, Sheet 1
LR-CPS-M05-1052, Sheet 1
LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1053, Sheet 16
LR-CPS-M05-1053, Sheet 18
LR-CPS-M05-1053, Sheet 20
LR-CPS-M05-1053, Sheet 21
LR-CPS-M05-1054, Sheet 28
LR-CPS-M05-1054, Sheet 29
LR-CPS-M05-1054, Sheet 34
LR-CPS-M05-1056, Sheet 2
LR-CPS-M05-1056, Sheet 5
LR-CPS-M05-1117, Sheet 1
LR-CPS-M05-1117, Sheet 2
LR-CPS-M05-1117, Sheet 14
LR-CPS-M05-1117, Sheet 15
LR-CPS-M05-1117, Sheet 16
LR-CPS-M05-1117, Sheet 17
LR-CPS-M05-1117, Sheet 18
LR-CPS-M05-1117, Sheet 19
LR-CPS-M05-1117, Sheet 20
LR-CPS-M05-1117, Sheet 25
LR-CPS-M05-1117, Sheet 26

Table 2.3.3-1 Closed Cycle Cooling Water System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Heat Exchanger (Component Cooling Water) Shell Side Components	Leakage Boundary
Heat Exchanger (Component Cooling Water) Tube Side Components	Leakage Boundary
Heat Exchanger (Containment Penetration Cooler) Tube Side Components	Leakage Boundary
Heat Exchanger (Drywell Penetration Cooler) Tube Side Components	Leakage Boundary
Heat Exchanger (Plant Chilled Water System Chiller - Condenser) Tube Side Components	Leakage Boundary
Heat Exchanger (Plant Chilled Water System Chiller - Condenser) Tubes	Leakage Boundary
Heat Exchanger (Plant Chilled Water System Chiller - Evaporator) Tube Side Components	Leakage Boundary
Heat Exchanger (Plant Chilled Water System Chiller - Evaporator) Tubes	Leakage Boundary
Hoses	Pressure Boundary
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
Piping, piping components: Insulated	Leakage Boundary
	Pressure Boundary
Pump Casing (Component Cooling Water Pump)	Leakage Boundary
Pump Casing (Plant Chilled Water System Pump)	Leakage Boundary
Tanks (Chemical Feeder Tank)	Leakage Boundary
Tanks (Component Cooling Water Demineralizer Tank) - internal coating/linings	Leakage Boundary
Tanks (Component Cooling Water Storage Tank)	Leakage Boundary
Tanks (Plant Chilled Water System Compression Tank)	Leakage Boundary
Valve Body	Leakage Boundary
	Pressure Boundary
Valve Body: Insulated	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-1 Closed Cycle Cooling Water System
Summary of Aging Management Evaluation

2.3.3.2 Combustible Gas Control System

Description

The Combustible Gas Control System (CGCS) is designed to control hydrogen concentrations in the containment and drywell following a degraded core event which results in excessive quantities of hydrogen being generated. The Combustible Gas Control System consists of the following plant systems: hydrogen mixing system, hydrogen recombiner system, drywell purge HVAC system, and the hydrogen ignition system. Hydrogen monitoring is accomplished by the plants containment monitoring system which is addressed as part of the Process Sampling and Post Accident Monitoring System.

As part of the rulemaking that revised 10 CFR 50.44, the Commission retained requirements for ensuring a mixed atmosphere, inerting Mark I and II containments, and providing hydrogen control systems capable of accommodating an amount of hydrogen generated from a metal-water reaction involving 75 percent of the fuel cladding surrounding the active fuel region in Mark III and ice condenser containments. The revised 10 CFR 50.44 no longer defines a design-basis LOCA hydrogen release and eliminates requirements for hydrogen control systems to mitigate such a release. The installation of hydrogen recombiners and/or vent and purge systems was intended to address the limited quantity and rate of hydrogen generation that was postulated from a design-basis LOCA. It has been determined that this hydrogen release is not risk-significant because the design-basis LOCA hydrogen release does not contribute to the conditional probability of a large release up to approximately 24 hours after the onset of core damage. In addition, it was found, these systems were ineffective at mitigating hydrogen releases from risk-significant beyond design-basis accidents. Therefore, the hydrogen release associated with a design-basis LOCA from 10 CFR 50.44 and the associated requirements that necessitated the need for the hydrogen recombiners, the associated cooling system, and the backup hydrogen vent and purge systems have been eliminated from the licensing basis per license amendment 164 (ML050910194).

Regardless, the hydrogen recombiners are conservatively maintained for risk related purposes, so the hydrogen mixing system, the hydrogen ignition system as well as the hydrogen recombiners are all identified as performing the (a)(1) intended function to maintain local hydrogen concentrations in the drywell and containment to less than 4 percent.

Hydrogen Mixing System

The function of the mixing system is to mix the drywell and the containment atmosphere to ensure the hydrogen concentration will not exceed the flammability limit of 4 percent by volume. The mixing system will accomplish the initial control of hydrogen in the drywell following an accident. The hydrogen mixing system consists of two redundant 800 cfm centrifugal air compressors exhausting from the drywell through two 6-inch lines. These exhaust lines are routed to the suppression pool and exhaust below the water surface.

Hydrogen Recombiner System

The function of the thermal recombiner system is to control combustible gas concentration. The system, located on elevation 702 feet in the control building, will pump gases from the containment through a reaction chamber in which the temperature is maintained by radiant heaters. The gases reach a temperature sufficient to cause the hydrogen and oxygen to recombine to form water without flame. After passing through the reaction chamber, the gas is cooled and returned to the containment below the surface of the suppression pool.

Drywell Purge HVAC System

The function of the drywell purge system is to purge the drywell of potentially contaminated air whenever access to the drywell is desired. The system also is designed to relieve slight drywell under or overpressures during normal operation, under the direct supervision of control room personnel when operating procedures permit. Slight differential pressure (between drywell and containment) is expected during temperature transients in the drywell which would occur during reactor startup, shutdown, and periodically during normal operation. The drywell purge system is not required to function under any accident conditions rather it is utilized for normal station operating conditions, and therefore, has no safety bases except for acting as part of the containment pressure boundary.

Hydrogen Ignition System

The function of the hydrogen ignition system is to control hydrogen concentrations in the containment and drywell as a result of a degraded core following extensive core uncovery in the event of simultaneous occurrence of either a LOCA or a transient event, and the failure of emergency coolant supply to the core. This function supports the hydrogen control requirements of 10 CFR 50.44 for boiling water reactors with Mark III containments with construction permits issued prior to March 28, 1979.

The Combustible Gas Control System is described in USAR Sections 1.2.2.4.9.4, 6.2.3, 6.2.4.3.2.2.3.1, 6.2.5, 7.1.2.1.28.1, 7.3.1.1.7, and 9.4.7.2. The Combustible Gas Control System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Combustible Gas Control System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Combustible Gas Control System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Combustible Gas Control System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Station Blackout (10 CFR 50.63). The Combustible Gas Control System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provide primary containment boundary. The CGCS contains containment isolation valves and the hydrogen recombiner portion of the system is considered to be a closed loop outside containment. 10 CFR 54.4(a)(1)

2. Control combustible gas mixtures in the primary containment atmosphere. The CGCS mixes the drywell and containment atmospheres to ensure a local hydrogen concentration will not exceed the flammability limit of 4 percent by volume. 10 CFR 54.4(a)(1)

3. Provide emergency heat removal from primary containment and provide containment pressure control. The vacuum breakers open to provide a flow path to the drywell from the containment to prevent excessive negative pressure in the drywell. 10 CFR 54.4 (a)(1)

4. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Combustible Gas Control System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the control building. The Combustible Gas Control System also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping. 10 CFR 54.4(a)(2)

5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Combustible Gas Control System contains electrical equipment subject to the requirements of 10CFR50.49, the EQ rule. 10 CFR 54.4(a)(3)

6. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The drywell purge HVAC system containment building exhaust outboard isolation bypass valve is required to remain operable following a Station Blackout. 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.4.9.4
6.2.3
6.2.4.3.2.2.3.1
6.2.5
7.1.2.1.28.1
7.3.1.1.7
9.4.7.2

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1063, Sheet 1
LR-CPS-M05-1064, Sheet 9
LR-CPS-M05-1105, Sheet 1
LR-CPS-M05-1110, Sheet 1
LR-CPS-M05-1110, Sheet 2
LR-CPS-M05-1111, Sheet 5
LR-CPS-M05-2063, Sheet 1

Table 2.3.3-2 Combustible Gas Control System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Compressor Housing (Hydrogen Compressors)	Pressure Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Recombiners	Pressure Boundary
Strainer (Element)	Filter
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-2 Combustible Gas Control System
Summary of Aging Management Evaluation

2.3.3.3 Compressed Air System

Description

The Compressed Air System is a normally operating system that is in scope for license renewal. Those plant systems or portions of plant system that do not perform a license renewal intended function are not in the scope for license renewal. The Compressed Air System consists of three subsystems: breathing air, service air, and instrument air.

Breathing Air

The control room emergency breathing air system consists of two 14 bottle high pressure cascade breathing air systems. Each system is capable of supplying sufficient breathing air for seven people for six hours. Each system of bottles has a remote fill station located outside the external south wall of the diesel generator building that serves to recharge the bottles if their use is required for longer than six hours. Air stations are located so that all areas of the control room are accessible. The system meets the single failure criteria, is seismically designed and supported, and were procured as safety-related, however the system does not perform any safety-related functions beyond the portion of the system that contains containment isolation valves.

Service Air

The service air system provides oil free, filtered and dried air for service and maintenance use throughout the plant. The service air system is the source of air for the instrument air system. Pressure reducing devices are provided where needed. The service air system consists of three air compressors, two volume tanks for moisture separation, three heatless air dryers complete with prefilter and after-filter, two air receivers, necessary piping, valves, and instrumentation. The service air system has no safety-related function, with the exception of containment isolation.

Instrument Air

The instrument air system takes filtered and dried air from the service air system and distributes it to air operated valves and instrumentation throughout the plant. Air for the automatic depressurization system function and the low-low set safety/relief valves is split into two divisions. One division supplies air to the automatic depressurization system safety/relief valves and the medium low-low set safety/relief valves on the A and C steam lines side of the reactor pressure vessel, and the other division supplies air to the valves (automatic depressurization system and the low-low set safety/relief valves) on the B and D side.

Storage bottles provide a Seismic Category I backup supply of air for the automatic depressurization system and the low-low set safety/relief valves. A filter downstream of the storage bottles provides secondary instrument air filtration. A filter is also installed upstream on the instrument air supply to the main steam isolation valves for the same purpose.

Instrument air lines that pass through containment and drywell penetrations are ASME Class II and have a license renewal intended function.

Other pneumatic-operated devices are designed for the fail-safe mode and do not require air supply under abnormal or postulated accident conditions. No compressors are required to perform safety-related functions for the Compressed Air system.

The Compressed Air System is described in USAR Sections 1.2.2.8.11, 6.4.4.2, and 9.3.1. The Compressed Air System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Compressed Air System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Compressed Air System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Compressed Air System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and 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), and Station Blackout (10 CFR 50.63). The Compressed Air System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provide primary containment boundary. The Compressed Air System contains containment isolation valves for lines that penetrate containment and the drywell. 10 CFR 54.4 (a)(1)

2. Provide motive power to safety-related components. The Compressed Air System supplies air to the automatic depressurization system to ensure proper operation of the safety/relief valves and the main steam isolation valves. 10 CFR 54.4 (a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Compressed Air System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the diesel generator building. The Compressed Air System also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping. 10 CFR 54.4(a)(2)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Station Blackout (10 CFR 50.63). The Compressed Air System supplies air to the automatic depressurization system which is required to remain functional to following a complete loss of AC power. 10 CFR 54.4(a)(3)

5. Relied upon 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). The Compressed Air System supplies air to the safety/relief valves and automatic depressurization system which are required to remain functional to ensure safe shutdown capability. 10 CFR 54.4(a)(3)

6. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Compressed Air System contains electrical equipment subject to the requirements of 10 CFR 50.49, the EQ rule. 10 CFR 54.4(a)(3)

USAR References
1.2.2.8.11
6.4.4.2
9.3.1

License Renewal Boundary Drawings
LR-CPS-M05-1040, Sheet 5
LR-CPS-M05-1040, Sheet 7
LR-CPS-M05-1040, Sheet 13
LR-CPS-M05-1040, Sheet 14
LR-CPS-M05-1040, Sheet 15
LR-CPS-M05-1040, Sheet 21
LR-CPS-M05-1040, Sheet 22
LR-CPS-M05-1040, Sheet 23
LR-CPS-M05-1048, Sheet 6
LR-CPS-M05-1048, Sheet 9
LR-CPS-M05-1054, Sheet 38
LR-CPS-M05-1056, Sheet 2
LR-CPS-M05-1065, Sheet 1
LR-CPS-M05-1065, Sheet 6
LR-CPS-M05-1065, Sheet 7
LR-CPS-M05-1077, Sheet 1
LR-CPS-M10-9002, Sheet 1
LR-CPS-M10-9002, Sheet 2
LR-CPS-M10-9002, Sheet 5

Table 2.3.3-3 Compressed Air System
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator (Automatic Depressurization System)	Pressure Boundary
Accumulator (Main Steam Isolation Valves)	Pressure Boundary
Bolting (Closure)	Mechanical Closure
Compressor Housing (Breathing Air Compressors)	Leakage Boundary
Flow Device	Pressure Boundary
	Throttle
Heat Exchanger (Breathing Air Compressor Aftercooler) Tube Side Components	Leakage Boundary
Heat Exchanger (Breathing Air Compressor Aftercooler) Tubes	Leakage Boundary
Hoses	Pressure Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Valve Body	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)

The aging management review results for these components are provided in:

Table 3.3.2-3 Compressed Air System
Summary of Aging Management Evaluation

2.3.3.4 Control Rod Drive System

Description

The Control Rod Drive (CRD) System is a reactivity control system that utilizes pressurized demineralized water to position neutron absorbing control rods within the reactor core. The primary safety-related purpose of the CRD System is to support rapid insertion of negative reactivity into the reactor core to shut down the reactor under accident or transient conditions by simultaneously inserting all control rods. The CRD System is also used to manage core reactivity and control reactor power during normal reactor operation by inserting or withdrawing control rods at a controlled rate, one rod at a time. The CRD System accomplishes these functions by providing water at the required operating pressures to the control rod drive mechanisms in response to inputs from the reactor protection system. The CRD System includes the alternate rod insertion (ARI) system, which provides an alternate means of venting the scram air header and inserting control rods that is independent of the reactor protection system. The ARI function serves to mitigate the consequences of an ATWS event and may be initiated automatically or manually.

The CRD System also supplies a source of cool, clean, high-pressure water to the reactor recirculation pump seals, the reactor pressure vessel, and keep-fill flow reactor level instrumentation.

The CRD charging line to the reactor is provided with primary containment isolation valves.

The CRD System is described in detail in USAR Sections 1.2.2.4.3, 3.9.4, 4.6.1, 7.7.1.25.1, 15.9.3, and Appendix F. The portions of the CRD System that are in scope and the system boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Control Rod Drive System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Control Rod Drive System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Control Rod Drive System also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Introduce negative reactivity to achieve or maintain subcritical reactor condition. The HCUs provide the motive force to the control rod drive mechanisms to rapidly insert control rods during a scram event. The scram discharge volume provides a low pressure sink for water discharged from the above piston area of control rod drive mechanisms during a scram event. 10 CFR 54.4(a)(1)

2. Provide primary containment boundary. The CRD System includes safety-related primary containment isolation valves on the injection line. 10 CFR 54.4(a)(1)

3. Sense process conditions and generate signals for reactor trip or engineered safety features actuation. The scram discharge volume includes level instrumentation that causes actuation of the reactor protection system upon a high water level condition. 10 CFR 54.4(a)(1)

4. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The CRD System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the auxiliary building, fuel building and primary containment. 10 CFR 54.4(a)(2)

5. Relied upon 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). The CRD System includes equipment that is credited by Fire Safe Shutdown analysis to shutdown the reactor via the scram function. 10 CFR 54.4(a)(3)

6. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The CRD System includes instrumentation and equipment that is required to be environmentally qualified. 10 CFR 54.4(a)(3)

7. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without SCRAM (10 CFR 50.62). The CRD System includes solenoid valves that receive signals from the plant alternate rod insertion system to provide an alternate means of venting the scram air header and cause insertion of control rods. 10 CFR 54.4(a)(3)

8. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The station blackout analysis credits the CRD System with successfully inserting all control rods upon receipt of scram initiation signals from the Reactor Protection System. 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.4.3
3.9.4
4.6.1
7.7.1.25.1
15.9.3
Appendix F

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1046, Sheet 3
LR-CPS-M05-1046, Sheet 7
LR-CPS-M05-1071, Sheet 1
LR-CPS-M05-1071, Sheet 2
LR-CPS-M05-1078, Sheet 1
LR-CPS-M05-1078, Sheet 2
LR-CPS-M05-1078, Sheet 3

Table 2.3.3-4 Control Rod Drive System
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator (HCU)	Pressure Boundary
Bolting (Closure)	Mechanical Closure
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
Rupture Disks	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-4 Control Rod Drive System
Summary of Aging Management Evaluation

2.3.3.5 Control Room Ventilation System

Description

The Control Room Ventilation (CRV) System is designed to ensure the operability of all the components in the control room under all the station operating and accident conditions. In addition, the CRV System is designed to maintain a habitable environment under accident conditions by providing adequate protection against radiation and toxic gases. The system accomplishes this using emergency makeup air filter units and recirculating air filter units, which provide and recirculate clean filtered makeup air in cases where the outside air is contaminated.

The system is designed to maintain a positive pressure within the control room envelope with respect to the adjacent areas to preclude infiltration of unconditioned air, during all the operating modes except when the system is in recirculation mode or when the system is in the maximum outside air purge mode. Maintaining positive pressure during normal mode is not a system intended function.

The CRV System is comprised of two full-capacity, redundant HVAC equipment trains. Each train has a 100 percent capacity high-efficiency air filter, an adsorber for fume and odor removal (normally bypassed), a humidification system, supply and return air fans, and a blow-through type air-handling unit comprised of cooling coil, heating coil, and zone mixing dampers. The heating and humidification provided in the CRV System are not essential for the safety of operating personnel or the function of the safety-related equipment and are therefore in license renewal scope for leakage boundary only.

The system is provided with radiation monitors to monitor radiation levels at the minimum outside air intakes of the control room and upon detecting a radiation level exceeding a preset value automatically limits the introduction of contaminants into the system by filtering the contaminated air. These radiation monitors are evaluated in the Miscellaneous Electrical System license renewal system. Fire damper assemblies are evaluated with the Fire Protection System.

The CRV System is described in detail in USAR Sections 1.2.2.4.18, 9.4.1, Appendix E, and Appendix F. The CRV System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Control Room Ventilation System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Control Room Ventilation System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Control Room Ventilation System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Station Blackout (10 CFR 50.63). The Control Room Ventilation System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provide centralized area for control and monitoring of nuclear safety-related equipment. The Control Room Ventilation System maintains environmental conditions and ensures the safety and comfort of operating personnel in the control room. The system also provides a filtered fresh air supply during adverse plant conditions. 10 CFR 54.4(a)(1)

2. Maintain emergency temperature limits within areas containing safety-related components. The Control Room Ventilation System maintains environmental conditions to ensure the operability of safety-related equipment in the control room. 10 CFR 54.4(a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Control Room Ventilation System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Control Building. Additionally, the system includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping. 10 CFR 54.4(a)(2)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The Control Room Ventilation System contains components that are relied upon to provide ventilation during coping and recovery from a station blackout event. 10 CFR 54.4(a)(3)

5. Relied upon 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). The Control Room Ventilation System contains components that are relied upon to support Safe Shutdown. Additionally, the system includes a fire protection system function for smoke removal. 10 CFR 54.4(a)(3)

USAR References
1.2.2.4.18
9.4.1
Appendix E
Appendix F

License Renewal Boundary Drawings
LR-CPS-M05-1052, Sheet 1
LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1053, Sheet 23
LR-CPS-M05-1053, Sheet 24
LR-CPS-M05-1054, Sheet 36
LR-CPS-M05-1102, Sheet 1
LR-CPS-M05-1102, Sheet 2
LR-CPS-M05-1102, Sheet 3
LR-CPS-M05-1102, Sheet 4
LR-CPS-M05-1102, Sheet 5
LR-CPS-M05-1102, Sheet 6
LR-CPS-M05-1102, Sheet 7

LR-CPS-M05-1121, Sheet 6

Table 2.3.3-5 Control Room Ventilation System Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Bolting (Ducting Closure)	Mechanical Closure
Drip Pan	Leakage Boundary
Ducting and Components	Direct Flow
	Pressure Boundary
Flexible Connection	Pressure Boundary
Gearbox (Control Room HVAC Chilled Water Pump)	Pressure Boundary
Heat Exchanger (Control Room HVAC Air Handling Unit) Fins	Heat Transfer
Heat Exchanger (Control Room HVAC Air Handling Unit) Tube Side Components	Pressure Boundary
Heat Exchanger (Control Room HVAC Air Handling Unit) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (Control Room HVAC Equipment Room Air Handling Unit) Fins	Heat Transfer
Heat Exchanger (Control Room HVAC Equipment Room Air Handling Unit) Tube Side Components	Pressure Boundary
Heat Exchanger (Control Room HVAC Equipment Room Air Handling Unit) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (Control Room HVAC Water Chiller - Condenser) Shell Side Components	Pressure Boundary
Heat Exchanger (Control Room HVAC Water Chiller - Condenser) Tube Sheet	Pressure Boundary
Heat Exchanger (Control Room HVAC Water Chiller - Condenser) Tube Side Components	Pressure Boundary
Heat Exchanger (Control Room HVAC Water Chiller - Condenser) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (Control Room HVAC Water Chiller - Evaporator) Shell Side Components	Pressure Boundary
Heat Exchanger (Control Room HVAC Water Chiller - Evaporator) Tube Sheet	Pressure Boundary
Heat Exchanger (Control Room HVAC Water Chiller - Evaporator) Tube Side Components	Pressure Boundary
Heat Exchanger (Control Room HVAC Water Chiller - Evaporator) Tubes	Heat Transfer
	Pressure Boundary
Piping elements	Leakage Boundary
	Pressure Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Piping, piping components: Insulated	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Pump Casing (Control Room HVAC Chilled Water Pump)	Pressure Boundary
Strainer (Element)	Filter
Tanks (Chemical Feeder Tank)	Leakage Boundary

Component Type	Intended Function
Tanks (Control Room HVAC Compression Tank)	Pressure Boundary
Tanks (Control Room HVAC Humidification Steam Boiler)	Leakage Boundary
Tanks (Filtration Skid Filter Vessel)	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary
Valve Body: Insulated	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-5 Control Room Ventilation System
Summary of Aging Management Evaluation

2.3.3.6 Cranes, Hoists, and Refueling Equipment System

Description

The Cranes, Hoists and Refueling Equipment System is comprised of load handling bridge cranes, jib cranes, lifting devices, monorails, and hoists provided throughout the facility to support operation and maintenance activities. Also included are equipment that handles fuel and other light loads above fuel and other safety-related components. The Cranes, Hoists and Refueling Equipment System is in scope for license renewal. However, portions of the Cranes, Hoists and Refueling Equipment System are not required to perform system intended functions and are not in scope.

The Cranes, Hoists, and Refueling Equipment System consists of the fuel handling and transfer system, the fuel support system, hoists, cranes, and elevators system. The containment building polar crane and fuel building crane are seismically qualified, single failure proof in conformance with NUREG-0554, safety-related, and within the scope of equipment required to meet NUREG-0612, Section 5.1.1. Based on the NRC's approved response to the station in regard to NUREG-0612, the cranes that are in scope due to the NUREG-0612 program are the Containment Building Polar Crane and the Fuel Building Crane.

The fuel handling system (Cranes, Hoists, and Refueling Equipment sub-system) is designed to provide a safe and effective means for transporting and handling fuel from the time it reaches the plant until it leaves the plant after post irradiation cooling.

The fuel handling system includes a fuel transfer tube which penetrates containment. This portion of the system is safety-related. A containment isolation assembly containing a blind flange and a bellows which connects from the containment isolation assembly to the building containment penetration is provided to make containment isolation. The outer portion of the fuel transfer tube is assessed in Primary Containment. The inner portion of the fuel transfer tube including connected piping and valves as well as the hydraulic positioning system are assessed in the Fuel Pool Cooling and Storage System

Included in the Cranes, Hoists and Refueling Equipment System are load handling systems and monorails throughout the facility. Cranes, monorails, and hoists that handle loads over safety-related systems, structures and components are in scope for license renewal. Postulated failure of these cranes, monorails, and hoists could impact a safety-related function. As a result, the following cranes, monorails, and hoists are in scope for license renewal:

- Containment Building Polar Crane
- Fuel Building Crane
- Fuel Prep Machines
- Fuel Handling Platform
- Refueling Platform
- Auxiliary Platform
- CRD Cart Jib Cranes
- IFTS Shield Plug Jib Crane
- Refueling Platform Jib Crane

The Cranes, Hoists and Refueling Equipment System is described in USAR Sections 1.2.2.7, 9.1.4, and 9.1.5.

Reason for Scope Determination

The Cranes, Hoists, and Refueling Equipment System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Cranes, Hoists, and Refueling Equipment System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Cranes, Hoists, and Refueling Equipment System is not in scope under 10 CFR 54.4(a)(3) because it is not relied upon 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provides physical support, shelter and protection for safety-related systems, structures, and components. The containment polar crane and fuel building crane are safety-related, seismically qualified, and are used to transport heavy loads over irradiated fuel and above or near safety-related components. The Cranes, Hoists, and Refueling Equipment System contains safety-related components that handle equipment above or near safety-related components or spent fuel. 10 CFR 54.4(a)(1)

2. Provides a safe means for handling safety-related components and loads above or near safety-related components. The Cranes, Hoists, and Refueling Equipment System contains nonsafety-related components within the scope of license renewal that handle equipment above or near safety-related components or spent fuel. 10 CFR 54.4(a)(2)

USAR References
1.2.2.7
9.1.4
9.1.5

License Renewal Boundary Drawings
None

Table 2.3.3-6 Cranes, Hoists, and Refueling Equipment System Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Crane/Hoist (Fuel Prep Machine)	Structural Support
Crane/Hoist: Rails, Bridges, Structural Members, Structural Components	Structural Support

The aging management review results for these components are provided in:

Table 3.3.2-6 Cranes, Hoists, and Refueling Equipment System Summary of Aging Management Evaluation

2.3.3.7 Demineralized Water Makeup System

Description

The Demineralized Water Makeup System consists of three subsystems, the makeup condensate storage system, the makeup demineralizer system, and the potable water system. Portions of the system perform a safety-related function.

Except for the portion of the system penetrating containment, the only intended function of the Demineralized Water Makeup System for license renewal is to maintain leakage boundary integrity to preclude system interactions. For this reason, this system's pressure retaining components located in areas where there are potential spatial interactions with safety-related equipment have been included in the scope of license renewal. This includes the liquid-filled portions of the system located within the auxiliary building, control building, diesel generator building, and fuel building. Included in this boundary are pressure-retaining components relied upon to preserve the leakage boundary intended function of this system. This system is not required to operate to support other license renewal intended functions and is in scope only for potential spatial interaction (except for the portion of the system penetrating containment described under System Intended Functions).

Makeup Condensate Storage System

The makeup condensate storage system is designed to receive the final effluent from the demineralizer train and store it in the makeup demineralized water storage tanks, and to distribute the stored water throughout the station as required. The makeup condensate storage system includes lines which penetrate containment, which are provided with two automatic isolation valves as required by Design Criterion 56. This portion of the system is safety-related as it provides a primary containment boundary.

Makeup demineralizer System

The makeup demineralizer system is designed to treat the lake water for use as filtered water, potable water, and other auxiliary uses. The filtered water is used for cooling and lubrication requirements of circulating water and service water pumps, and back and surface wash requirements for filters. This portion of the Demineralized Water Makeup System does not perform any safety-related functions.

Potable Water System

The potable water system is designed to produce and maintain the quality of water required to meet drinking water standards. The system is supplied with lake water that is treated and chlorinated. The system does not connect to any system that might discharge radioactive materials. This portion of the Demineralized Water Makeup System does not perform any safety-related functions.

The Demineralized Water Makeup System is described in USAR Sections 1.2.2.8.6, 1.2.2.8.7, 6.2.4.3.2.2.3.3, 9.2.3, and 9.2.4.

The Demineralized Water Makeup System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Demineralized Water Makeup System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Demineralized Water Makeup System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Demineralized Water Makeup System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Demineralized Water Makeup System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. The makeup condensate storage portion of the Demineralized Water Makeup System includes lines which penetrate containment. 10 CFR 54.4(a)(1)

2. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Demineralized Water Makeup System contains nonsafety-related, water-filled lines in the auxiliary building, control building, diesel generator building, and fuel building, which have the potential for spatial interaction with safety-related SSCs. The Demineralized Water Makeup System also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping located in the control building. 10 CFR 54.4(a)(2)

3. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The makeup condensate storage portion of the Demineralized Water Makeup System contains electrical equipment subject to the requirements of 10 CFR 50.49. 10 CFR 54.4(a)(3)

USAR References
1.2.2.8.6
1.2.2.8.7
6.2.4.3.2.2.3.3
9.2.3
9.2.4

License Renewal Boundary Drawings
LR-CPS-M05-1042, Sheet 2
LR-CPS-M05-1042, Sheet 4
LR-CPS-M05-1042, Sheet 5
LR-CPS-M05-1045, Sheet 7
LR-CPS-M05-1045, Sheet 8
LR-CPS-M05-1045, Sheet 11
LR-CPS-M05-1052, Sheet 1

LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1053, Sheet 23
LR-CPS-M05-1053, Sheet 24
LR-CPS-M05-1053, Sheet 25
LR-CPS-M05-1064, Sheet 2
LR-CPS-M05-1064, Sheet 3
LR-CPS-M05-1064, Sheet 5
LR-CPS-M05-1077, Sheet 1
LR-CPS-M05-1102, Sheet 5
LR-CPS-M05-1102, Sheet 6
LR-CPS-M05-1102, Sheet 7
LR-CPS-M05-1109, Sheet 2
LR-CPS-M05-1109, Sheet 3
LR-CPS-M05-1117, Sheet 1
LR-CPS-M05-1118, Sheet 5
LR-CPS-M05-9061, Sheet 3
LR-CPS-M05-9061, Sheet 5
LR-CPS-M05-9061, Sheet 6

Table 2.3.3-7 Demineralized Water Makeup System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
Pump Casing (Potable Water Booster Pumps)	Leakage Boundary
Tanks (Hot Water Heater)	Leakage Boundary
Tanks (Laboratory Humidification Steam Boiler) - Insulated	Leakage Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-7 Demineralized Water Makeup System
Summary of Aging Management Evaluation

2.3.3.8 Diesel Generator and Auxiliaries System

Description

The Diesel Generator and Auxiliaries System is a standby system designed to provide sufficient electrical power to important plant equipment when normal offsite power sources are not available. The Diesel Generator and Auxiliaries System is in scope for license renewal. However, portions of the Diesel Generator and Auxiliaries System that are not required to perform intended functions are not included in the scope of license renewal. The Diesel Generator and Auxiliaries System consists of the diesel generators and the following plant systems:

- diesel generator fuel-oil storage and transfer system,
- diesel generator cooling water system,
- diesel generator starting systems,
- diesel engine lubrication system, and
- diesel generator combustion air intake and exhaust system.

Diesel Generators

Standby AC power is supplied by three diesel generators. Each engineered safety features (ESF) division is supplied by a separate diesel generator. The diesel generators serve as standby power sources, independent of any onsite or offsite power source. In the unlikely event that a design basis accident (DBA) occurs coincident with a loss of off-site power (LOOP), the diesel generators will automatically start and supply power to essential equipment that has the capability of mitigating the consequences of the accident. The diesel generators are described in USAR Sections 1.2.2.4.13, 1.2.2.6.1.4, and 8.3.1.1.2.

Diesel Generator Fuel Oil Storage and Transfer System

The diesel generator fuel-oil storage and transfer system stores and supplies the fuel oil required to operate the diesel-generator units during post-LOCA maximum load demands (USAR 1.2.2.8.12). The system is divided into three divisions. Each Division I and II diesel generator set has a fuel oil storage tank, a day tank, a transfer pump, two diesel engines, one electric generator, and necessary piping, valves, and instrumentation. The Division III high pressure core spray (HPCS) diesel generator set has a fuel oil storage tank, a transfer pump, one diesel engine, one electric generator, and necessary piping, valves, and instrumentation.

Storage tanks are of the horizontal type and are located in separate rooms in the basement of the Diesel Generator Building. Each has a storage capacity sufficient to operate its corresponding diesel-generator set for 7 days while supplying post-LOCA maximum electrical load demands. Each is provided with a flame arrester which prevents the ignition of flammable vapors on one side of the arrester when the other side is exposed to an ignition source.

The day tanks are of the horizontal type and are located in separate rooms in the Diesel Generator Building. Each day tank is provided with a flame arrester. Transfer pumps deliver fuel to the day tanks from the storage tanks. They are located in the basement of the Diesel Generator Building near their storage tanks. The fuel transfer pump starts automatically when its diesel generator is started. An overflow line is provided from the day tank back to the storage tank to provide a closed recirculation loop. A recirculation line containing a Y-type strainer is provided from the discharge of the transfer pump back to its associated storage tank. The strainer is provided to clean up the fuel oil if necessary. One fuel oil pump is supplied with and located on each diesel engine. These pumps are driven by the diesel engines. They are used to supply fuel from the day tanks to the diesel engine fuel injectors.

The diesel generator fuel-oil storage and transfer system is described in USAR Section 9.5.4.

Diesel Generator Cooling Water System (DGWS)

The DGWS removes sufficient heat to allow continuous operation of the diesel engines at maximum load. The DGWS provides cooling water to the diesel engine, lube oil heat exchanger, and turbocharger aftercoolers. It rejects accumulated heat to the Open Cycle Cooling Water System (shutdown service water system). The DGWS for each diesel-generator is Seismic Category I and is housed in a separate tornado-missile-proof, flood protected, Seismic Category I structure. Independent DGWS's are provided for Division I, II, and III diesel generators.

Each division of the DGWS is a closed system with an immersion heater, expansion tank, temperature regulating valve, lube oil cooler, and cooling water pumps. The immersion heater is thermostatically controlled and, in conjunction with the temperature regulating valve, will maintain the jacket water at a steady temperature. During the engine shutdown condition, jacket water heated by the immersion heater will circulate through the lube oil cooler by natural circulation to warm the lubricating oil which is circulated by a motor-driven pump.

The heat exchanger on the diesel generator skid is designed to maintain an engine cooling water temperature of 190 degrees F at full load at any ambient environment temperature. The lube oil cooler is of the fin-tube type construction, with the cooling water inside the tubes and the oil flowing over the tubes and fins.

The DGWS is described in USAR Section 9.5.5.

Diesel Generator Starting System

Each diesel-generator starting system (one per division) consists of two full capacity air starting subsystems. Each subsystem is capable of starting its respective engine set five times without recharging the associated air receiver. The starting system initiates an engine start so that within 12 seconds after receipt of start signal, the diesel generator operates at rated speed, voltage, and frequency. The portions of the starting system essential to the starting of a diesel engine are of Seismic Category I design.

The starting system for the diesel-generators consists of air compressors, air dryers, air receivers, motors, and associated piping, valves, and controls. Each subsystem contains one air receiver connected to one starting air motor train. The two air receivers for each unit are charged by an individual compressor associated with that particular air receiver. Diesel starting air is delivered to the air receiver by the air compressors through desiccant air dryers.

The diesel generator starting systems are described in USAR Section 9.5.6

Diesel Engine Lubrication System

The diesel engine lubrication system provides lubricating oil to all moving parts of the diesel engine during diesel-generator operation and is of Seismic Category I design. The system is part of the engine designed by the engine manufacturer.

The diesel engine lubrication system consists of the lube oil pumps, lube oil sump pans, lube oil heat exchanger, and associated piping, valves, filters, strainers, and controls.

The main lube oil pump provides oil to the engine bearings, gears, and turbocharger. The turbo soak back oil pump circulates oil from the engine sump to the auxiliary turbocharger filter and the turbocharger to provide lubrication to the turbocharger bearings. The circulating oil pump circulates oil from the engine sump, through an in-line strainer and a relief check valve, through the full flow oil filter and the oil cooler, and then into the engine oil gallery where it flows through the crankshaft bearings.

The lube oil heat exchanger cools the lube oil via water provided by the DGWS.

The diesel engine lubrication system is described in USAR Section 9.5.7.

Diesel Generator Combustion Air Intake and Exhaust System

The diesel generator combustion air intake and exhaust system supplies reliable quality air to the diesel engine and exhausts the products of combustion with the atmosphere. With the exception of the exhaust silencers and the exhaust screens, the system is of Seismic Category I design.

The system consists of air filters, air silencers, exhaust silencers, and associated piping and expansion joints. An independent system is provided for each diesel-generator set.

The diesel generator combustion air intake and exhaust system is described in USAR Section 9.5.8.

The Diesel Generator and Auxiliaries System is described in detail in USAR Sections 1.2.2.4.13, 1.2.2.6.1.4, 8.3.1.1.2, and 9.5.4 through 9.5.8. The Diesel Generator and Auxiliaries System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

<u>Reason for Scope Determination</u>

The Diesel Generator and Auxiliaries System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Diesel Generator and Auxiliaries System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Diesel Generator and Auxiliaries System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Fire Protection (10 CFR 50.48), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63). The Diesel Generator and Auxiliaries System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49).

Intended Functions

1. Provide motive power to safety-related components. The nuclear safety function of the Diesel Generator and Auxiliaries system is to provide power to systems and components that require electric power to accomplish their safety-related function. 10 CFR 54.4(a)(1)

2. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Diesel Generator and Auxiliaries system includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs. The Diesel Generator and Auxiliaries system also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping. 10 CFR 54.4(a)(2)

3. Relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for ATWS (10 CFR 50.62). The diesel generators provide Class 1E AC power during Loss of Offsite Power. The ATWS event includes a Loss of Offsite Power. 10 CFR 54.4(a)(3)

4. Relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48). The diesel generators provide class 1E AC power during loss of offsite power. The diesel generators support all safe shut down methods (USAR Section 7.4). Additionally, the diesel-generator fuel oil storage and transfer system provides diesel fuel for the diesel fire pumps. 10 CFR 54.4(a)(3)

5. Relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commissions regulations for Station Blackout (10 CFR 50.63). The Division III diesel generator is assumed available to support HPCS system operation. Additionally, the diesel generators supply onsite AC Power during Station Blackout. 10 CFR 54.4(a)(3)

USAR References
1.2.2.4.13
1.2.2.6.1.4
1.2.2.8.12
8.3.1.1.2
9.5.4
9.5.5
9.5.6
9.5.7
9.5.8

License Renewal Boundary Drawings
LR-CPS-M05-1035, Sheet 1
LR-CPS-M05-1035, Sheet 2
LR-CPS-M05-1035, Sheet 3
LR-CPS-M05-1035, Sheet 4

LR-CPS-M05-1035, Sheet 5
LR-CPS-M05-1035, Sheet 6
LR-CPS-M05-1035, Sheet 7
LR-CPS-M05-1035, Sheet 8
LR-CPS-M05-1035, Sheet 10
LR-CPS-M05-1036, Sheet 1
LR-CPS-M05-1036, Sheet 2
LR-CPS-M05-1052, Sheet 1
LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1052, Sheet 3
LR-CPS-M05-1054, Sheet 40
LR-CPS-M05-1054, Sheet 41
LR-CPS-M05-1054, Sheet 42
LR-CPS-M05-1054, Sheet 43
LR-CPS-M05-9035, Sheet 1
LR-CPS-M05-9035, Sheet 2
LR-CPS-M05-9035, Sheet 3

Table 2.3.3-8 Diesel Generator and Auxiliaries System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Expansion Joints	Pressure Boundary
Flame Arrestor	Pressure Boundary
Flexible Connection	Pressure Boundary
Heat Exchanger (DG Lube Oil Cooler) Shell Side Components	Pressure Boundary
Heat Exchanger (DG Lube Oil Cooler) Tube Sheet	Pressure Boundary
Heat Exchanger (DG Lube Oil Cooler) Tube Side Components	Pressure Boundary
Heat Exchanger (DG Lube Oil Cooler) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (DGWS Aftercooler) Fins	Heat Transfer
Heat Exchanger (DGWS Aftercooler) Shell Side Components	Pressure Boundary
Heat Exchanger (DGWS Aftercooler) Tube Sheet	Pressure Boundary
Heat Exchanger (DGWS Aftercooler) Tube Side Components	Pressure Boundary
Heat Exchanger (DGWS Aftercooler) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (DGWS Cooling Water Heat Exchanger) Shell Side Components	Pressure Boundary
Heat Exchanger (DGWS Cooling Water Heat Exchanger) Tube Sheet	Pressure Boundary
Heat Exchanger (DGWS Cooling Water Heat Exchanger) Tube Side Components	Pressure Boundary
Heat Exchanger (DGWS Cooling Water Heat Exchanger) Tubes	Heat Transfer
	Pressure Boundary
Piping elements	Pressure Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Pump Casing (DG Fuel Oil Transfer Pump)	Pressure Boundary
Silencer / Muffler (Exhaust Silencer)	Structural Integrity (Attached)
Strainer (Element)	Filter
Tanks (Air Receiver)	Pressure Boundary
Tanks (DG Fuel Oil Day Tank)	Pressure Boundary
Tanks (DG Fuel Oil Storage Tank)	Pressure Boundary
Tanks (DGWS Expansion Tank)	Pressure Boundary
Tanks (DGWS Immersion Heater)	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)

The aging management review results for these components are provided in:

Table 3.3.2-8 Diesel Generator and Auxiliaries System
Summary of Aging Management Evaluation

2.3.3.9 Fire Protection System

Description

The term "Fire Protection System" refers to the integrated complex of components and equipment provided for detection and suppression of fires. The fire protection program uses a defense-in-depth approach aimed at preventing fires, minimizing the effect of any fires that occur, providing appropriate fire detection and suppression equipment. The Fire Protection System is designed such that normal or inadvertent system operation will not induce failure of safe shutdown systems. The Fire Protection System (FPS) consists of the following plant systems: fire protection and CO2 and generator purge.

The FPS detects the presence of smoke or excessive heat in designated plant areas, provides local alarms, control room annunciation, and suppression system activation. The FPS includes various types of water, halon, and carbon dioxide suppression systems. Additionally, the FPS includes active and passive features such as fire barriers (doors, dampers, fire rated enclosures, fire proofing material, penetration seals, fire barrier function of walls and slabs), ventilation dampers, and deluge systems which retard fires from spreading from one area of the plant to another. Heat and smoke detection is accomplished by the appropriate detectors installed in areas where fire potential exists and, in all areas containing safety-related equipment. Detection of fire by any smoke or heat detector will activate an audible control room alarm with visual annunciation.

Furthermore, the FPS extends into the Primary Containment and includes primary containment isolation valves and associated piping, which perform a safety-related containment isolation function.

The source of water for the Clinton Power Station Fire Protection System is the ultimate heat sink of Lake Clinton. This source can provide a minimum of 900,000 gallons of water for fire protection. There are two 100 percent capacity diesel-driven fire pumps (primary fire protection system water supply) with an additional connection to the plant service water system for a backup water supply. A dedicated pressure maintenance jockey pump serves to keep the fire system filled and pressurized.

A low-pressure carbon dioxide system provides fire suppression in the Division 1, 2, and 3 diesel-generator rooms, and the main turbine generator exciter enclosure.

Halon is used in the areas containing electronics and computers, such as the main control room complex and auxiliary equipment room.

The FPS includes fire water pumps, piping and valves, underground yard water mains, hydrants, standpipes, hose stations, sprinklers, deluge spray systems, automatic water mist systems, CO2 equipment, thermal detectors, flame detectors, ionization detectors, photoelectric smoke detectors, incipient fire detectors, alarms, fire barriers, fire-stops, portable fire extinguishers, portable breathing apparatus, ventilation system dampers, and associated controls and appurtenances.

Consistent with site quality assurance requirements, the portions of the FPS (i.e., fire detection, suppression, and extinguishing systems, and associated components) in-scope of license renewal are those which serve safety-related structures or buildings, including connected piping, wiring, or equipment that may be routed through or located within other areas, but which serve these areas (USAR Section 9.5.1.5.4). Nonsafety-related buildings or structures, such as the Radwaste or Turbine Buildings, do not contain safety-related or fire safe shutdown components, as described in the site Fire Hazards Analysis (USAR Appendix E). Additionally, the fire protection boundary for license renewal extends to the underground water main loop, including many branch connections, up to and including the first isolation valve outside of nonsafety-related buildings or structures.

The FPS is described in detail in USAR Sections 1.2.2, 9.5.1, and Appendix E. The FPS boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Fire Protection System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Fire Protection System is not in scope under 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system would not prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Fire Protection System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49). The Fire Protection System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62) and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. The Fire Protection System includes primary containment isolation valves and associated piping. 10 CFR 54.4(a)(1)

2. Relied upon 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). The Fire Protection System provides the capability to control postulated fires in plant areas to maintain safe shutdown ability. 10 CFR 54.4(a)(3)

3. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Environmental Qualification (10 CFR 50.49). The Fire Protection System includes components with are environmentally qualified. 10 CFR 54.4(a)(3)

USAR References
1.2.2.8.16
9.5.1
9.5.1.2.2.6
9.5.1.5.4
Appendix E

License Renewal Boundary Drawings
LR-CPS-M05-1039, Sheet 1
LR-CPS-M05-1039, Sheet 2
LR-CPS-M05-1039, Sheet 3

LR-CPS-M05-1039, Sheet 4
LR-CPS-M05-1039, Sheet 5
LR-CPS-M05-1039, Sheet 6
LR-CPS-M05-1039, Sheet 8
LR-CPS-M05-1039, Sheet 9
LR-CPS-M05-1052, Sheet 5
LR-CPS-M05-1065, Sheet 1
LR-CPS-M05-1101, Sheet 1
LR-CPS-M05-1101, Sheet 2
LR-CPS-M05-1102, Sheet 1
LR-CPS-M05-1102, Sheet 2
LR-CPS-M05-1102, Sheet 3
LR-CPS-M05-1102, Sheet 4
LR-CPS-M05-1103, Sheet 1
LR-CPS-M05-1104, Sheet 1
LR-CPS-M05-1104, Sheet 2
LR-CPS-M05-1105, Sheet 2
LR-CPS-M05-1106, Sheet 2
LR-CPS-M05-1106, Sheet 3
LR-CPS-M05-1110, Sheet 1
LR-CPS-M05-1111, Sheet 1
LR-CPS-M05-1113, Sheet 1
LR-CPS-M05-1114, Sheet 1
LR-CPS-M05-1115, Sheet 1
LR-CPS-M05-1115, Sheet 2
LR-CPS-M05-1115, Sheet 3
LR-CPS-M05-1118, Sheet 1
LR-CPS-M05-1118, Sheet 2
LR-CPS-M05-9014, Sheet 1
LR-CPS-M05-9038, Sheet 1

Table 2.3.3-9 Fire Protection System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Fire Barriers	Fire Barrier
Fire Barriers (Concrete Curbs)	Fire Barrier
Fire Barriers (Concrete Walls, Ceilings, Floors)	Fire Barrier
Fire Barriers (Damper Assembly)	Fire Barrier
Fire Barriers (Doors)	Fire Barrier
Fire Barriers (For Steel Components)	Fire Barrier
Fire Barriers (Masonry Walls)	Fire Barrier
Fire Barriers (Penetration Seals and Fire Stops)	Fire Barrier
Fire Hydrant	Pressure Boundary
Flame Arrestor	Pressure Boundary
Flexible Connection	Pressure Boundary
Flow Device	Pressure Boundary
	Throttle
Gearbox (Diesel Fire Water Pump)	Pressure Boundary
Gearbox (Jockey Pump)	Pressure Boundary
Hose Stations	Structural Support
Hoses	Pressure Boundary
Odorizer	Pressure Boundary
Piping elements	Pressure Boundary
Piping, piping components	Pressure Boundary
Piping, piping components: Insulated	Pressure Boundary
Pump Casing (Diesel Fire Water Pump)	Pressure Boundary
Pump Casing (Jockey Pump)	Pressure Boundary
Silencer / Muffler (Exhaust Silencer)	Pressure Boundary
Spray Nozzles	Spray
Sprinkler Heads	Pressure Boundary
	Spray
Strainer (Element)	Filter
Tanks (Diesel Fire Pump Day Tank) - internal coating/linings	Pressure Boundary
Tanks (Diesel Generator CO2 Storage Tank)	Pressure Boundary
Tanks (Retard Chamber)	Pressure Boundary
Valve Body	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-9 Fire Protection System
Summary of Aging Management Evaluation

2.3.3.10 Fuel Pool Cooling and Storage System

Description

The Fuel Pool Cooling and Storage (FPC) System is designed to remove the decay heat from the fuel assemblies and maintain pool water level and maintains the water temperature, purity, and radiation level in the spent fuel and upper containment pools within acceptable limits. It is also designed to remove radioactive contaminants from the pool water in order to minimize the radiation levels in the vicinity of the pool and the release of radioisotopes from pool water into the air.

The FPC System also contains spent fuel storage racks. The spent fuel storage consists of two high-density racks utilizing a neutron poison to assist in maintaining a safe subcritical configuration located in the spent fuel storage pool and aluminum racks located in the upper containment fuel storage area. Irradiated fuel is stored in the spent fuel pool within the fuel building. No spent (irradiated) fuel is stored inside the containment during plant operation. Reliable decay heat removal is provided by the closed loop FPC System. It consists of two circulating pumps, two heat exchangers, two filter-demineralizers, two skimmer surge tanks, and the required piping, valves, and instrumentation. Each heat exchanger is designed to provide the required cooling capacity to accommodate expected long term spent fuel storage.

The FPC System is described in detail in USAR Sections 1.2.2, 9.1.1, 9.1.2, and 9.1.3. The FPC System boundaries for license renewal are shown on the license renewal boundary drawing listed below.

Reason for Scope Determination

The Fuel Pool Cooling and Storage System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Fuel Pool Cooling and Storage System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Fuel Pool Cooling and Storage System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Station Blackout (10 CFR 50.63). The Fuel Pool Cooling and Storage System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provide primary containment boundary. The nuclear safety function of the primary containment is to contain radioactive material leakage or releases from equipment located within the primary containment. 10 CFR 54.4(a)(1)

2. Ensure adequate cooling in the spent fuel pool to maintain stored fuel within acceptable temperature limits. The nuclear safety function of the fuel storage and handling systems is to ensure adequate cooling in the spent fuel pool to maintain stored fuel within acceptable temperature limits and maintain adequate water inventory.

10 CFR 54.4(a)(1).

3. Prevents criticality of fuel assemblies stored in the spent fuel pool. The spent fuel storage racks maintain new and spent nuclear fuel in subcritical configuration, with at least 5 percent subcriticality margin. 10 CFR 54.4 (a)(1)

4. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The FPC System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs. 10 CFR 54.4(a)(2)

5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The FPC System includes environmentally qualified SSCs. 10 CFR 54.4(a)(3)

6. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The FPC System containment isolation valves must be capable of being closed or operated under SBO conditions. 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.7.1
1.2.2.8.2
9.1.1
9.1.2
9.1.3

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1032, Sheet 2
LR-CPS-M05-1032, Sheet 6
LR-CPS-M05-1037, Sheet 1
LR-CPS-M05-1037, Sheet 2
LR-CPS-M05-1037, Sheet 3
LR-CPS-M05-1046, Sheet 1
LR-CPS-M05-1052, Sheet 1
LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1069, Sheet 1
LR-CPS-M05-1071, Sheet 1
LR-CPS-M05-1071, Sheet 2
LR-CPS-M05-1075, Sheet 1
LR-CPS-M05-1075, Sheet 2
LR-CPS-M05-1080, Sheet 1
LR-CPS-M05-1111, Sheet 3

Table 2.3.3-10 Fuel Pool Cooling and Storage System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Expansion Joints	Pressure Boundary
Fuel Storage Racks (New Fuel)	Structural Support
Fuel Storage Racks (Spent Fuel Storage Pool)	Absorb Neutrons
	Structural Support
Fuel Storage Racks (Upper Containment Pool)	Structural Support
Heat Exchanger (Fuel Pool) Shell Side Components	Pressure Boundary
Heat Exchanger (Fuel Pool) Tube Sheet	Pressure Boundary
Heat Exchanger (Fuel Pool) Tube Side Components	Pressure Boundary
Heat Exchanger (Fuel Pool) Tubes	Heat Transfer
	Pressure Boundary
Hoses	Leakage Boundary
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
Piping, piping components (Fuel Transfer Tube)	Pressure Boundary
Pump Casing (Fuel Pool Cooling Pumps)	Pressure Boundary
Strainer (Element)	Filter
Tanks (Fuel Pool Skimmer Surge Tanks)	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-10 Fuel Pool Cooling and Storage System
Summary of Aging Management Evaluation

2.3.3.11 Nonsafety-Related Ventilation System

Description

The intended function of the Nonsafety-Related Ventilation System (NSV) for license renewal is to maintain leakage boundary integrity to preclude system interactions. For this reason, this system's pressure retaining components located in areas where there are potential spatial interactions with safety-related equipment have been included in the scope of license renewal. This includes the liquid and steam filled portions of the system located within the Auxiliary Building, Control Building and Diesel Generator Building. Included in this boundary are pressure-retaining components relied upon to preserve the leakage boundary intended function of this system. This system is not required to operate to support other license renewal intended functions and is in scope only for potential spatial interaction. Fire dampers in the NSV system are evaluated with the Fire Protection System for aging management review.

The NSV System is described in USAR Sections 7.7.1, 9.4.3, 9.4.4, 9.4.8, 9.4.9, 9.4.10, 9.4.11, 9.4.12 and 9.4.13. The NSV System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Nonsafety-Related Ventilation System is not in scope under 10 CFR 54.4(a)(1) because no portions of the system are safety-related or relied upon to remain functional during and following design basis events. The Nonsafety-Related Ventilation System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Nonsafety-Related Ventilation System is not in scope under 10 CFR 54.4(a)(3) because it is not relied upon 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Nonsafety-Related Ventilation System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Auxiliary Building, Control Building, and Diesel Generator Building. 10 CFR 54.4(a)(2)

USAR References

7.7.1.18
9.4.3
9.4.4
9.4.8
9.4.9
9.4.10
9.4.11
9.4.12
9.4.13

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1045, Sheet 12
LR-CPS-M05-1047, Sheet 4
LR-CPS-M05-1047, Sheet 7
LR-CPS-M05-1053, Sheet 16
LR-CPS-M05-1053, Sheet 17
LR-CPS-M05-1053, Sheet 18
LR-CPS-M05-1053, Sheet 19
LR-CPS-M05-1053, Sheet 20
LR-CPS-M05-1053, Sheet 21
LR-CPS-M05-1053, Sheet 22
LR-CPS-M05-1053, Sheet 24
LR-CPS-M05-1053, Sheet 25
LR-CPS-M05-1054, Sheet 38
LR-CPS-M05-1054, Sheet 39
LR-CPS-M05-1056, Sheet 2
LR-CPS-M05-1101, Sheet 1
LR-CPS-M05-1117, Sheet 14
LR-CPS-M05-1117, Sheet 15
LR-CPS-M05-1117, Sheet 16
LR-CPS-M05-1117, Sheet 25
LR-CPS-M05-1118, Sheet 1
LR-CPS-M05-1118, Sheet 2
LR-CPS-M05-1121, Sheet 5

Table 2.3.3-11 Nonsafety-Related Ventilation System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Bolting (Ducting Closure)	Mechanical Closure
Drip Pan	Leakage Boundary
Ducting and Components	Leakage Boundary
Heat Exchanger (Area Coolers) Tube Side Components	Leakage Boundary
Heat Exchanger (Area Coolers) Tubes	Leakage Boundary
Heat Exchanger (Aux Bld Supply, Count Room, Lab Coolers) Tube Side Components	Leakage Boundary
Heat Exchanger (Aux Bld Supply, Count Room, Lab Coolers) Tubes	Leakage Boundary
Heat Exchanger (Counting Room Condensing Unit) Shell Side Components	Leakage Boundary
Heat Exchanger (Counting Room Condensing Unit) Tube Side Components	Leakage Boundary
Heat Exchanger (PASS Room Cooling Coil) Tubes	Leakage Boundary
Piping, piping components	Leakage Boundary
Valve Body	Leakage Boundary

The aging management review results for these components are provided in:

Table 3.3.2-11 Nonsafety-Related Ventilation System
Summary of Aging Management Evaluation

2.3.3.12 Open Cycle Cooling Water System

Description

The Open Cycle Cooling Water (OCCW) System is designed to remove heat from equipment required for safe reactor shutdown and to cool plant auxiliary equipment over the full range of reactor operation during normal operating and normal shutdown conditions. The OCCW consists of the following plant systems: plant service water, shutdown service water, circulating water, chlorination, and screen wash.

Plant Service Water System

The plant service water system is the source of cooling for station auxiliaries during normal station operation and shutdown and is not required to ensure safe shutdown of the plant. The cooling water source for the plant service water system is Lake Clinton. The system consists of three vertical wet pit pumps, strainers, piping, valves, and corresponding instrumentation. The plant service water system is cross connected to the fire protection system; the connection has a normally locked shut gate valve and a check valve to prevent fire water flow into the plant service water system. The plant service water system also supplies raw water to the makeup demineralizer and circulating water systems. Additionally, the plant service water pumps furnish water to the circulating water traveling screen wash system, which keeps the circulating water traveling screens free of debris.

Shutdown Service Water System

The shutdown service water system removes heat from equipment required for safe reactor shutdown and does not operate during normal station operation and shutdown. The cooling water source for the shutdown service water system is the Ultimate Heat Sink (UHS) which is a submerged pond and intake flume that underlies Lake Clinton and provides sufficient water volume and cooling capability for the station for at least 30 days with no water makeup. During normal operation and shutdown, the plant service water system supplies water to safety-related equipment though shutdown service water system piping. The inter tie between each shutdown service water division and the plant service water system is provided with an automatic motor-operated isolation valve. The shutdown service water pumps automatically start upon receiving a signal indicating either a loss-of-coolant accident (LOCA), or a low pressure signal from the shutdown service water header which indicates a loss-of-offsite power (LOOP). When the shutdown service water pumps start, the isolation valves between the shutdown service water and plant service water systems close. The shutdown service water system consists of three motor-driven vertical wet pit pumps (one per division), strainers, piping, valves, and corresponding instrumentation to provide water from the UHS to station essential equipment and discharge back to the UHS. Division I and II are crosstied with double isolation valves to provide added flexibility to the system. The flow path for the shutdown service water cooling water is from the UHS through the bar grills and traveling screens into the shutdown service water pump intake bay. In addition, the system provides shutdown service water to the manual deluge systems of the standby gas treatment system, control room supply air filter packages, and the control room makeup air filter packages.

While the fuel pool cooling and cleanup heat exchangers and pump motors are normally supplied by the component cooling water system, the shutdown service water system provides a backup for cooling when necessary or desired. In an emergency, the shutdown service water system has the capability to provide make up water directly to the spent fuel pool. Finally, the shutdown service water system is capable of providing makeup water to the suppression pool, flooding the reactor vessel, the drywell, or containment through residual heat removal system piping.

Two potential paths for radioactive inleakage to the shutdown service water system are the residual heat removal and fuel pool cooling and cleanup heat exchangers. Radiation monitors are in the service water discharge from the residual heat removal and fuel pool heat exchangers and are evaluated with the Process Radiation Monitoring System. Motor-operated isolation valves in the service water inlet and discharge can be closed if a high radiation alarm from the heat exchangers occurs. Process radiation monitoring ensures any radioactivity released to the ultimate heat sink will not exceed allowable limits.

Traveling screens in the Unit 1 intake, which are part of the circulating water system, and the fixed screens in both the Unit 1 and 2 intakes are also evaluated with the OCCW System. These screens are required to filter debris from the UHS prior to reaching the basket strainers on the wet-pit style fire pumps pursuant to NFPA 20.

Circulating Water, Chlorination, and Screen Wash Systems

The circulating water, screen wash, and chlorination systems perform as an integrated unit. These systems are not required to perform or assist in performing nuclear safety functions and are not located in areas in which spatial interaction with safety-related components is possible. Therefore, the circulating water (with the exception of the traveling screens), screen wash, and chlorination systems are not in the scope of license renewal.

The UHS and Clinton Lake are scoped with the Cooling Lake license renewal structure. Process radiation monitors are scoped with the Process Radiation Monitoring System.

The OCCW is described in detail in USAR Sections 9.2.1.1, 9.2.1.2, and 10.4.5. The OCCW boundaries for license renewal are shown on the license renewal boundary drawings listed below.

<u>Reason for Scope Determination</u>

The Open Cycle Cooling Water System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Open Cycle Cooling Water System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Open Cycle Cooling Water System also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

<u>Intended Functions</u>

1. Remove residual heat from the reactor coolant system. The Open Cycle Cooling Water System removes heat from equipment necessary to safely shutdown the plant and maintain a safe plant shutdown by rejecting this heat to the ultimate heat sink.
   10 CFR 54.4(a)(1)

2. Provide heat removal from safety-related heat exchangers. The Open Cycle Cooling Water System removes heat from the RHR heat exchangers during normal and accident conditions and from fuel pool cooling heat exchangers during accident conditions. 10 CFR 54.4(a)(1)

3. Provide emergency heat removal from primary containment and provide containment pressure control. The Open Cycle Cooling Water System has the capability to flood the drywell and containment through use of the residual heat removal piping, if required following a postulated LOCA. 10 CFR 54.4(a)(1)

4. Maintain emergency temperature limits within areas containing safety-related components. The Open Cycle Cooling Water System provides cooling following a postulated LOCA automatically with no operator action, assuming a single failure coincident with the LOOP. 10 CFR 54.4(a)(1)

5. Provide primary containment isolation. The Open Cycle Cooling Water System includes primary containment isolation valves and associated piping. 10 CFR 54.4(a)(1)

6. Ensure adequate cooling in the spent fuel pool to maintain stored fuel within acceptable temperature limits. While the fuel pool cooling and cleanup heat exchangers and pump motors are normally supplied by the component cooling water system, the Open Cycle Cooling Water System assures that makeup will be available for the spent fuel storage pool. 10 CFR 54.4(a)(1)

7. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Open Cycle Cooling Water System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Screenhouse, Control Building, Auxiliary Building, Diesel Generator Building, Fuel Building, and Primary Containment. 10 CFR 54.4(a)(2)

8. Relied upon 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). The Open Cycle Cooling Water System transfers heat to the lake from Fire Safe Shutdown equipment. The system also provides water to the manual deluge systems of the standby gas treatment system. Additionally, the system houses the traveling screens and the fixed screens in the intake structure from the lake, which are required in addition to the basket strainers on the diesel driven fire pumps, pursuant to NFPA 20. 10 CFR 54.4(a)(3)

9. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Open Cycle Cooling Water System includes components which are environmentally qualified. 10 CFR 54.4(a)(3)

10. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients Without Scram (10 CFR 50.62). The Open Cycle Cooling Water System is designed to remove heat from station auxiliaries, such as: RHR heat exchangers, RHR pump seal coolers, RHR pump room coolers, RHR heat exchanger room coolers, RCIC pump room coolers, and HPCS room coolers. 10 CFR 54.4(a)(3)

11. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The Open Cycle Cooling Water System provides the water supply to RHR loads and plant auxiliaries for safe shutdown, as well as suppression pool cooling following recovery of AC power. 10 CFR 54.4(a)(3)

USAR References
1.2.2.4.19
1.2.2.5.7
1.2.2.8.3
9.2.1.1
9.2.1.2
10.4.5

License Renewal Boundary Drawings
LR-CPS-M05-1032, Sheet 3
LR-CPS-M05-1045, Sheet 12
LR-CPS-M05-1047, Sheet 5
LR-CPS-M05-1047, Sheet 6
LR-CPS-M05-1051, Sheet 1
LR-CPS-M05-1052, Sheet 1
LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1052, Sheet 3
LR-CPS-M05-1052, Sheet 4
LR-CPS-M05-1052, Sheet 5
LR-CPS-M05-1056, Sheet 1
LR-CPS-M05-1056, Sheet 2
LR-CPS-M05-1056, Sheet 5
LR-CPS-M05-1075, Sheet 4
LR-CPS-M05-1102, Sheet 1
LR-CPS-M05-1102, Sheet 5
LR-CPS-M05-1102, Sheet 6
LR-CPS-M05-1105, Sheet 1
LR-CPS-M05-1109, Sheet 2
LR-CPS-M05-1109, Sheet 3
LR-CPS-M05-1117, Sheet 1
LR-CPS-M05-1117, Sheet 2

Table 2.3.3-12 Open Cycle Cooling Water System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Fixed Screens	Filter
Flexible Connection	Pressure Boundary
Flow Device	Pressure Boundary
	Throttle
Heat Exchanger (Shutdown Service Water Pump Thrust Bearing Cooling Coil) Fins	Heat Transfer
Heat Exchanger (Shutdown Service Water Pump Thrust Bearing Cooling Coil) Tubes	Heat Transfer
	Pressure Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Piping, piping components: Insulated	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Pump Casing (Shutdown Service Water Pump 1A/1B)	Pressure Boundary
Pump Casing (Shutdown Service Water Pump 1C)	Pressure Boundary
Spray Nozzles	Spray
Strainer (Element)	Filter
Traveling Water Screens	Filter
Valve Body	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Valve Body: Insulated	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)

The aging management review results for these components are provided in:

Table 3.3.2-12 Open Cycle Cooling Water System
Summary of Aging Management Evaluation

2.3.3.13 Plant Drainage System

Description

The Plant Drainage System is a normally operating system designed to collect various liquid wastes generated in the operation of the plant. The Plant Drainage System consists of several plant systems including the floor and equipment drain systems for the Primary Containment, Auxiliary Building, Fuel Building, Turbine Building, Radwaste Building, Diesel Generator Building, and Control Building. The Plant Drainage System also includes the filtered water system, the laundry equipment and floor drain system, the laundry equipment floor drains radioactive waste reprocessing and disposal system, the miscellaneous building drains system, the roof drain system, the sanitary system, and the turbine generator miscellaneous drains and vents system. The Plant Drainage System is in scope for License Renewal. However, portions of the Plant Drainage System are not required to perform intended functions and are not in scope.

The purpose of the floor and equipment drain systems is to collect radioactive and potentially radioactive waste liquids from the Primary Containment, Auxiliary Building, Fuel Building, Turbine Building, Radwaste Building, Diesel Generator Building, and Control Building and to transfer them to the collecting vessels in the radwaste treatment system for processing for reuse or disposal. The systems accomplish this by collecting waste liquids from their points of origin and transferring them for eventual processing. Radioactive, nonradioactive, and oily wastes are segregated and processed separately by the appropriate methods.

The floor and equipment drain systems for the Primary Containment, Auxiliary Building, and Fuel Building, include safety-related and environmentally qualified primary containment isolation valves.

Floor drains in the Primary Containment, Auxiliary Building, Fuel Building, Diesel Generator Building, Control Building, and Screenhouse, are credited for the removal of fire water from areas containing safe shutdown equipment and are in scope for Fire Safe Shutdown.

Exposed, non-embedded portions of the floor and equipment drain systems which have potential spatial interaction with safety-related equipment in the Primary Containment, Auxiliary Building, Fuel Building, Diesel Generator Building, Control Building, and Screenhouse, perform a license renewal intended function and are in scope for potential spatial interaction.

The purpose of the filtered water system is to supply clean water to the pump seals for the circulating water pumps, the bearings for circulating water pumps, the motor coolers for the plant service water pumps, the horizontal diesel fire pump, and the fire protection jockey pump. The filtered water system performs this function by providing a filtered water storage tank and associated pumps to transfer water to support the circulating water pumps and plant service water pumps. The filtered water storage tank supplies water to the horizontal diesel fire pump and the fire protection jockey pump. The filtered water storage tank is not credited as part of the fire protection system water supply. Normally the fire protection system is pressurized by a jockey pump fed from the filtered water system. The filtered water system does not perform a license renewal intended function.

The purpose of the laundry equipment and floor drain system, and the laundry equipment floor drain radioactive waste reprocessing and disposal system (laundry drain systems) is to receive waste from the station laundry drains, personnel decontamination showers, and any other contaminated sources that may be high in detergent content. The systems are designed to allow for complete recycling of all processed waste with return to the condensate storage system. The systems perform this function by collecting the laundry drains in tanks and treating the laundry drains by filtering, evaporation, and demineralization for reuse. Exposed, non-embedded portions of the laundry drain systems in the Control Building perform a license renewal intended function and are in scope for potential spatial interaction.

The purpose of the miscellaneous building drains system is to collect equipment and floor drains water from the shutdown service water pump room, the circulating water screen house, the seal well valve pit, the relay house, the service building, the sediment pond filter house, and the makeup water pump house. The miscellaneous building drains system performs this function by collecting equipment and floor drain water in various sumps. Drains from the ‘A’ and ‘B’ shutdown service water pump room are pumped to the shutdown service water pump intake area. Drains from the ‘C’ shutdown service water pump room and the circulating water screen house are pumped to the circulating water pump intake. Drains from the seal well valve pit are pumped to the seal well. Portions of the miscellaneous building drains system in the Screenhouse are credited for the removal of fire water from areas containing safe shutdown equipment and are in scope for Fire Safe Shutdown. Exposed, non-embedded portions of the miscellaneous building drains system in the Screenhouse perform a license renewal intended function and are in scope for potential spatial interaction.

The purpose of the roof drain system is to prevent the accumulation of precipitation on plant building roofs. The roof drain system accomplishes this by collecting roof drainage and discharging it into the storm sewer system. The roof drain system is not required to operate to support license renewal intended functions. Roof drains are not credited to mitigate the effects of the probable maximum precipitation (PMP). The roofs of safety-related structures are designed for the maximum accumulation of water assuming the roof drains are clogged. Only the exposed, non-embedded portions of the roof drain branch lines and headers which have potential spatial interaction with safety-related equipment in the Control Building, Diesel Generator Building, Fuel Building, Auxiliary Building, and Screenhouse perform a license renewal intended function and are in scope for potential spatial interaction.

The purpose of the sanitary system is to treat sanitary wastes to meet the effluent quality limits of the National Pollutant Discharge Elimination System (NPDES) permit. Sewage treatment is provided by primary and secondary aerated lagoon cells. The effluent of the lagoon is normally treated by sand filtration, for total suspended solids reduction. Sewage treatment effluent is released to the circulating water discharge flume. The sanitary system is not required to operate to support license renewal intended functions. Only the exposed, non-embedded portions of the sanitary waste drain system which have potential spatial interaction with safety-related equipment in the Control Building and Diesel Generator Building perform a license renewal intended function and are in scope for potential spatial interaction.

The purpose of the turbine generator miscellaneous drains and vents system is to collect equipment leakoff and drainage from the main turbine and associated components located in the Turbine Building. The turbine generator miscellaneous drains and vents system accomplishes this by collecting leakoff and drainage for transfer to the main condenser or to the turbine building floor drain system or the turbine building equipment drain system for processing. The turbine generator miscellaneous drains and vents system does not perform a license renewal intended function.

For more detailed information see USAR Sections 1.2.2.8.7, 1.2.2.8.10, 2.4.2.3, 9.2.4, 9.3.3, 9.5.1.5.4, 11.2; and USAR Appendix E, Section 3.1.2.2.11.

Reason for Scope Determination

The Plant Drainage System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Plant Drainage System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Plant Drainage System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49). The Plant Drainage System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62) and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. The Plant Drainage System piping penetrating the drywell and containment structures is nuclear safety-related, designed in accordance with the ASME Section III Code, Class 2, and is provided with air-operated valves for containment and drywell isolation. 10 CFR 54.4(a)(1)

2. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Plant Drainage System is designed to preclude cross-flooding of the standby diesel generator cubicles and the nuclear safety-related ECCS compartments. 10 CFR 54.4(a)(2)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Plant Drainage System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Primary Containment, Auxiliary Building, Fuel Building, Diesel Generator Building, Control Building, and Screenhouse. The Plant Drainage System also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping. 10 CFR 54.4(a)(2)

4. Relied upon 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). The Plant Drainage System is credited for the removal of fire water from areas containing safe shutdown upon fire suppression system actuation. 10 CFR 54.4(a)(3)

5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Environmental Qualification (10 CFR 50.49). The Plant Drainage System contains electrical equipment

subject to the requirements of 10 CFR 50.49, the EQ rule. 10 CFR 54.4(a)(3)

USAR References
1.2.2.8.7
1.2.2.8.10
1.2.2.9.2
9.3.3
9.5.1.5.4
11.2
11.2.2.4

License Renewal Boundary Drawings
LR-CPS-M05-1046, Sheet 1
LR-CPS-M05-1046, Sheet 2
LR-CPS-M05-1046, Sheet 3
LR-CPS-M05-1046, Sheet 4
LR-CPS-M05-1046, Sheet 5
LR-CPS-M05-1046, Sheet 6
LR-CPS-M05-1046, Sheet 7
LR-CPS-M05-1047, Sheet 1
LR-CPS-M05-1047, Sheet 2
LR-CPS-M05-1047, Sheet 3
LR-CPS-M05-1047, Sheet 4
LR-CPS-M05-1047, Sheet 5
LR-CPS-M05-1047, Sheet 6
LR-CPS-M05-1047, Sheet 7
LR-CPS-M05-1047, Sheet 8
LR-CPS-M05-1047, Sheet 9
LR-CPS-M05-1053, Sheet 16
LR-CPS-M05-1053, Sheet 17
LR-CPS-M05-1053, Sheet 18
LR-CPS-M05-1053, Sheet 19
LR-CPS-M05-1053, Sheet 20
LR-CPS-M05-1053, Sheet 21
LR-CPS-M05-1053, Sheet 22
LR-CPS-M05-1053, Sheet 23
LR-CPS-M05-1053, Sheet 24
LR-CPS-M05-1053, Sheet 25
LR-CPS-M05-1054, Sheet 28
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LR-CPS-M05-1054, Sheet 32
LR-CPS-M05-1054, Sheet 33
LR-CPS-M05-1054, Sheet 34
LR-CPS-M05-1054, Sheet 35
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LR-CPS-M05-1054, Sheet 38
LR-CPS-M05-1054, Sheet 39

LR-CPS-M05-1054, Sheet 40
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LR-CPS-M05-1054, Sheet 43
LR-CPS-M05-1054, Sheet 44
LR-CPS-M05-1059, Sheet 3
LR-CPS-M05-1083, Sheet 1
LR-CPS-M05-9062, Sheet 2
LR-CPS-M05-1012, Sheet 6
LR-CPS-M05-1012, Sheet 7
LR-CPS-M05-1032, Sheet 1
LR-CPS-M05-1032, Sheet 3
LR-CPS-M05-1037, Sheet 1
LR-CPS-M05-1037, Sheet 2
LR-CPS-M05-1045, Sheet 8
LR-CPS-M05-1045, Sheet 11
LR-CPS-M05-1045, Sheet 12
LR-CPS-M05-1064, Sheet 2
LR-CPS-M05-1064, Sheet 3
LR-CPS-M05-1071, Sheet 1
LR-CPS-M05-1071, Sheet 2
LR-CPS-M05-1072, Sheet 1
LR-CPS-M05-1072, Sheet 2
LR-CPS-M05-1073, Sheet 1
LR-CPS-M05-1074, Sheet 1
LR-CPS-M05-1075, Sheet 1
LR-CPS-M05-1075, Sheet 2
LR-CPS-M05-1075, Sheet 3
LR-CPS-M05-1076, Sheet 1
LR-CPS-M05-1076, Sheet 3
LR-CPS-M05-1078, Sheet 2
LR-CPS-M05-1078, Sheet 3
LR-CPS-M05-1079, Sheet 2
LR-CPS-M05-1085, Sheet 1
LR-CPS-M05-1086, Sheet 1
LR-CPS-M05-1087, Sheet 1
LR-CPS-M05-1102, Sheet 1
LR-CPS-M05-1102, Sheet 5
LR-CPS-M05-1102, Sheet 6
LR-CPS-M05-1105, Sheet 1
LR-CPS-M05-1106, Sheet 2
LR-CPS-M05-1109, Sheet 2
LR-CPS-M05-1109, Sheet 3
LR-CPS-M05-1110, Sheet 1
LR-CPS-M05-1111, Sheet 3
LR-CPS-M05-1111, Sheet 5
LR-CPS-M05-1116, Sheet 2
LR-CPS-M05-1117, Sheet 1
LR-CPS-M05-1117, Sheet 26
LR-CPS-M05-1118, Sheet 5

Table 2.3.3-13 Plant Drainage System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Drip Pan	Leakage Boundary
Heat Exchanger (Drywell Equipment Drain Coolers) Shell Side Components	Leakage Boundary
Heat Exchanger (Drywell Equipment Drain Coolers) Tube Side Components	Leakage Boundary
Hoses	Leakage Boundary
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Pump Casing (Auxiliary Building Drain Tank Pumps)	Leakage Boundary
Pump Casing (Fuel Building Equipment Drain Pumps)	Leakage Boundary
Pump Casing (Fuel Building Floor Drain Transfer Pumps)	Leakage Boundary
Pump Casing (Fuel Cask Washdown Area Drain Pump)	Pressure Boundary
Tanks (Auxiliary Building Floor Drain Tank)	Leakage Boundary
Tanks (Fuel Building Equipment Drain Tank)	Leakage Boundary
Tanks (Fuel Building Floor Drain Tank)	Leakage Boundary
Tanks (Oil Reservoir)	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-13 Plant Drainage System
Summary of Aging Management Evaluation

2.3.3.14 Primary Containment Ventilation System

Description

The Primary Containment Ventilation (PCV) System is a normally operating system designed to limit the maximum average temperature of the air to maintain the containment building and drywell air temperatures within equipment operating limits and maintain differential pressures in building areas to reduce the spread of contamination. Air flow is regulated to maintain the containment building at a negative pressure with respect to the outside. The system contains fans and blowers, fan-coil cooling units, isolation valves, piping, strainers, dampers, and ductwork. Supply air ducts are provided for air distribution in each cubicle. The air circulated through each cubicle is cooled by its respective fan-coil unit. Portions of the PCV System are not required to perform intended functions and are not in scope.

The PCV System is composed of three plant subsystems, the containment building ventilation system (VR/VQ), the continuous containment purge system (VR), and the drywell cooling system (VP). The ventilation and purge subsystems are not normally used simultaneously.

Containment Ventilation System

This nonsafety-related (except for containment isolation function) system is normally used during cold shutdown (mode 4) or refueling (mode 5) but can be used during power operation (modes 1, 2 and 3) as limited by Technical Specifications. When in operation, the containment building ventilation system supplies filtered, heated, or cooled air to the general areas through a central fan system consisting of an outside air intake, filters, a heating coil, a cooling coil, two 100 percent capacity supply air fans, and supply air ductwork. The potentially contaminated cubicles are maintained at a slightly lower pressure than the surrounding accessible areas and; therefore, the air flows from the accessible areas to these shielded cubicles before it is exhausted. One of the two 100 percent capacity exhaust fans provides the ventilation air through exhaust ducts from potentially contaminated areas and discharges the air to the common station HVAC vent. The containment ventilation system includes the combustible gas control system cubicle coolers. Blind couplings were installed on the connections to the open cycle cooling water systems for these coolers.

Continuous Containment Purge System

This nonsafety-related (except for containment isolation function) system is normally used during power operation (modes 1, 2 and 3) but can be used in modes 4 and 5. This subsystem is designed to maintain the airborne radiation levels in containment below design basis conditions of operation. The continuous containment purge system supplies filtered, heated, or cooled air to the general areas through a central fan system consisting of an outside air intake, filters, an electric heating coil, a cooling coil, a secondary cooling coil, two 100 percent capacity supply air blowers, and supply air piping and ductwork. The potentially contaminated cubicles are maintained at a slightly lower pressure than the surrounding accessible areas and, therefore, the air flows from the accessible areas to these shielded cubicles before it is exhausted. One of the two 100 percent capacity exhaust blowers provided exhausts the ventilation air through exhaust ducts from potentially contaminated areas and discharges the air to the common station HVAC vent. Alternately, the operator has the option to exhaust the air through the drywell purge filter units (A or B) before being discharged to the common station HVAC vent.

Drywell Cooling System

The nonsafety-related (except for containment isolation function) drywell cooling system is used during normal plant operating conditions and provides cooling to the drywell areas to maintain temperature limits per the USAR. There are eight drywell coolers, six upper (two original and four supplemental) and two lower. The coolers are fan-coil units. Four 50 percent capacity fan-coil units are located within the drywell, with two fan-coil units normally operating and two serving as standby. Each fan-coil unit consists of a supply fan and chilled water cooling coils.

The drywell chilled water system is included in scope for license renewal as part of the Closed Cycle Cooling Water (CCW) System. The drywell chilled water system removes heat from a total of six drywell coolers (four original and two supplemental). Two refrigeration units provide the cooling medium for the closed loop drywell chilled water that supports the six drywell coolers. The remaining two coolers are cooled by plant chilled water system which is also included in scope for license renewal as part of the CCW System.

The Primary Containment Ventilation System is described in USAR Sections 7.7.1.17, 9.4.5.5, 9.4.6, and 9.4.7.1. The PCV System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Primary Containment Ventilation System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Primary Containment Ventilation System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Primary Containment Ventilation System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Station Blackout (10 CFR 50.63). The Primary Containment Ventilation System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provide primary containment boundary. The Primary Containment Ventilation System contains safety-related primary containment isolation valves in the chilled water piping and air ducting to and from Primary Containment. 10 CFR 54.4(a)(1)

2. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Primary Containment Ventilation System includes nonsafety-related water filled piping and components that have the potential for spatial interactions (spray or leakage) with safety-related SSCs. The Primary Containment Ventilation System also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping located in the Fuel Building and Primary Containment. 10 CFR 54.4(a)(2)

3. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Primary Containment Ventilation System contains components associated with the primary containment isolation valves that are environmentally qualified. 10 CFR 54.4(a)(3)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). Position indication and manual operation of a Primary Containment Ventilation System primary containment isolation valve is required during station blackout events. 10 CFR 54.4(a)(3)

USAR References
9.2.8.2
9.4.6
7.7.1.17
9.4.7.1
9.4.5.5
15.9.3.6
Table 3.2-1
Table 15.9-4

License Renewal Boundary Drawings
LR-CPS-M05-1046, Sheet 2
LR-CPS-M05-1046, Sheet 6
LR-CPS-M05-1046, Sheet 7
LR-CPS-M05-1047, Sheet 1
LR-CPS-M05-1047, Sheet 3
LR-CPS-M05-1047, Sheet 8
LR-CPS-M05-1052, Sheet 5
LR-CPS-M05-1053, Sheet 25
LR-CPS-M05-1056, Sheet 2
LR-CPS-M05-1109, Sheet 1
LR-CPS-M05-1109, Sheet 2
LR-CPS-M05-1109, Sheet 3
LR-CPS-M05-1111, Sheet 1
LR-CPS-M05-1111, Sheet 4
LR-CPS-M05-1111, Sheet 5
LR-CPS-M05-1117, Sheet 15
LR-CPS-M05-1117, Sheet 19
LR-CPS-M05-1117, Sheet 20
LR-CPS-M05-1117, Sheet 26
LR-CPS-M05-1121, Sheet 6

Table 2.3.3-14 Primary Containment Ventilation System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Bolting (Ducting Closure)	Mechanical Closure
Drip Pan	Leakage Boundary
Ducting and Components	Structural Integrity (Attached)
Heat Exchanger (CGCS Cubicle Coil Cabinet) Tube Side Components	Structural Integrity (Attached)
Heat Exchanger (Containment Purge and Supply Cooling Coils) Tube Side Components	Leakage Boundary
Heat Exchanger (Containment Purge and Supply Cooling Coils) Tubes	Leakage Boundary
Heat Exchanger (Drywell Chiller Lube Oil Cooler) Shell Side Components	Leakage Boundary
Heat Exchanger (Drywell Chiller) Shell Side Components: Insulated	Leakage Boundary
Heat Exchanger (Drywell Chiller) Tube Side Components: Insulated	Leakage Boundary
Heat Exchanger (Drywell Cooling Coils) Tube Side Components	Leakage Boundary
Heat Exchanger (Drywell Cooling Coils) Tubes	Leakage Boundary
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Piping, piping components: Insulated	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Pump Casing (Drywell Chilled Water Pump)	Leakage Boundary
Strainer (Element)	Filter
Tanks (Air Separator): Insulated	Leakage Boundary
Tanks (Drywell Chilled Water Compression Tank, Chemical Feed Tank, Sidestream Filter Vessel): Insulated	Leakage Boundary
Valve Body	Leakage Boundary
	Pressure Boundary
Valve Body: Insulated	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-14 Primary Containment Ventilation System
Summary of Aging Management Evaluation

2.3.3.15 Process Radiation Monitoring System

Description

The Process Radiation Monitoring System is provided to monitor and control radioactivity in process and effluent streams and to activate appropriate alarms and controls. A process radiation monitoring system is provided for indication and recording radiation levels associated with selected plant process streams and effluent paths leading to the environment. All effluents from the plant which are potentially radioactive are monitored.

The safety-related monitoring systems that activate alarms and perform automatic actions are the following:

- Main steam line radiation monitoring subsystem
- Containment fuel transfer pool vent plenum radiation monitoring subsystem
- Containment building exhaust duct radiation monitoring subsystem
- Fuel building ventilation exhaust radiation monitoring subsystem
- Control room air intakes radiation monitoring subsystem

General Design Criterion 64 requirements for monitoring all effluent discharge paths for radioactivity that may be released from normal operations, anticipated operational occurrences, and from postulated accidents are met. The gaseous monitors that meet General Design Criterion 64 and perform a safety-related function are the following:

- Common station HVAC exhaust high range radiation monitors
- Standby gas treatment system (SGTS) exhaust high range radiation monitors
- Continuous containment purge exhaust duct radiation monitors

The liquid monitors that do not perform a safety-related function are the following:

- Plant service water effluent radiation monitor
- Shutdown service water effluent radiation monitors
- Liquid radwaste discharge radiation monitor
- Fuel pool heat exchanger service water radiation monitor
- Component cooling water radiation monitor

The gaseous monitors that do not perform a safety-related function are the following:

- Pretreatment air ejector off-gas radiation monitor
- Post-Treatment air ejector off-gas radiation monitors
- Drywell iodine/gas and particulate monitors

Safety-Related Radiation Monitoring Subsystems

Main Steam Line Radiation Monitoring Subsystem

The main steam line radiation monitoring system consists of two gamma radiation monitors located externally to the main steam lines just outside the containment. The monitors are designed to detect a gross release of fission products from the fuel. On detection of high radiation, the trip signals generated by the monitors are used to trip the mechanical vacuum pump, if running.

Containment Fuel Transfer Pool Vent Plenum Radiation Monitoring Subsystem

The purpose of this subsystem is to indicate when excessive amounts of radioactive material exist in the containment fuel transfer pool vent plenum, and to initiate appropriate action so that the release of radioactive material to the environs is controlled. The subsystem consists of four channels of radiation monitors and is a part of the integrated radiation monitor system containment building HVAC radiation monitoring system. The trip outputs of this subsystem initiates isolation of the containment building and fuel building ventilation systems and starts the standby gas treatment system.

Containment Building Exhaust Duct Radiation Monitoring Subsystem

The containment building ventilation radiation monitoring system consists of radiation monitors arranged to monitor the activity level of the ventilation exhaust from the fuel transfer area and in the building's main exhaust duct. The detection of high radiation will automatically shut down the containment and fuel building ventilation systems, start the standby gas treatment system, initiate closure of the various purge and exhaust paths to these buildings, and isolate the normal exhaust from the ECCS pump rooms to the fuel building ventilation system.

Fuel Building Ventilation Radiation Monitoring Subsystem

The fuel building ventilation radiation monitoring system consists of radiation monitors arranged to monitor the activity level of the ventilation exhaust from the fuel handling area and fuel building. On detection of high radiation, the fuel building is automatically isolated and the standby gas treatment system is started.

Control Room Air Intake Radiation Monitors

Four redundant gross gamma channels are provided to monitor the control room air intakes and control the ventilation system to limit the radiation dose to personnel in the control room under normal and accident conditions. Whenever the level of radioactivity exceeds a preset level, the monitoring system starts one of the two standby makeup air filter trains.

Common Station HVAC Vent Stack Radiation Monitors

Two common station HVAC vent radiation monitors are provided. One monitor is operational and the other is an installed spare. The operational monitor extracts samples via a flow splitter through an isokinetic probe mounted in the stack downstream of all ventilation inputs to the stack.

The monitors are offline sampling type (skid mounted) with detectors to measure particulate, iodine, and noble gas radioactivity. The low range noble gas channel is used in conjunction with the HVAC accident range radiation monitor (AXM) to monitor accident effluent releases. Annunciator in the main control and local visual alarms can be actuated on iodine, particulate, or noble gas channel ALERT or HIGH radioactivity or on monitor failure. The high range monitor performs a safety-related function while the low range does not.

Standby Gas Treatment System (SGTS) Exhaust Radiation Monitors

Two SGTS exhaust radiation monitors are provided. One monitor is operational and the other is an installed spare. The operational monitor extracts samples via a flow splitter through an isokinetic probe mounted in the exhaust stack.

The monitors are offline sampling type (skid mounted) with detectors to measure particulate, iodine, and noble gas radioactivity. The low range noble gas channel is used in conjunction with the SGTS accident range radiation monitor (AXM) to monitor accident effluent releases. Annunciators in the main control room and local visual alarms can be actuated on iodine, particulate, or noble gas channel ALERT or HIGH radioactivity or on monitor failure. The high range monitor performs a safety-related function while the low range does not.

Continuous Containment Purge Exhaust Duct Radiation Monitors

The purpose of this subsystem is to indicate when excessive amounts of radioactive material exist in the exhaust duct, and to initiate appropriate action so that the release of radioactive material to the environs is controlled. The detection of high radiation will automatically shut down the containment and fuel building ventilation systems, start the standby gas treatment system, initiate closure of the various purge and exhaust paths to these buildings.

Nonsafety-Related Radiation Monitoring Subsystems

Plant Service Water Effluent Radiation Monitor

The plant service water effluent radiation monitor, located in the seal well enclosure, measures the radioactivity concentration in the effluent of the plant service water (WS) system to the seal well. The sample extraction point is located in the WS discharge header downstream of all inputs to the header which may possibly contain radioactivity.

The monitor is an offline sampling type (skid mounted) with a gamma scintillator detector to measure gross radioactivity. Grab sample capability is provided. Annunciators in the main control room and local visual alarms will actuate on HIGH and ALERT radioactivity or on monitor failure.

Shutdown Service Water Effluent Radiation Monitors

Two monitors are provided on the shutdown service water system to 1) detect inter-system leakage in the residual heat removal (RHR) heat exchangers (HX), or from the seal water coolers; and 2) measure the radioactivity concentrations of discharges to Lake Clinton should the shutdown service water system be used to cool the RHR HX. One monitor is provided for SX Division 1 (System A) and one monitor is provided for shutdown service water Division 2 (System B). These two divisions provide cooling water to the RHR Systems A and B.

The sample point for each monitor is located downstream from the shutdown service water system discharge from the RHR HX and the RHR pumps seal water coolers. A significant leak in the HX from the shell side to the tube side, or from the seal water coolers, will be detected by the monitor and alarmed for the operator to correct the condition.

Liquid Radwaste Discharge Radiation Monitor

The liquid radwaste discharge radiation monitor measures the radioactivity concentration of the liquid radwaste discharge into the plant service water (WS) discharge header. The sample extraction point is located upstream of the discharge isolation valve prior to the connection to the WS system. The sample point is located sufficiently upstream of the isolation valve to ensure that the monitor response will shut off flow before excess radioactivity passes the valve.

Fuel Pool Heat Exchanger Service Water Radiation Monitors

Two monitors are provided for fuel pool heat exchanger (FC HX) service water effluent to detect and measure the inter-system leakage. One monitor is provided on the discharge of each of the two FC HXs. The sample extraction point is located upstream from the component cooling water (CC) and shutdown service water (SX) branch connection, such that discharge to either system is monitored. A significant leak in the HX from the shell side to tube side will be detected by the monitor, which will actuate an alarm to alert the operator to correct the condition.

The CC system, (which is the normal source of FC HX service water) is a closed loop so that continued radioactive leakage will increase the CC system radioactivity concentration but no discharge to the environment will occur. If the SX system is providing the FC HX service water and leakage occurs, the radioactivity will be diluted by the SX system and discharged to the ultimate heat sink. Operator action would be required to correct the condition.

Component Cooling Water (CC) Radiation Monitor

A monitor on the CC system is provided to detect radioactive contamination in the CC system. The sample extraction point is located upstream from the CC pump suction header beyond the return point for potentially radioactive sources.

Pre- and Post-Treatment Air Ejector Off-Gas Radiation Monitors

These monitors are provided to measure, indicate, and record the levels of radiation and radioactivity associated condenser off-gas.

The Process Radiation Monitoring System is described in USAR Sections 1.2.2.4.11, 1.2.2.9.2, 1.2.2.10.1, 3.1.2.6.5, 7.6.1.2, and 11.5.2. The Process Radiation Monitoring System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

<u>Reason for Scope Determination</u>

The Process Radiation Monitoring System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Process Radiation Monitoring System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Process Radiation Monitoring System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Process Radiation Monitoring System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. The Process Radiation Monitoring System provides isolation of the drywell penetrations utilized by the leak detection system upon receiving a containment isolation signal. 10 CFR 54.4(a)(1)

2. Sense process conditions and generate signals for reactor trip or engineered safety features actuation.

   a. The main steam line radiation monitoring system detects a gross release of fission products from the fuel. On detection of high radiation, the trip signals generated by the monitors are used to trip the mechanical vacuum pump, if running. 10 CFR 54.4(a)(1)

   b. On detection of high radiation, the containment building ventilation radiation monitoring will automatically shut down the containment and fuel building ventilation systems, start the standby gas treatment system, initiate closure of the various purge and exhaust paths to these buildings, and isolate the normal exhaust from the ECCS pump rooms to the fuel building ventilation system. 10 CFR 54.4(a)(1)

   c. The fuel building ventilation radiation monitoring system monitors the activity level of the ventilation exhaust from the fuel handling area and fuel building. On detection of high radiation, the fuel building is automatically isolated and the standby gas treatment system is started. 10 CFR 54.4(a)(1)

   d. The control room air intake radiation monitors detect high levels of radioactivity and start one of the two standby makeup air filter trains if high radiation is detection. 10 CFR 54.4(a)(1)

   e. The containment building fuel transfer ventilation plenum radiation monitors detect high levels of radioactivity, isolate primary containment ventilation, isolate secondary containment ventilation (fuel building), and start the standby gas treatment system. 10 CFR 54.4(a)(1)

   f. The common station HVAC vent stack radiations high range monitors, standby gas treatment system exhaust high range radiation monitors, and continuous containment purge exhaust duct radiation monitors are used to monitor post-accident radioactive releases. 10 CFR 54.4(a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Process Radiation Monitoring System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the fuel building and control building. The Process Radiation Monitoring System also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping located in containment. 10 CFR 54.4(a)(2)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Process Radiation Monitoring System contains electrical equipment subject to the requirements of 10 CFR 50.49, the EQ rule.

10 CFR 54.4(a)(3)

USAR References
1.2.2.4.11
1.2.2.9.2
1.2.2.10.1
3.1.2.6.5
7.6.1.2
11.5.2

License Renewal Boundary Drawings
LR-CPS-M05-1032, Sheet 1
LR-CPS-M05-1032, Sheet 2
LR-CPS-M05-1041, Sheet 4
LR-CPS-M05-1047, Sheet 1
LR-CPS-M05-1052, Sheet 1
LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1053, Sheet 18
LR-CPS-M05-1053, Sheet 21
LR-CPS-M05-1064, Sheet 2
LR-CPS-M05-1064, Sheet 3
LR-CPS-M05-1064, Sheet 5
LR-CPS-M05-1064, Sheet 9
LR-CPS-M05-1064, Sheet 10
LR-CPS-M05-1064, Sheet 11
LR-CPS-M05-1100, Sheet 1
LR-CPS-M05-1102, Sheet 1
LR-CPS-M05-1104, Sheet 2
LR-CPS-M05-1105, Sheet 1
LR-CPS-M05-1110, Sheet 2
LR-CPS-M05-1111, Sheet 1
LR-CPS-M05-1111, Sheet 3
LR-CPS-M05-1111, Sheet 5

Table 2.3.3-15 Process Radiation Monitoring System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Heat Exchanger (Standby Gas Hi Range Rad Monitor Cooler) Shell Side Components	Pressure Boundary
Heat Exchanger (Standby Gas Hi Range Rad Monitor Cooler) Tube Side Components	Pressure Boundary
Heat Exchanger (Standby Gas Hi Range Rad Monitor Cooler) Tubes	Heat Transfer
	Pressure Boundary
Hoses	Pressure Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Support
Pump Casing (CCW Sample Panels Pumps)	Leakage Boundary
Pump Casing (Common Station HVAC Rad Monitor Pump)	Pressure Boundary
Pump Casing (Fuel Pool Service Water Rad Monitor Pumps)	Leakage Boundary
Pump Casing (Shutdown Service Water Rad Monitors Pumps)	Leakage Boundary
Pump Casing (Standby Gas Hi Range Rad Monitor Pump)	Pressure Boundary
Tanks (CCW Sample Panels Sample Chambers)	Leakage Boundary
Tanks (Common Station HVAC Rad Monitor Sample Chambers)	Pressure Boundary
Tanks (Fuel Pool Service Water Rad Monitors Sample Chambers)	Leakage Boundary
Tanks (Shutdown Service Water Rad Monitors Sample Chambers)	Leakage Boundary
Tanks (Standby Gas Hi Range Rad Monitors Sample Chambers)	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary
	Structural Support

The aging management review results for these components are provided in:

Table 3.3.2-15 Process Radiation Monitoring System
Summary of Aging Management Evaluation

2.3.3.16 Process Sampling and Post Accident Monitoring System

Description

The Process Sampling and Post Accident Monitoring System is a normally operating system designed to monitor station operation and equipment performances, obtain highly radioactive samples of reactor coolant, suppression pool and containment atmosphere streams, and provide information for making corrections or adjustments to process system operations. The Process Sampling and Post Accident Monitoring System consists of the containment monitoring system (CM), process sampling system (PS), and post accident sampling system which is a subsystem of PS.

Containment Monitoring System

The purpose of the containment monitoring system is to provide remote indication of parameters which define the environmental conditions within the drywell and containment building. Indication of drywell or containment temperature, pressure, radiation levels, hydrogen concentration, suppression pool level and temperature are provided to the control room operators. This allows the operators to verify normal plant operation conditions and to identify or evaluate certain plant conditions or problems that result in changes in the drywell or containment building environmental parameters. The containment monitoring system is designed to detect hydrogen concentration and to provide a gross gamma radiation reading, which may indicate fuel failure, following a design basis loss of coolant accident. The containment monitoring system is safety-related.

Process Sampling System

The purpose of the process sampling system is to provide process information that is required to monitor plant and equipment performance and changes to operating parameters during normal operation and shutdown conditions. Representative liquid and gas samples are taken automatically and/or manually during normal plant operation for laboratory or on-line analyses. The process sampling system is not required to ensure safe shutdown of the plant.

Post Accident Sampling System

The post accident sampling system may be used to obtain highly radioactive samples of reactor coolant, suppression pool and containment atmosphere. Regulatory Requirements which had been associated with the design basis of the panel (NUREG-0737 and Reg Guide 1.97) have been eliminated per Clinton Power Station License Amendment 155. The post accident sampling system is considered a commercial grade sample station.

The post accident sampling system is designed to minimize contamination of samples, minimize personnel radiation exposure at the sample station, minimize volume of fluid removed from containment, and minimize plate-out. The post accident sampling system consists of a sample analysis panel and sample monitor panel that are used to obtain representative liquid and gas grab samples for radiological and chemical analysis under accident conditions. The panels are located close to containment building to minimize radiation exposure during sampling and purge time.

The Process Sampling and Post Accident Monitoring System is described in USAR Sections

1.2.2.8.9, 7.6.1.10, 9.3.2, 9.3.7.2, and 9.3.7. The Process Sampling and Post Accident Monitoring System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Process Sampling and Post Accident Monitoring System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Process Sampling and Post Accident Monitoring System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Process Sampling and Post Accident Monitoring System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and 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), and Station Blackout (10 CFR 50.63). The Process Sampling and Post Accident Monitoring System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provide primary containment boundary. The Process Sampling and Post Accident Monitoring System includes piping and isolation valves that are part of the primary containment boundary. (USAR Table 6.2-47) 10 CFR 54.4 (a)(1)

2. Control combustible gas mixtures in the primary containment atmosphere. The Process Sampling and Post Accident Monitoring System includes equipment that samples the containment atmosphere and provides indication of hydrogen concentration. (USAR Sections 7.6.1.10 and 9.3.7.2) 10 CFR 54.4 (a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Process Sampling and Post Accident Monitoring System contains nonsafety-related, water-filled lines in Containment and Auxiliary Building which have the potential for spatial interaction with safety-related SSCs. 10 CFR 54.4(a)(2)

4. Relied upon 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). Suppression pool instrumentation for level and temperature supports Fire Safe Shutdown requirements. 10 CFR 54.4 (a)(3)

5. Relied upon in safety analyses for plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Environmental Qualification (10 CFR 50.49). The Process Sampling and Post Accident Monitoring System includes components which are environmentally qualified. 10 CFR 54.4(a)(3)

6. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Station Blackout (10 CFR 50.63). The Process Sampling and Post Accident Monitoring System includes systems and equipment to cope with a complete loss of offsite and onsite power. 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.8.9
7.6.1.10
9.3.2
9.3.7.2
9.3.7

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1032, Sheet 1
LR-CPS-M05-1032, Sheet 3
LR-CPS-M05-1034, Sheet 1
LR-CPS-M05-1034, Sheet 2
LR-CPS-M05-1034, Sheet 3
LR-CPS-M05-1042, Sheet 5
LR-CPS-M05-1045, Sheet 7
LR-CPS-M05-1045, Sheet 8
LR-CPS-M05-1045, Sheet 11
LR-CPS-M05-1045, Sheet 12
LR-CPS-M05-1047, Sheet 7
LR-CPS-M05-1072, Sheet 1
LR-CPS-M05-1072, Sheet 3
LR-CPS-M05-1075, Sheet 1
LR-CPS-M05-1075, Sheet 2
LR-CPS-M05-1075, Sheet 4
LR-CPS-M05-1076, Sheet 1
LR-CPS-M05-1078, Sheet 2
LR-CPS-M10-9079, Sheet 2

Table 2.3.3-16 Process Sampling and Post Accident Monitoring System Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Drip Pan	Leakage Boundary
Heat Exchanger (Auxiliary Building Process Sample Panel Coolers) Shell Side Components	Leakage Boundary
Heat Exchanger (Auxiliary Building Process Sample Panel Coolers) Tube Side Components	Leakage Boundary
Heat Exchanger (Closed Loop Cooling Skid) Shell Side Components	Leakage Boundary
Heat Exchanger (Reactor Sample Station Cooler) Shell Side Components	Leakage Boundary
Heat Exchanger (Reactor Sample Station Cooler) Tube Side Components	Leakage Boundary
Hoses	Pressure Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Pump Casing (Closed Loop Cooling Pump)	Leakage Boundary
Pump Casing (Containment Sample Pump)	Pressure Boundary
Pump Casing (Drywell Sump Sample Pump)	Leakage Boundary
Pump Casing (H2/O2 Atmosphere Monitoring System Pump)	Pressure Boundary
Tanks (Surge Tank)	Leakage Boundary
Valve Body	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)

The aging management review results for these components are provided in:

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System Summary of Aging Management Evaluation

2.3.3.17 Radwaste System

Description

The Radwaste System is a normally operating system designed to collect, monitor, process, and dispose of radioactive wastes. The Radwaste System consists of gaseous, liquid, and solid radwaste plant systems that include offgas (OG), reprocess & disposal equipment drains (WE), reprocess & disposal floor drains (WF), solid radwaste reprocessing drains (WX), and chemical radwaste reprocess & disposal (WZ) systems. The Radwaste System is in scope for license renewal. However, portions of the Radwaste System are not required to perform intended functions and therefore are not in scope.

The portions of the Radwaste System that is in scope for license renewal are those components that support the primary containment boundary and those that provide a leakage boundary to preclude system interactions with safety-related components and structures.

Gaseous Radwaste System

The purpose of the gaseous radwaste system is to process and control the release of gaseous radioactive wastes to the site environs so the total radiation exposure to persons outside the controlled area does not exceed the maximum limits of the applicable 10 CFR 20 regulations even with some defective fuel rods.

The treatment of these gases includes volume reduction through a catalytic hydrogen-oxygen recombiner, water vapor removal through a condenser, decay of short-lived radioisotopes through a holdup line, further condensation and cooling, adsorption of isotopes on activated charcoal beds, further filtration through high efficiency filters, and final releases.

Liquid Radwaste System

The liquid radwaste system consists of four major subsystems: (1) the equipment drain subsystem, (2) the floor drain subsystem, (3) the chemical waste subsystem, and (4) the laundry waste subsystem. The purpose of the liquid radwaste system is to collect, monitor, and treat liquid radioactive waste for return to the station for reuse insofar as is practicable. Waste processing is done on a batch basis and located in the Radwaste Building. Processed waste volumes discharged to the environs are expected to be small. Any discharge is such that concentrations and quantities of radioactive material and other contaminants are in accord with applicable local, state, and federal regulations.

Solid Radwaste System

The purpose of the solid radwaste system provides for the safe handling packaging, and short-term storage of radioactive solid and concentrated liquid wastes that may be produced. Wet waste processed by this system is transferred to the mobile solidification system where it is solidified and packaged in containers. Dry waste such as rags, paper, and tools, is accumulated at designated storage areas for processing and disposal.

The Radwaste System is described in USAR Sections 1.2.2.9, 1.2.2.9.1, 1.2.2.9.2, 1.2.2.9.3, 11.2.2, 11.2.2.1, 11.3.2, and 11.4.2. The Radwaste System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Radwaste System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Radwaste System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Radwaste System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Radwaste System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. The Radwaste System includes piping and isolation valves that are part of the primary containment boundary. 10 CFR 54.4 (a)(1)

2. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Radwaste System contains nonsafety-related fluid filled lines in the Containment Building, Control Building, and Auxiliary Building which have potential spatial interactions with safety-related SSCs. 10 CFR 54.4(a)(2)

3. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Radwaste System includes environmentally qualified components. 10 CFR 54.4(a)(3)

USAR References
1.2.2.9
1.2.2.9.1
1.2.2.9.2
1.2.2.9.3
11.2.2
11.2.2.1
11.3.2
11.4.2

License Renewal Boundary Drawings
LR-CPS-M05-1046, Sheet 2
LR-CPS-M05-1047, Sheet 3
LR-CPS-M05-1076, Sheet 3
LR-CPS-M05-1082, Sheet 1
LR-CPS-M05-1089, Sheet 2

Table 2.3.3-17 <u>Radwaste System</u>
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Piping, piping components	Leakage Boundary
	Pressure Boundary
Pump Casing (RWCU F/D Backwash Tank Pumps)	Leakage Boundary
Rupture Disks	Leakage Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-17 Radwaste System
Summary of Aging Management Evaluation

2.3.3.18 Reactor Water Cleanup System

Description

The Reactor Water Cleanup (RWCU) System is designed to maintain high purity reactor water. The RWCU System may be operated at any time during reactor operations (normal, startup, shutdown, hot standby, and refueling) or may be taken out of service when not required to clean up reactor coolant.

The purpose of the RWCU System is to maintain reactor water quality by removing soluble and insoluble impurities during all modes of rector operations thus minimizes the corrosion of vessel internals and fouling of the fuel heat transfer surfaces. Impurities in the reactor coolant can become activated and can result in an increase in the radiation levels.

The RWCU System also maintains circulation in the reactor vessel and recirculation piping during periods when the recirculation pumps are not in service and the reactor is hot. Significant thermal stratification can occur during these conditions resulting in thermal shock to the vessel when flow is reestablished. The RWCU may also be used to provide an alternate means of shutdown cooling.

Portions of the RWCU System must maintain reactor coolant pressure boundary and are in scope for license renewal. The Class 1 portions of the RWCU System include the piping and piping components coming from the reactor recirculation lines and reactor bottom head drain up to and including the outboard containment isolation valve. These SSCs are included in the Reactor Coolant Pressure Boundary (RCPB) license renewal system.

The RWCU System is described in USAR Sections 1.2.2.3.5 and 5.4.8. The RWCU System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Reactor Water Cleanup System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Reactor Water Cleanup System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Reactor Water Cleanup System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Reactor Water Cleanup System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. The RWCU System includes containment penetrations, which are required to provide containment isolation during all station conditions. 10 CFR 54.4(a)(1)

2. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The RWCU System contains nonsafety-related, water-filled lines in Containment and the Auxiliary Building which have the potential for spatial interaction with safety-related SSCs. 10 CFR 54.4(a)(2)

3. Relied upon in safety analyses for plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The RWCU System includes components which are environmentally qualified. 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.3.5
5.4.8

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1032, Sheet 2
LR-CPS-M05-1032, Sheet 3
LR-CPS-M05-1046, Sheet 2
LR-CPS-M05-1046, Sheet 5
LR-CPS-M05-1046, Sheet 6
LR-CPS-M05-1047, Sheet 3
LR-CPS-M05-1047, Sheet 7
LR-CPS-M05-1076, Sheet 1
LR-CPS-M05-1076, Sheet 2
LR-CPS-M05-1076, Sheet 3
LR-CPS-M05-1076, Sheet 4
LR-CPS-M05-1085, Sheet 1
LR-CPS-M05-9076, Sheet 1

Table 2.3.3-18 Reactor Water Cleanup System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Gearbox	Leakage Boundary
Heat Exchanger (Bearing Cooler) Tube Side Components	Leakage Boundary
Heat Exchanger (RWCU Non-Regenerative) Shell Side Components	Leakage Boundary
Heat Exchanger (RWCU Non-Regenerative) Tube Side Components	Leakage Boundary
Heat Exchanger (RWCU Pedestal and Cover Cooler) Tube Side Components	Leakage Boundary
Heat Exchanger (RWCU Regenerative) Shell Side Components	Leakage Boundary
Heat Exchanger (RWCU Regenerative) Tube Side Components	Leakage Boundary
Heat Exchanger (RWCU Seal Cooler) Shell Side Components	Leakage Boundary
Heat Exchanger (RWCU Seal Cooler) Tube Side Components	Leakage Boundary
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
Pump Casing (RWCU Holding Pumps)	Leakage Boundary
Pump Casing (RWCU Precoat Pump)	Leakage Boundary
Pump Casing (RWCU Recirculating Pumps)	Leakage Boundary
Pump Casing (RWCU Resin Metering Pump)	Leakage Boundary
Tanks (RWCU Filter Demineralizers)	Leakage Boundary
Tanks (RWCU Precoat Tank)	Leakage Boundary
Tanks (Resin Feed)	Leakage Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-18 Reactor Water Cleanup System
Summary of Aging Management Evaluation

2.3.3.19 Safety-Related Ventilation System

Description

The license renewal Safety-Related Ventilation (SRV) System is comprised of fuel building HVAC system, diesel generator facilities ventilation system, switchgear heat removal system, ECCS equipment area cooling system, shutdown service water pump room cooling system, and refrigeration piping system. This system, where portions are normally operating while other portions are in standby, is in scope of license renewal. Those portions of the SRV System that do not have an intended function are not in scope of license renewal.

Fuel Building HVAC System (VF)

The fuel building HVAC system is designed to provide ventilation air to the general areas and cubicles in the Fuel Building and the ECCS equipment cubicles during normal operating conditions to limit the maximum temperatures in accordance with equipment ambient temperature requirements. The Fuel Building is maintained at negative pressure with respect to outdoors during all station normal operating conditions. The fuel building HVAC system is nonsafety-related except for the secondary containment isolation function.

The fuel building HVAC system supplies filtered, tempered, or cooled outside air to the accessible areas through a central fan system consisting of outside air intake, filters, heating and cooling coils, and two 100% capacity supply fans. Ventilation air flows from clean, accessible areas to areas of greater potential contamination by induction action of one of the system exhaust fans. Two 100% capacity exhaust fans are provided. The cooling coils are supplied by Closed Cycle Cooling Water System and heat is provided by electric heating coils.

The system also exhausts air from the ECCS equipment rooms during normal operating conditions. Purge air is supplied by the fuel building HVAC system at normal operating conditions.

Safety related radiation monitors are located on the fuel pool main exhaust air plenum. These monitors measure the radiation levels of air exhausted from over the spent fuel, fuel cask storage, and fuel transfer pools as well as from other general areas if excessive airborne radiation levels are detected, alarms are actuated in the main control room and locally. The fuel building HVAC system is automatically isolated, and the Standby Gas Treatment System is started. The radiation monitors are evaluated with the Miscellaneous Electrical System for aging management.

The system is designed with redundant, safety-related, Seismic Category I, spring-loaded, air operated fail-closed isolation dampers at the Fuel Building boundary walls to ensure building isolation in the event of a fuel handling accident. The operation of the fuel building isolation dampers is required to ensure that the limits of 10 CFR 50.67 are not exceeded.

Diesel Generator Facilities Ventilation System (VD)

The diesel-generator ventilation system (VD) ventilates the three diesel-generator rooms, three day tank rooms, and three diesel oil storage tank rooms. The system consists of an independent, normally operating, non-safety related system and a safety-related system that operates while the generators are operating. Each diesel-generator room is provided with an independent safety-related ventilation system. Each diesel-generator ventilation system is designed to limit the maximum temperature in the diesel-generator rooms within acceptable limits.

The safety-related diesel-generator ventilation system consists of three 100 percent capacity ventilation fans, one for each diesel-generator room, and three 100 percent capacity exhaust fans, one for each day tank and oil storage tank room. The day tank and oil storage tank room fans are normally running. The diesel-generator room fans automatically start when the associated diesel engine starts. Cooling coils are not provided.

The non-safety related ventilation system operates during normal plant operation conditions, when the diesel generators are not operating. Ventilation air is supplied continuously by two nonsafety-related 50 percent makeup supply makeup fans to the three diesel-generator rooms and their corresponding day tank and oil storage tank rooms to maintain acceptable room temperature. The cooling coils are supplied by Closed Cycle Cooling Water System and heat is provided by electric heating coils.

Switchgear Heat Removal System (VX)

The switchgear heat removal system provides ventilation for the switchgear areas, battery rooms in the auxiliary and control buildings, the cable spreading area, BOP battery rooms, and Division 1, 2, and 4 inverter rooms under normal and abnormal operating conditions. The switchgear heat removal system is designed to limit the maximum temperatures inside the switchgear and battery rooms during normal plant operation and abnormal plant operation in conformance with equipment ambient temperature ratings and requirements. The intended function of the system is to maintain emergency temperature limits within areas containing safety related components during abnormal conditions. Maintenance of normal operating temperatures is not a license renewal intended function.

The switchgear heat removal system for each division consists of two independent switchgear heat removal coil cabinets connected to a common supply duct system. Each switchgear heat removal coil cabinet consists of a filter, cooling coil, and fan. The nonsafety-related switchgear heat removal coil cabinet has a chilled water coil fed from the plant Closed Cycle Cooling Water System and utilized for cooling during normal station operating conditions only.

The safety-related switchgear heat removal coil cabinet is in standby and has a refrigerant evaporator coil fed from a water-cooled condensing unit located within the switchgear room. This coil is to be utilized during abnormal operating conditions or upon failure of the nonsafety-related chilled water switchgear heat removal coil cabinets. The condenser heat is removed by the Open Cycle Cooling Water System.

Supply air is ducted throughout each switchgear area and battery room. Return air from the cable spreading area and Division 4 inverter room is ducted and returned to the corresponding switchgear room by means of a switchgear heat removal return fan, and then to switchgear heat removal coil cabinet by the suction action of the cabinet fan.

During normal operating conditions, air supplied to each battery room is exhausted to the turbine building by one of the safety-related exhaust fans provided for each room. No less than six air changes per hour of air are exhausted to ensure the dilution of hydrogen generated by the batteries. Each battery room is held at a negative pressure with respect to the switchgear rooms.

Under normal operating conditions, makeup air is provided by the auxiliary building HVAC supply system. Under abnormal operating conditions, provision is made for outside air to be inducted to the switchgear room to make up for the battery room exhaust requirements.

ECCS Equipment Area Cooling System (VY)

This ECCS equipment area cooling system provides ventilation for the emergency core cooling system (ECCS) equipment cubicles in the auxiliary building when the ECCS equipment is required for service. Equipment is designed to dissipate the heat produced by the operation of corresponding ECCS equipment and limiting the cubicles temperature within acceptable limits following a loss of coolant accident. This system is safety-related.

The ECCS equipment area cooling system consists of a fan and coil cabinet for each ECCS equipment cubicle which is available for removing equipment heat under all station operating conditions. A supply air duct is provided for the air distribution in each cubicle. The air is recirculated and cooled by the fan and coil cabinet. Each coil is supplied by the Open Cycle Cooling Water system.

Under normal operating conditions, a small quantity of ventilation air is purged through the ECCS cubicles from the containment gas control boundary and exhausted from the cubicles by the fuel building HVAC system. A radiation monitor is located in the fuel building common exhaust duct. Upon detection of high radiation, an alarm is actuated in the main control room, the secondary containment is isolated, and the standby gas treatment system is started. The radiation monitor is evaluated with the Miscellaneous Electrical System for license renewal aging management.

Shutdown Service Water Pump Room Cooling System (VH)

The shutdown service water (SSW) pump room cooling system provides ventilation for the shutdown service water (SSW) pump rooms in the screen house when the SSW pumps are required for service. Each fan and coil cabinet are capable of dissipating the heat produced by the operation of the corresponding pump and motor to maintain the inside room temperature within acceptable limits. This system is safety-related.

The SSW pump room cooling system consists of a fan and coil cabinet for each pump room and is available under all station operating conditions. A supply air duct is provided for the air distribution in each room. The air is recirculated and cooled by the fan and coil cabinet. Each cooling coil is cooled by Open Cycle Cooling Water System. The SSW pump room cooling system is normally in standby unless the associated SSW pump is operating. Under normal operating conditions, SSW pump room is ventilated by the screen house ventilation system.

Refrigeration Piping System (RG)

The refrigeration piping system connects various safety-related and nonsafety-related refrigeration compressors, evaporators, and condensers. Refrigeration piping is also used for vents from various relief devices to atmosphere. The portions of the RG system in scope for license renewal aging management review include the safety-related piping for the switchgear heat removal system coolers (VX) and portions of the refrigerant relief valve exhaust piping connected to the safety-related control room ventilation chillers.

The Safety-Related Ventilation System is described in USAR Sections 9.4.2, 9.4.5.1, 9.4.5.2, 9.4.5.3, 9.4.5.4, 9.4.5.5, and Table 3.2-1. The SRV System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Safety-Related Ventilation System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Safety-Related Ventilation System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Safety-Related Ventilation System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and 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), and Station Blackout (10 CFR 50.63). The Safety-Related Ventilation System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Maintain emergency temperature limits within areas containing safety related components. The Safety-Related Ventilation System provides cooling to the emergency diesel generator building, shutdown service water pump rooms, switchgear rooms, battery rooms, inverter rooms, cable spread rooms, and ECCS equipment rooms. 10 CFR 54.4(a)(1)

2. Provide secondary containment boundary. The Safety-Related Ventilation System contains safety-related secondary containment isolation dampers in the supply and exhaust ducting between the Diesel Generator Building and the Fuel Building. 10 CFR 54.4(a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Safety-Related Ventilation System includes nonsafety-related water filled piping and components that have the potential for spatial interactions (spray or leakage) with safety-related SSCs. Additionally, the system includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping. 10 CFR 54.4(a)(2)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Environmental Qualification (10 CFR 50.49). The Safety-Related Ventilation System contains components associated with fuel building HVAC, switchgear heat removal, and ECCS equipment cooling subsystems that are environmentally qualified. 10 CFR 54.4(a)(3)

5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Station Blackout (10 CFR 50.63). The Safety-Related Ventilation System contains components associated with safety-related diesel-generator facilities ventilation, fuel building HVAC,

switchgear heat removal, and ECCS equipment cooling subsystems that are relied upon to provide ventilation after establishing alternate AC power and for recovery following a station blackout event. 10 CFR 54.4(a)(3)

6. Relied upon 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). The Safety-Related Ventilation System contains components associated with safety-related diesel-generator facilities ventilation, switchgear heat removal, ECCS equipment cooling, shutdown service water pump room cooling, and refrigeration piping subsystems that are relied upon to maintain safe shutdown ability. Additionally, the system includes a Fire Protection System function to preclude accumulation of hydrogen in the battery rooms. 10 CFR 54.4(a)(3)

<u>USAR References</u>
9.4.2 (VF)
9.4.5.1 (VD)
9.4.5.2 (VX)
9.4.5.3 (VY)
9.4.5.4 (VH)
9.4.5.5 (HG)
Table 3.2-1
Appendix E
Appendix F

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1046, Sheet 1
LR-CPS-M05-1047, Sheet 1
LR-CPS-M05-1047, Sheet 2
LR-CPS-M05-1047, Sheet 5
LR-CPS-M05-1047, Sheet 6
LR-CPS-M05-1047, Sheet 7
LR-CPS-M05-1047, Sheet 9
LR-CPS-M05-1052, Sheet 1
LR-CPS-M05-1052, Sheet 2
LR-CPS-M05-1052, Sheet 3
LR-CPS-M05-1052, Sheet 4
LR-CPS-M05-1053, Sheet 22
LR-CPS-M05-1054, Sheet 2
LR-CPS-M05-1054, Sheet 37
LR-CPS-M05-1054, Sheet 38
LR-CPS-M05-1054, Sheet 39
LR-CPS-M05-1103, Sheet 1
LR-CPS-M05-1104, Sheet 1
LR-CPS-M05-1106, Sheet 2
LR-CPS-M05-1113, Sheet 2
LR-CPS-M05-1115, Sheet 1
LR-CPS-M05-1115, Sheet 2
LR-CPS-M05-1115, Sheet 3
LR-CPS-M05-1115, Sheet 4
LR-CPS-M05-1116, Sheet 1

LR-CPS-M05-1116, Sheet 2
LR-CPS-M05-1117, Sheet 15
LR-CPS-M05-1117, Sheet 16
LR-CPS-M05-1117, Sheet 17
LR-CPS-M05-1117, Sheet 18
LR-CPS-M05-1117, Sheet 25
LR-CPS-M05-1121, Sheet 1
LR-CPS-M05-1121, Sheet 2

Table 2.3.3-19 Safety-Related Ventilation System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Bolting (Ducting Closure)	Mechanical Closure
Drip Pan	Leakage Boundary
Ducting and Components	Pressure Boundary
Flexible Connection	Pressure Boundary
Heat Exchanger (Diesel Generator Make-Up Supply Unit) Tube Side Components	Leakage Boundary
Heat Exchanger (Diesel Generator Make-Up Supply Unit) Tubes	Leakage Boundary
Heat Exchanger (ECCS Equipment Room Coil Cabinet) Fins	Heat Transfer
Heat Exchanger (ECCS Equipment Room Coil Cabinet) Tube Side Components	Pressure Boundary
Heat Exchanger (ECCS Equipment Room Coil Cabinet) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (Fuel Building Area Cooler) Tube Side Components	Leakage Boundary
Heat Exchanger (Fuel Building Area Cooler) Tubes	Leakage Boundary
Heat Exchanger (Fuel Building Ventilation Supply Air Coil Bank) Tube Side Components	Leakage Boundary
Heat Exchanger (Fuel Building Ventilation Supply Air Coil Bank) Tubes	Leakage Boundary
Heat Exchanger (Inverter Room Coil Cabinet) Fins	Heat Transfer
Heat Exchanger (Inverter Room Coil Cabinet) Tube Side Components	Pressure Boundary
Heat Exchanger (Inverter Room Coil Cabinet) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (MSIV Inboard Room Coil Cabinet) Fins	Heat Transfer
Heat Exchanger (MSIV Inboard Room Coil Cabinet) Tube Side Components	Pressure Boundary
Heat Exchanger (MSIV Inboard Room Coil Cabinet) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (SSW Pump Room Coil Cabinet) Fins	Heat Transfer
Heat Exchanger (SSW Pump Room Coil Cabinet) Tube Side Components	Pressure Boundary
Heat Exchanger (SSW Pump Room Coil Cabinet) Tubes	Heat Transfer
	Pressure Boundary
Heat Exchanger (Switchgear Heat Removal Coil Cabinet) Fins	Heat Transfer
Heat Exchanger (Switchgear Heat Removal Coil Cabinet) Tube Side Components	Leakage Boundary
	Pressure Boundary
Heat Exchanger (Switchgear Heat Removal Coil Cabinet) Tubes	Heat Transfer
	Leakage Boundary
	Pressure Boundary

Component Type	Intended Function
Heat Exchanger (Switchgear Heat Removal Condensing Unit) Shell Side Components	Pressure Boundary
Heat Exchanger (Switchgear Heat Removal Condensing Unit) Tube Sheet	Pressure Boundary
Heat Exchanger (Switchgear Heat Removal Condensing Unit) Tube Side Components	Pressure Boundary
Heat Exchanger (Switchgear Heat Removal Condensing Unit) Tubes	Heat Transfer
	Pressure Boundary
Piping elements	Pressure Boundary
Piping, piping components	Pressure Boundary
	Structural Integrity (Attached)
Piping, piping components: Insulated	Pressure Boundary
Strainer (Element)	Filter
Valve Body	Pressure Boundary
Valve Body: Insulated	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-19 Safety-Related Ventilation System
Summary of Aging Management Evaluation

2.3.3.20 Standby Liquid Control System

Description

The Standby Liquid Control (SLC) System is a standby system which provides a redundant, independent, and alternate way to bring the nuclear fission reaction to subcriticality and to maintain subcriticality as the reactor cools. The system provides for an orderly and safe shutdown in the event that not enough control rods can be inserted into the reactor core to accomplish shutdown in the normal manner. The SLC system is also credited with buffering the pH of the Suppression Pool following a LOCA involving fuel damage to minimize iodine releases from the Primary Containment.

The system consists of a boron neutron absorber solution (sodium pentaborate) storage tank, test water tank, two positive displacement injection pumps, two explosives valves, two motor-operated pump suction valves, and associated local valves and controls. The system is manually initiated from the control room.

The preferred injection path of the sodium pentaborate solution to the reactor vessel is through the High Pressure Core Spray (HPCS) sparger. The SLC piping is connected to the HPCS system just downstream of the HPCS manual injection isolation valve. An alternate flow path to the reactor vessel is provided by the SLC sparger near the bottom of the core shroud. This flow path is normally locked out of service by the SLC manual injection valve. The Class 1 portion of the SLC System is in scope of the Reactor Coolant Pressure Boundary (RCPB) license renewal system, and includes the two injection squib valves and associated injection flow paths.

The SLC System is described in detail in USAR Section 9.3.5. The SLC System boundaries for license renewal are shown on the license renewal boundary drawing listed below.

Reason for Scope Determination

The Standby Liquid Control System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Standby Liquid Control System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Standby Liquid Control System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and 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), and Anticipated Transient Without Scram (10 CFR 50.62). The Standby Liquid Control System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63).

Intended Functions

1. Introduce emergency negative reactivity to make the reactor subcritical. The Standby Liquid Control System provides a redundant, independent, and alternate way to bring the nuclear fission reaction to subcriticality and to maintain subcriticality as the reactor cools. 10 CFR 54.4(a)(1)

2. Control and treat radioactive materials released to the secondary containment. In the event of a Loss of Coolant Accident involving fuel damage, the Standby Liquid Control System is manually initiated to pump sodium pentaborate into the reactor to maintain suppression pool pH at a level of 7.0 or higher to minimize iodine releases from Primary Containment. 10 CFR 54.4(a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Standby Liquid Control System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Primary Containment. The Standby Liquid Control System also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping located in the Fuel Building. 10 CFR 54.4(a)(2)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients Without Scram (10 CFR 50.62). The Standby Liquid Control System injects sodium pentaborate solution into the reactor to achieve subcriticality independent of rod insertion. 10 CFR 54.4(a)(3)

5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Standby Liquid Control System includes environmentally qualified components. 10 CFR 54.4(a)(3)

6. Relied upon 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). The Standby Liquid Control System is a backup method for manually shutting down the reactor to cold subcritical conditions by independent means other than the normal method by the control rod system and is considered a Fire Safe Shutdown System. 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.4.14
9.3.5
7.4.1.2
15.6.5.5.1.1
15.8
15A.6.6
Table 3.2-1

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1077 Sheet 1
LR-CPS-M05-1047 Sheet 3

Table 2.3.3-20 <u>Standby Liquid Control System</u>
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Electric Heaters	Pressure Boundary
Gearbox (Standby Liquid Control Pumps)	Pressure Boundary
Piping elements	Leakage Boundary
	Pressure Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Pump Casing (Standby Liquid Control Pumps)	Pressure Boundary
Tanks (Standby Liquid Control Storage Tank)	Pressure Boundary
Tanks (Standby Liquid Control Test Tank)	Leakage Boundary
Tanks (Waste Drum)	Leakage Boundary
Valve Body	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)

The aging management review results for these components are provided in:

Table 3.3.2-20 Standby Liquid Control System
Summary of Aging Management Evaluation

2.3.3.21 Suppression Pool Cleanup System

Description

The Suppression Pool Cleanup System consists of the following plant systems: suppression pool makeup (SPMU) and suppression pool cleanup and transfer (SPCU).

Suppression Pool Makeup

The SPMU system provides water from the upper containment pool to the suppression pool by gravity flow following a LOCA. The quantity of water provided is sufficient to account for all conceivable post accident entrapment volumes (i.e., places where water can be stored).

The SPMU system consists of two lines which penetrate the separator end of the upper containment pool through the side walls. One line is on either side of the separator pool and they are then routed down to the suppression pool on opposite sides of the steam tunnel. Each suppression pool makeup line has two normally closed valves (dump valves) in series. The dump valves automatically open when the low-low suppression pool water level is reached to ensure adequate water volume to keep the suppression pool vents covered for all break sizes and ensures an adequate water volume exists for operation of Emergency Core Cooling Systems (ECCS).

Suppression Pool Cleanup and Transfer

The SPCU system is designed to provide continuous demineralization of the suppression pool water during normal plant operation to maintain the suppression pool water quality compatible with ECCS vessel makeup and containment spray requirements. The system is also capable of removing radioactive iodine from the suppression pool water following a safety/relief valve blowdown at a rate sufficient to allow normal access for plant personnel to the containment within a reasonable time after blowdown.

The SPCU system serves no safety function. Failure of the system will not compromise any safety-related systems or prevent safe shutdown of the plant. However, the suppression pool cleanup and transfer system does contain lines which penetrate containment and includes safety-related containment isolation valves.

The Suppression Pool Cleanup System is described in detail in USAR Sections 6.2.7 and 9.3.6. The Suppression Pool Cleanup System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Suppression Pool Cleanup System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Suppression Pool Cleanup System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Suppression Pool Cleanup System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Station Blackout (10 CFR 50.63). The Suppression Pool Cleanup System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provide primary containment boundary. The Suppression Pool Cleanup System includes lines which penetrate containment. 10 CFR 54.4(a)(1)
2. Provide emergency core cooling where the equipment provides coolant directly to the core. The Suppression Pool Cleanup System provides water from the upper containment pool to the suppression pool by gravity flow following a LOCA to ensure a sufficient volume exists to support operation of Emergency Core Cooling Systems (ECCS). 10 CFR 54.4(a)(1)
3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Suppression Pool Cleanup System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Auxiliary Building. 10 CFR 54.4(a)(2)
4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Environmental Qualification (10 CFR 50.49). 10 CFR 54.4(a)(3)
5. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Station Blackout (10 CFR 50.63). Suppression Pool Cleanup System containment isolation valves must be capable of being closed or operated under SBO conditions. The Suppression Pool Cleanup System maintains sufficient water volume in the suppression pool to support operation of Emergency Core Cooling Systems (ECCS). 10 CFR 54.4(a)(3)

USAR References
1.2.2.4.17
6.2.7
7.3.1.1.10.1
9.3.6.1.1

License Renewal Boundary Drawings
LR-CPS-M05-1047, Sheet 5
LR-CPS-M05-1060, Sheet 1
LR-CPS-M05-1069, Sheet 1
LR-CPS-M10-9079, Sheet 2

Table 2.3.3-21 Suppression Pool Cleanup System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Piping, piping components	Leakage Boundary
	Pressure Boundary
Pump Casing (Suppression Pool Clean-Up Pump)	Leakage Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.3.2-21 Suppression Pool Cleanup System
Summary of Aging Management Evaluation

2.3.4 STEAM AND POWER CONVERSION SYSTEM

The following systems are addressed in this section:

- Condensate System (2.3.4.1)
- Feedwater System (2.3.4.2)
- Main Steam System (2.3.4.3)

2.3.4.1 Condensate System

Description

The Condensate System is a normally operating system that provides high quality, reactor grade water to plant systems that interface with the reactor pressure vessel. The Condensate System is in the scope of license renewal. Those plant systems or portions of plant system that do not perform a license renewal intended function are not in the scope for license renewal. The Condensate System consists of the following plant systems: the acid and caustic handling system, the condensate system, the condensate polishing system, condensate booster system, condensate vacuum system, the cycled condensate system, and the extraction steam system.

Acid and Caustic Handling System

The acid and caustic handling system is designed to supply a caustic solution or an acidic solution to the radwaste day tanks, condensate polishing day tanks, makeup demineralizer day tanks for acid or caustic solutions as required. There are no license renewal intended functions for the acid and caustic handling system.

Condensate System

The condensate system, which includes the main condenser, is designed to condense and deaerate the turbine exhaust steam and provide the necessary heat sink of the turbine bypass steam, and other turbine cycle flows. The Condensate System also receives and collects these flows for return to the reactor.

Condensate Polishing System

The condensate polishing system is designed to remove both suspended and dissolved solids from the condensate continuously to maintain the required purity of feedwater flowing to the reactor. There are no license renewal intended functions for the condensate polishing system.

Condensate Booster System

The condensate booster system is designed to provide a dependable supply of feedwater to the reactor, provide feedwater heating, to maintain high water quality in the feedwater, and to provide the required flow at the required pressure to the reactor, allowing a sufficient margin to provide continued flow under anticipated transient conditions. There are no license renewal intended functions for the condensate booster system.

Condensate Vacuum System

The condenser vacuum system is designed to achieve and maintain a vacuum in the main condenser to permit plant startup and power generation, remove the expected quantities of hydrogen and oxygen produced by radiolysis of water, and remove the incondensable gases from the main condenser, including air leakage and dissociation products originating in the reactor and exhausting them to the gaseous radwaste system. There are no license renewal intended functions for the condensate vacuum system.

Cycled Condensate System

The cycled condensate system is designed to store condensate and distribute it to the main condenser, reactor core isolation cooling (RCIC) system, and high pressure core spray (HPCS) systems. This system is designed to maintain the water level of condensate in the condenser hotwell and provide condensate quality water to other systems as required. The cycled condensate system also stores water required for refueling. The cycled condensate system includes lines which penetrate containment which are provided with two automatic isolation valves as required by General Design Criterion 56. A portion of this system is safety-related as it provides a primary containment boundary. The cycled condensate system includes components which are environmentally qualified. In addition, cycle condensate system has liquid filled lines located within structures containing safety-related SCC's. As a result, cycle condensate system has portions that are in scope for license renewal due to spatial interaction concerns.

Extraction Steam System

The extraction steam (ES) system (a Condensate System sub-system) is designed to accept steam from the turbine and provide steam to auxiliary reactor plant functions such as feedwater heating and gland seals. The ES subsystem supports RPS instrumentation that detects the loss of condenser vacuum. The instrumentation initiates a trip on loss of condenser vacuum, which causes closure of the turbine stop valves and main steam isolation valves, initiating a reactor scram. Since failure of the instrument piping would result in a trip, the instrument piping does not have a pressure boundary intended function.

The Condensate System is described in USAR Sections 1.2.2.5.3, 1.2.2.5.4, 1.2.2.5.8, 1.2.2.5.9, 1.2.2.8.5, 7.2.2.1.3.5, 9.2.6, 9.3, 10.4.1, 10.4.2, 10.4.3, 10.4.6, and 10.4.7. The Condensate System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Condensate System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Condensate System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Condensate System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49), and Station Blackout (10 CFR 50.63). The Condensate System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) or Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provide primary containment boundary. The Condensate System includes lines which penetrate the drywell and containment. 10 CFR 54.4(a)(1)

2. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Condensate System contains nonsafety-related, water-filled

lines in the auxiliary building, control building, drywell, diesel generator building, and fuel building, which have the potential for spatial interaction with safety-related SSCs. 10 CFR 54.4(a)(2)

3. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Condensate System includes components which are environmentally qualified. 10CFR 54.4(a)(3)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The CND System containment isolation valves must be capable of being closed or operated under SBO conditions. 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.5.3
1.2.2.5.4
1.2.2.5.8
1.2.2.5.9
1.2.2.8.5
7.2.2.1.3.5
9.2.6
10.4.1
10.4.2
10.4.3.
10.4.6
10.4.7

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1003, Sheet 2
LR-CPS-M05-1003, Sheet 3
LR-CPS-M05-1012, Sheet 2
LR-CPS-M05-1012, Sheet 6
LR-CPS-M05-1012, Sheet 7
LR-CPS-M05-1037, Sheet 2
LR-CPS-M05-1053, Sheet 17
LR-CPS-M05-1053, Sheet 23
LR-CPS-M05-1053, Sheet 24
LR-CPS-M05-1054, Sheet 30
LR-CPS-M05-1069, Sheet 1
LR-CPS-M05-1073, Sheet 1
LR-CPS-M05-1074, Sheet 1
LR-CPS-M05-1075, Sheet 1
LR-CPS-M05-1075, Sheet 2
LR-CPS-M05-1075, Sheet 3
LR-CPS-M05-1076, Sheet 3
LR-CPS-M05-1079, Sheet 2
LR-CPS-M05-1089, Sheet 2
LR-CPS-M05-1102, Sheet 1
LR-CPS-M05-1105, Sheet 1

Table 2.3.4-1 Condensate System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Piping elements	Leakage Boundary
Piping, piping components	Leakage Boundary
	Pressure Boundary
Piping, piping components: Insulated	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.4.2-1 Condensate System
Summary of Aging Management Evaluation

2.3.4.2 Feedwater System

Description

The Feedwater System is a normally operating system designed to provide a dependable supply of high quality feedwater to the reactor vessel. The Feedwater System consists of the following plant systems: feedwater, feedwater heater drains, feedwater heater miscellaneous, feedwater control, and hydrogen water chemistry.

Feedwater, Feedwater Heater Drains, and Feedwater Heater Miscellaneous Systems

The plant feedwater, feedwater heater drains, and feedwater heater miscellaneous systems provide a dependable supply of preheated feedwater to the reactor vessel at the required flow and pressure. The systems consist of piping, valves, pumps, heat exchangers, controls and instrumentation, and the associated equipment which supply the reactor with heated feedwater in a closed steam cycle utilizing regenerative feedwater heating. The feedwater system also includes a passive zinc injection system which injects depleted zinc oxide into the feedwater during normal plant operation to establish a thin protective oxide layer on the primary system piping in order to reduce Co-60 buildup and shutdown dose rates. The nonsafety-related portion of the feedwater, feedwater heater drains, and feedwater heater miscellaneous systems are not required to effect or support the safe shutdown of the reactor or perform in the operation of reactor safety features. The safety-related portion of the feedwater system includes piping and valves which provide for primary containment isolation and provide a flowpath to the reactor vessel from the Residual Heat Removal System (RHR).

Feedwater Control System

The feedwater control system controls the flow of feedwater into the reactor pressure vessel to maintain the water in the vessel within predetermined levels during all normal plan operating modes. The system employs water level, steam flow, and feedwater flow in its control configuration. The feedwater control system is nonsafety-related and does not perform a license renewal intended function.

Hydrogen Water Chemistry System

The hydrogen water chemistry system injects hydrogen into the reactor coolant (via the condensate system) to reduce the rates of intergranular stress corrosion cracking (IGSCC) in recirculation piping and reactor vessel internals. Periodic noble metals injection is implemented to minimize the required hydrogen injection rates and to minimize the resultant increase in main steam line radiation. The hydrogen water chemistry system includes mitigation monitoring equipment which measures the effectiveness of noble metal injection. The hydrogen water chemistry system is nonsafety-related and does not perform a license renewal intended function with the exception of the liquid filled mitigation monitoring equipment which is located in the Auxiliary Building and is in-scope for spatial interaction.

The Class 1 portions of the Feedwater System are included in the Reactor Coolant Pressure Boundary (RCPB) license renewal system.

The Feedwater System is described in detail in USAR Sections 5.4.15, 7.7.1.4, and 10.4.7. The Feedwater System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Feedwater System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Feedwater System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Feedwater System also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Environmental Qualification (10 CFR 50.49). The Feedwater System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62) and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide primary containment boundary. When used in conjunction with the Feedwater Leakage Control Mode of the RHR system, the piping between the safety-related Feedwater System shutoff valves and the outboard feedwater isolation check valves (scoped with the RCPB System) is filled to create a water seal within one hour following a DBA LOCA and is designed to maintain the seal for a 30 -day period.
   10 CFR 54.4(a)(1)

2. Remove residual heat from the reactor coolant system. Loops A and B of the RHR System can discharge to the reactor via the feedwater line. 10 CFR 54.4(a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Feedwater System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Auxiliary Building. 10 CFR 54.4(a)(2)

4. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Feedwater System includes environmentally qualified SSCs. 10 CFR 54.4(a)(3)

5. Relied upon 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). The feedwater shutoff valves are credited for fire safe shutdown methods 1, 2, 3, and R. 10 CFR 54.4(a)(3)

USAR References
1.2.2.5.8
1.2.2.6.3.2
5.4.7.1
5.4.15
7.7.1.4
10.4.7
Table 6.2-47

Appendix F

<u>License Renewal Boundary Drawings</u>
LR-CPS-M05-1004, Sheet 1
LR-CPS-M05-1066, Sheet 2
LR-CPS-M05-1076, Sheet 4

Table 2.3.4-2 <u>Feedwater System</u>
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Closure)	Mechanical Closure
Piping, piping components	Leakage Boundary
	Pressure Boundary
Valve Body	Leakage Boundary
	Pressure Boundary

The aging management review results for these components are provided in:

Table 3.4.2-2 Feedwater System
Summary of Aging Management Evaluation

2.3.4.3 Main Steam System

Description

The Main Steam System consists of the following plant systems: main steam system, portions of the main steam isolation valve leakage control system (MSIVLCS), and the safety/relief valves (SRV) acoustic monitoring system. The Main Steam System is in scope for license renewal. However, portions of the system are not required to perform intended functions and are not in scope.

The purpose of the Main Steam System is to provide the high-pressure steam produced by the reactor to the main turbine during normal plant operation. It accomplishes this function via the four main steam lines from the outboard primary containment isolation valves to the main turbine stop valves.

The Main Steam System also provides the capability to bypass steam around the main turbine. It accomplishes this by operation of main turbine bypass valves that discharge to the main condenser. The Main Steam System also provides steam to users such as the reheaters, steam jet air ejectors, auxiliary steam system, reactor feed pump turbines, offgas recombiners, and the steam seal evaporator. It accomplishes this function by providing high-pressure steam, from upstream of the main turbine stop valves to flow or pressure control valves at each of the steam users.

The Main Steam System includes the discharge piping from the SRVs inside primary containment. The purpose of this portion of the Main Steam System is to route the SRV discharge to the suppression pool to minimize the thermal effects of opening the relief valves. It performs this function by routing the steam from the SRVs into the suppression pool, below the normal water level, to a quencher to facilitate condensation of the steam. SRV acoustic monitoring provides main control room indication when a SRV is not fully closed via a vibration sensor mounted on the SRV discharge piping.

The Main Steam System includes the discharge piping from the high-pressure turbine. The purpose of this portion of the Main Steam System is to deliver the high-pressure turbine exhaust to the reheater and reheated steam to the low-pressure turbines.

Main Steam System piping from the reactor pressure vessel (RPV) up to and including the outboard MSIV on each of the four main steam lines is included in the scope of the Reactor Coolant Pressure Boundary (RCPB) System. The RCPB license renewal system contains all ASME Class 1 piping, piping components and valves outboard of the reactor vessel nozzles including those components from the Main Steam System. The Main Steam System portion of the RCPB System supplies steam to the reactor core isolation cooling turbine. It also includes the in-line flow restrictor for each of the four main steam lines. These flow restrictors minimize reactor coolant losses and protect the fuel barrier prior to MSIV closure for steam line ruptures outside of primary containment.

As a result of the re-analysis of the Loss of Coolant Accident (LOCA) using Alternative Source Term (AST) Methodology, it is no longer necessary to credit the MSIVLCS for post-LOCA activity leakage mitigation. The MSIVLCS system is not required to perform any safety function. The Main Steam System is credited for plate out for post-LOCA activity leakage mitigation between the outboard MSIV and the turbine/auxiliary building (secondary containment) wall.

Portions of the Main Steam System are located in areas where there are potential spatial interactions with safety-related equipment in the Auxiliary Building. The intended function of these portions of the Main Steam System is to resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of the safety-related functions of safety-related SSCs.

For more detailed information see USAR Sections 1.2.2.4.16, 1.2.2.5.2, 5.2.2.4.1, 6.7, and 10.3. The Main Steam System boundaries for license renewal are shown on the license renewal boundary drawings listed below.

Reason for Scope Determination

The Main Steam System meets 10 CFR 54.4(a)(1) because it is a safety-related system that is relied upon to remain functional during and following design basis events. The Main Steam System meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Main Steam System also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provide emergency heat removal from primary containment and provide containment pressure control. The Main Steam System includes the SRV discharge piping which prevents bypass leakage between the drywell and suppression pool and routes SRV discharge to the suppression pool. 10 CFR 54.4(a)(1)

2. Sense process conditions and generate signals for reactor trip or engineered safety features actuation. The Main Steam System contains components that provide process parameters to the reactor protection system instrumentation that initiates reactor scram and to the containment and reactor vessel isolation control system that initiates containment isolation. In addition, the Main Steam System contains components that provide process parameters to the rod pattern control system enforcing the banked position withdrawal sequence which limits the introduction of positive reactivity. 10 CFR 54.4(a)(1)

3. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. The Main Steam System includes nonsafety-related components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs located in the Auxiliary Building. The Main Steam System also includes nonsafety-related components that maintain mechanical and structural integrity to provide structural support to attached safety-related piping. 10 CFR 54.4(a)(2)

4. Post-accident containment holdup and plate out of MSIV bypass leakage. Nonsafety-related Main Steam System SSCs provide for post-accident containment plate out of MSIV bypass leakage. 10 CFR 54.4(a)(2)

5. Relied upon 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). The Main Steam System includes the SRV discharge piping which is used to reduce and control reactor pressure to support Fire Safe Shutdown. 10 CFR 54.4(a)(3)

6. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). The Main Steam System includes environmentally qualified components. 10 CFR 54.4(a)(3)

7. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients Without Scram (10 CFR 50.62). The Main Steam System conveys decay heat to the suppression pool via the SRVs operating for pressure relief during an ATWS event. 10 CFR 54.4(a)(3)

8. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). The Main Steam System conveys decay heat to the suppression pool via the SRVs operating for pressure relief during a Station Blackout event. 10 CFR 54.4(a)(3)

USAR References
1.2.2.4.16
1.2.2.5.2
5.2.2
6.7
7.2.1.1.4
7.1.2.1.2
7.6.1.7
7.6.1.11
10.3
15.9.3
15A.6.6.3
15.D.15.4.9

License Renewal Boundary Drawings
LR-CPS-M05-1002 Sheet 1
LR-CPS-M05-1002 Sheet 2
LR-CPS-M05-1002 Sheet 3
LR-CPS-M05-1002 Sheet 6
LR-CPS-M05-1047 Sheet 6
LR-CPS-M05-1070 Sheet 1
LR-CPS-M05-1105 Sheet 2

Table 2.3.4-3 Main Steam System
Components Subject to Aging Management Review

Component Type	Intended Function
Blower Housing	Structural Integrity (Attached)
Bolting (Closure)	Mechanical Closure
Flow Device	Throttle
Hoses	Pressure Boundary
	Structural Integrity (Attached)
Piping, piping components	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)
Valve Body	Leakage Boundary
	Pressure Boundary
	Structural Integrity (Attached)

The aging management review results for these components are provided in:

Table 3.4.2-3 Main Steam System
Summary of Aging Management Evaluation

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES AND COMPONENT SUPPORTS

The following structural components are addressed in this section:

- Auxiliary Building (2.4.1)
- Component Supports Commodity Group (2.4.2)
- Control Building (2.4.3)
- Cooling Lake (2.4.4)
- Diesel Generator Building (2.4.5)
- Fuel Building (2.4.6)
- Insulation Commodities Group (2.4.7)
- Primary Containment (2.4.8)
- Radwaste Building (2.4.9)
- Screen House (2.4.10)
- Structural Commodity Group (2.4.11)
- Switchyard Structures (2.4.12)
- Tank Foundations and Dikes (2.4.13)
- Turbine Building (2.4.14)
- Yard Structures (2.4.15)

2.4.1 Auxiliary Building

Description

The purpose of the Auxiliary Building is to provide structural support, shelter, and protection to systems, structures, and components (SSCs) housed within the building during normal station operations, and during and following postulated design basis accidents, and extreme environmental conditions. The Auxiliary Building is divided into compartments designed to support and protect safety-related systems and components. The Auxiliary Building houses the residual heat removal (RHR) system pump rooms, the low pressure core spray (LPCS) pump room, the reactor core isolation cooling (RCIC) turbine and pump room, the RHR heat exchanger rooms, the reactor water cleanup (RWCU) pump rooms, the main steam isolation valve (MSIV) blower rooms, the auxiliary building floor drain pump room, the electrical switchgear rooms, and the battery rooms. The Auxiliary Building includes a steam tunnel that houses the main steam and feedwater lines as they are routed between the Primary Containment and the Turbine Building.

The Auxiliary Building is a Seismic Category I safety-related multi-story structure. Portions of the structure are constructed above and below grade.

The reinforced concrete Auxiliary Building is located next to the Primary Containment building. It is also adjacent to the Fuel, Turbine, Control, and Radwaste Buildings. The Auxiliary Building is supported by a reinforced concrete basemat which is continuous with the basemats of the Fuel, Turbine, Control, Diesel Generator, and Radwaste Buildings. Major power block structures are underlain by compacted fill resting on hard Illinoian till. The building is structurally connected with shared shear walls to the Fuel, Turbine, Control, Diesel Generator, and Radwaste Buildings above the basemats. The Auxiliary Building is structurally isolated from Primary Containment above the basemat.

The main structure is constructed of cast-in-place, reinforced concrete. Lateral stability is provided by shear walls. The reinforced concrete slabs are supported by concrete beams that rest on concrete columns and walls. Masonry walls are used to sub-divide spaces.

The main steam tunnel extends from the containment to the Turbine Building through the Auxiliary Building. It houses the main steam lines, feedwater lines, and additional process piping and protects the piping from the effects of external missiles. In the unlikely event of pipe rupture inside the steam tunnel, it protects the control room and other Seismic Category I equipment and components from the effects of radioactive steam and pipe rupture loads. The tunnel also provides supports and restraints for the piping.

The RHR pump rooms, the LPCS pump room, and the RCIC turbine and pump rooms are in the lowest level of the Auxiliary Building, are flood protection compartments with watertight doors. In the event of a postulated pipe rupture, the flooding in one compartment will not result in the flooding of any other compartment. The second or grade level of the Auxiliary Building houses pump room access hatches. The third and fourth levels are provided for electrical switchgear and electrical penetrations.

The secondary containment utilizes a system for controlling the release of radioactive materials from the primary containment and other plant areas including the Auxiliary Building. The secondary containment is sufficiently leak tight such that the Standby Gas

Treatment System can maintain the required negative pressure following a design basis accident.

The secondary containment completely encloses the primary containment, except for the upper personnel hatch, and consists of the containment gas control boundary, the containment gas control boundary extension (siding within the Auxiliary Building), the portions of the Auxiliary Building that enclose the RHR pump rooms and RHR heat exchanger rooms, the LPCS pump room, the RWCU pump room, the main steam tunnel to the S Line, the MSIV blower rooms, and the Auxiliary Building floor drain pump room.

Included in the boundary of the Auxiliary Building are concrete anchors, concrete embedments, curbs, equipment supports and foundations, hatches, plugs, masonry walls, metal components such as metal decking, reinforced concrete elements of the building, steel components, steel elements, and structural bolting.

Not included within the evaluation boundary of the Auxiliary Building are the fire barriers, component supports, and structural commodities. Fire barriers (doors, dampers, fire rated enclosures, fire proofing material, penetration seals, fire barrier function of walls and slabs) and ventilation dampers are evaluated with the Fire Protection System. Component supports, including their respective bolting, are evaluated with the Component Supports Commodity Group. Structural commodities include roofing, flashing, penetration seals, doors, other seals, other hazard barriers and elastomers, louvers and miscellaneous vent components. Also included in Structural commodities are miscellaneous steel (e.g., stairs, ladders, platforms, hatches, including their respective bolting) as well as electrical and instrumentation enclosures and raceways (e.g., conduit, cable trays, tube track, cabinets, electrical enclosures, racks, frames, and panels, including their respective bolting), which are all evaluated with the Structural Commodity Group. Roof drains, equipment drains, and floor drains, are evaluated under the Plant Drainage System. Hoists, cranes, and elevators are evaluated under the Cranes, Hoists, and Refueling Equipment System.

For more detailed information, see USAR Sections listed below. The Auxiliary Building boundaries are shown on the license renewal boundary drawing listed below.

<u>Reason for Scope Determination</u>

The Auxiliary Building meets 10 CFR 54.4(a)(1) because it is a safety-related structure that is relied upon to remain functional during and following design basis events. The Auxiliary Building meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Auxiliary Building also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

<u>Intended Functions</u>

1. Provides physical support, shelter, and protection for safety-related systems, structures, and components. 10 CFR 54.4(a)(1)

2. Provide secondary containment boundary. 10 CFR 54.4(a)(1)

3. Controls the potential release of fission products to the external environment so that offsite consequences of design basis events are within acceptable limits. 10 CFR 54.4 (a)(1)

4. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4 (a)(1). 10 CFR 54.4(a)(2)

5. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). 10 CFR 54.4(a)(3)

6. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). 10 CFR 54.4(a)(3)

7. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients without Scram (10 CFR 50.62). 10 CFR 54.4(a)(3)

8. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.2
3.6.1.2.2
D3.6.3.2
D3.6.3.2.7
D3.6.3.2.8
D3.6.4
3.8.4.1.1
3.11
6.2.3
6.2.3.2
6.3.1.1.3
7.1.2.2.4.3
9.5.1.2
10.4.5.3
12.1
15.9
15 Appendix A
Appendix E Fire Protection Evaluation Report
Appendix F Fire Protection Safe Shutdown Analysis

License Renewal Boundary Drawings
LR-CPS-S-001

Table 2.4-1 Auxiliary Building
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements: Anchors	Structural Support
Concrete Elements: Curbs	Direct Flow
Concrete Elements: Embedments	Structural Support
Concrete: Above-grade exterior (accessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Concrete: Above-grade exterior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Concrete: All (accessible)	Structural Support
Concrete: All (inaccessible)	Structural Support
Concrete: Below-grade exterior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Pressure Barrier, Structural Support
Concrete: Foundation (inaccessible)	Flood Barrier, Shelter/Protection, Structural Support
Concrete: Interior	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Concrete: Interior (Steam Tunnel)	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support, HELB/MELB Shielding
Equipment supports and foundations	Structural Support
Hatches/Plugs	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Masonry walls: Interior	Shelter/Protection, Shielding, Structural Support
Steel components: structural steel	Structural Support
Structural Miscellaneous- Siding (Gas Control Boundary)	Shelter/Protection, Structural Pressure Barrier

The aging management review results for these components are provided in:

Table 3.5.2-1 Auxiliary Building
Summary of Aging Management Evaluation

2.4.2 Component Supports Commodity Group

Description

The Component Supports Commodity Group consists of structural elements and specialty components designed to transfer the load applied from a system, structure, or component (SSC) to the building structural element or directly to the building foundation. Supports include seismic anchors or restraints, support frames, spring hangers, rod hangers, guides, stops, straps, bolting, and clamps. Specialty components include snubbers and sliding surfaces.

The commodity group is comprised of the following supports:

- Supports for ASME Class 1, 2, and 3, and MC piping and components, including reactor vessel anchorage.
- Supports for cable trays, conduit, HVAC ducts, tube track, instrument tubing and non-ASME piping and components.
- Supports for emergency diesel generators, HVAC system components and other miscellaneous mechanical equipment.
- Supports for platforms, masonry walls, spray shields, and other miscellaneous structures.
- Supports for racks, panels, cabinets and enclosures for electrical equipment and instrumentation.

The purpose of a support is to transfer loads such as gravity, thermal, seismic, and other lateral and vertical loads imposed on or by the system, structure, or component to the supporting building structural element or foundation. Sliding surfaces, when incorporated into the support design, permit release of lateral forces but are relied upon to provide vertical support. Specialty supports such as snubbers only resist seismic forces. Vibration isolators are incorporated in the design of some vibrating equipment to minimize the impact of vibration. Other support types, such as guides and position stops, allow displacement in a specified direction, or preclude unanalyzed movements and interactions.

The Component Supports Commodity Group includes supports for mechanical, electrical, and instrumentation systems, structures, and components that are within the scope of license renewal. The group also includes supports for SSCs, which are not within the scope of license renewal, but their supports are required to restrain or prevent physical interaction with safety-related SSCs (e.g., Seismic II over I). The supports include, but are not limited to, support members, welded and bolted connections, sliding surfaces, concrete anchors, concrete embedments, and grout.

Included in the boundary of the Component Supports Commodity Group for each of the supports indicated above are building concrete at locations of expansion and grouted anchors, grout pads for support base plates; constant and variable load spring hangers, guides, stops; support members, sliding surfaces, welds, bolted connections, and support anchorage to building structures. Snubbers are also included in the boundary of this commodity group; however, they are considered active components and are not subject to aging management review except for the end connections, which perform a passive function for structural support.

Component Supports are treated as a commodity group because of similarities in design, materials, aging effects, and environments within the various plant structures.

Component supports that are in scope for license renewal are located in structures and areas with mechanical or electrical components that are also in scope. Component supports are not in scope for license renewal when installed in other structures and areas where there are no mechanical or electrical components in scope.

Conduit, cable trays, cabinets, enclosures, and panels for electrical equipment and instrumentation are evaluated in the Structural Commodity Group. The Component Supports Commodity Group includes supports external to components. Supporting members internal to components, such as in the Reactor Vessel, are included within the scope of those mechanical or electrical systems. Structural foundations for buildings are included within the scope of the individual structures. Not included in the boundary of the Component Supports Commodity Group are concrete equipment foundations, pipe whip restraints, columns, concrete embedments, and concrete anchors used for components other than supports listed herein. These commodities are evaluated separately with the license renewal structure that contains them. The spent fuel racks are included with the Fuel Building.

For more detailed information, refer to USAR Sections 3.9.3.4 and 3.10.3.

Component Supports within the scope of license renewal are not shown on the license renewal boundary drawing since these commodities are included within structures in scope for license renewal.

Reason for Scope Determination

The Component Supports Commodity Group meets 10 CFR 54.4(a)(1) because it is a safety-related group that is relied upon to remain functional during and following design basis events. The Component Supports Commodity Group meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the group could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Component Supports Commodity Group also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provides structural support or restraint to SSCs in scope of license renewal. 10 CFR 54.4(a)(1), (a)(2), (a)(3)

2. Provides structural support or restraint to SSCs not in scope of license renewal to prevent interaction with safety-related SSCs. 10 CFR 54.4(a)(2)

USAR References
1.2.2.4.4
3.6.2.5.2.4
3.8.3.1.11
3.8.3.4.4
3.8.5
3.9.1.4.9
3.9.3
3.9.3.4
3.9.3.5
3.10.3
Table 3.2-1
Table A3.9-6
4.5.3
4.6.1.2
4.6.2.3.3
4.6.3.2
5.4.14
6.2.5.2.2.4

License Renewal Boundary Drawings
LR-CPS-S-001

Table 2.4-2 **Component Supports Commodity Group**
Components Subject to Aging Management Review

Component Type	Intended Function
Supports for ASME Class 1 Piping and Components (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support
Supports for ASME Class 1 Piping and Components (Constant and variable load spring hangers; guides; stops)	Structural Support
Supports for ASME Class 1 Piping and Components (Sliding surfaces)	Structural Support
Supports for ASME Class 1 Piping and Components (Support members; welds; bolted connections; support anchorage to building structure; reactor vessel anchorage)	Structural Support
Supports for ASME Class 2 and 3 Piping and Components (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support
Supports for ASME Class 2 and 3 Piping and Components (Constant and variable load spring hangers; guides; stops)	Structural Support
Supports for ASME Class 2 and 3 Piping and Components (Sliding Surfaces)	Structural Support
Supports for ASME Class 2 and 3 Piping and Components (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support
Supports for ASME Class MC Components (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support
Supports for ASME Class MC Components (Constant and variable load spring hangers; guides; stops)	Structural Support
Supports for ASME Class MC Components (Sliding Surfaces)	Structural Support
Supports for ASME Class MC Components (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support
Supports for Cable Trays, Conduit, HVAC Ducts, Tube Track, Instrument Tubing, Non-ASME Piping and Components (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support

Component Type	Intended Function
Supports for Cable Trays, Conduit, HVAC Ducts, Tube Track, Instrument Tubing, Non-ASME Piping and Components (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support
Supports for Emergency Diesel Generator, HVAC System Components, and Other Miscellaneous Mechanical Equipment (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support
Supports for Emergency Diesel Generator, HVAC System Components, and Other Miscellaneous Mechanical Equipment (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support Vibration Isolation
Supports for Platforms, Jet Impingement Shields, Masonry Walls, and Other Miscellaneous Structures (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support
Supports for Platforms, Jet Impingement Shields, Masonry Walls, and Other Miscellaneous Structures (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support
Supports for Racks, Panels, Cabinets, and Enclosures for Electrical Equipment and Instrumentation (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support
Supports for Racks, Panels, Cabinets, and Enclosures for Electrical Equipment and Instrumentation (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support

The aging management review results for these components are provided in:

Table 3.5.2-2 Component Supports Commodity Group
Summary of Aging Management Evaluation

2.4.3 Control Building

Description

The Control Building is a Seismic Category I multi-story structure. Portions of the structure are constructed above and below grade.

The reinforced concrete Control Building is located next to the Auxiliary Building. It is also adjacent to the Diesel Generator and Radwaste Buildings. The Control Building is supported by a reinforced concrete basemat which is continuous with the basemats of the Auxiliary, Diesel Generator, and Radwaste Buildings. Major power block structures are underlain by compacted fill resting on hard Illinoian till. The building is structurally connected with shared shear walls to the Auxiliary, Diesel Generator, and Radwaste Buildings above the basemats.

The main structure, except above the main floor, is constructed of cast-in-place, reinforced concrete. Lateral stability is provided by shear walls. The reinforced concrete slabs are supported by concrete beams that rest on concrete columns and walls. Above the main floor, structural steel frames, columns and beams, are used. Lateral stability is provided by horizontal and vertical steel trusses where adjacent shear walls are not used. The steel beams support concrete slabs supported by permanent metal decking. Masonry walls are also used to sub-divide spaces.

The Control Building houses the main control room, cable spreading rooms, switchgear, laboratories, nonsafety-related batteries, electrical equipment, battery rooms, instrument room, computer room, and facilities for shift operating personnel. The Control Building provides access to the containment personnel access hatch with an enclosed, elevated walkway that is included within the scope of the Control Building.

The Control Building is divided into compartments designed to support and protect safety-related systems and components. Among these compartments are the control room envelope, switchgear compartments, and miscellaneous equipment compartments.

The control room envelope consists of the control room and control panel area, the computer room, offices, and support facilities. Control Room Ventilation System air handling units, filter trains, ducts and dampers are located on the elevation above the control room envelope. Safe occupancy of the control room during abnormal conditions is provided for in the design. Fire barriers, such as walls and slabs, as well as penetration seals and doors, are located throughout the building to mitigate the consequences of a fire. The fire barriers are designed for the required level of fire protection to withstand the fire hazards associated with the area in which they are installed. Adequate shielding is provided to maintain acceptable radiation levels in the control room in the event of a design basis accident for the duration of the accident. The control room is protected by concrete shielding. The outside air for the control room supply, which is part of the Control Room Ventilation system, enters through independent and separate missile-protected roof openings.

The purpose of the Control Building is to provide structural support, shelter, and protection to systems, structures, and components (SSCs) along with personnel housed within the building during normal station operations, and during and following postulated design basis accidents, and extreme environmental conditions. The building contains the control room, which is the main operation center for the station. The control room provides a centralized area for control and monitoring of safety-related and nonsafety-related equipment throughout the station. The control room envelope in conjunction with the Control Room Ventilation System ensures the unfiltered inleakage into the control room envelope will not exceed the inleakage assumed in the licensing basis analysis of design basis accident consequences to control room envelope occupants. Included in the boundary of the Control Building are the MCR suspended ceiling support system, concrete anchors, concrete embedments, curbs, equipment supports and foundations, hatches, plugs, masonry walls, metal components such as metal decking, reinforced concrete elements of the building, steel components, steel elements, and structural bolting.

Included within the boundary of the Control Building and determined not to be within the scope of license renewal are certain architectural elements in the miscellaneous operational support areas and offices, locker rooms, the computer room, and labs that include drywall partitions and soffits. These components and structures are nonsafety-related and are provided to facilitate miscellaneous operational support.

Not included within the evaluation boundary of the Control Building are the fire barriers, component supports, and structural commodities. Fire barriers (doors, dampers, fire rated enclosures, fire proofing material, penetration seals, fire barrier function of walls and slabs) and ventilation dampers are evaluated with the Fire Protection System. Component supports, including their respective bolting, are evaluated with the Component Supports Commodity Group. Structural commodities include roofing, flashing, penetration seals, doors, other seals, other hazard barriers and elastomers, louvers and miscellaneous vent components. Also included in the Structural Commodity Group are miscellaneous steel (e.g., stairs, ladders, platforms, hatches, including their respective bolting) as well as electrical and instrumentation enclosures and raceways (e.g., conduit, cable trays, tube track, cabinets, electrical enclosures, racks, frames and panels, including their respective bolting). Roof drains, equipment drains, and floor drains, are evaluated under the Plant Drainage System. Hoists, cranes, and elevators are evaluated under the Cranes, Hoists, and Refueling Equipment System.

For more detailed information, see USAR Sections listed below. The Control Building boundaries are shown on the license renewal boundary drawing listed below.

Reason for Scope Determination

The Control Building meets 10 CFR 54.4(a)(1) because it is a safety-related structure that is relied upon to remain functional during and following design basis events. The Control Building meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Control Building also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provides physical support, shelter, and protection for safety-related systems, structures, and components. 10 CFR 54.4(a)(1)

2. Provide centralized area for control and monitoring of nuclear safety-related equipment. 10 CFR 54.4(a)(1)

3. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4 (a)(1). 10 CFR 54.4(a)(2)

4. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). 10 CFR 54.4(a)(3)

5. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). 10 CFR 54.4(a)(3)

6. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients without Scram (10 CFR 50.62). 10 CFR 54.4(a)(3)

7. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

USAR References
1.2.1.2.6
1.2.2.2
2.5.4.5.1.5
2.5.4.5.2.4
3.1.2.2.10
3.8.4.1.3
6.4
6.4.2.1
6.4.2.3
6.4.2.5
12.1.2.1.4
12.3.1.10.3
12.3.1.10.7
12.3.2
Appendix E Fire Protection Evaluation Report
Appendix F Fire Protection Safe Shutdown Analysis

License Renewal Boundary Drawings
LR-CPS-S-001

Table 2.4-3 Control Building
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements (Missile Barrier)	Missile Barrier
Concrete Elements: Anchors	Structural Support
Concrete Elements: Curbs	Direct Flow
Concrete Elements: Embedments	Structural Support
Concrete: Above-grade exterior (accessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Concrete: Above-grade exterior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Concrete: All (accessible)	Structural Support
Concrete: All (inaccessible)	Structural Support
Concrete: Below-grade exterior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Pressure Barrier, Structural Support
Concrete: Foundation (inaccessible)	Flood Barrier, Shelter/Protection, Structural Support
Concrete: Interior	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Equipment supports and foundations	Structural Support
Hatches/Plugs	Shelter/Protection, Shielding, Structural Support
Masonry walls: Interior	Shelter/Protection, Shielding, Structural Support
Sliding Surfaces	Structural Support
Steel Components (Containment Access Walkway)	Structural Support
Steel Components (Missile Barrier)	Missile Barrier
Steel Components: Structural Steel	Structural Support
Structural Miscellaneous- Ceiling Panel Supports	Structural Support
Structural Miscellaneous- Siding	Shelter/Protection
Structural Miscellaneous- vent	Shelter/Protection

The aging management review results for these components are provided in:

Table 3.5.2-3 Control Building
Summary of Aging Management Evaluation

2.4.4 Cooling Lake

Description

The Cooling Lake (also known as Clinton Lake) is located in the upper reaches of Salt Creek. The station is located between two fingers of the U-shaped lake that was formed by construction of a dam just downstream from the confluence of the North Fork of Salt Creek with the Salt Creek. The cooling water intake for the circulating water and service water pumps is in the Screen House on the west side of the station, and the water then passes through the required systems. During normal operation, the water is discharged on the east side of the station and then recirculated back to the west side. The surface area of the Cooling Lake dissipates the heat resulting from station operation to the atmosphere. The ground topography along the station access route is favorably high and the station grades have been located well above the probable maximum flood level in the lake with the exception of the Screen House.

The Cooling Lake is designed to provide cooling water to the station and to remove the design heat load from the circulating water before the water circulates back into the station from the lake. Included in the evaluation of the Cooling Lake are the Cooling Lake main dam, service spillway, auxiliary spillway, outlet works, Ultimate heat sink (UHS), UHS discharge structure, and station discharge flume. Design criteria for these elements of the Cooling Lake are addressed for each element below.

Cooling Lake Main Dam:

The Cooling Lake main dam is a homogeneous earthfill dam located southwest of the station. The upstream face of the main dam (lake-side) is provided with riprap laid on layers of graded filter material for protection against wind wave erosion and lake drawdown effects. The downstream face is provided with seeded topsoil for protection against the erosive effect of rain falling over the main dam. A riprap laid on layers of graded filter materials is provided at the toe of the main dam for erosion protection against tailwater effects. Provisions are made for seepage control under the main dam and the abutments. The main dam is not safety-related and does not perform an intended function and therefore, is not in the scope of license renewal.

Service Spillway:

The service spillway is located on the west abutment of the Cooling Lake main dam. The service spillway is provided to mitigate the effects of a design flood of 100-year frequency. When flood waters exceed the top of the semi-circular, concrete spillway, the water will discharge through a concrete chute and into a stilling basin. A discharge canal is excavated to transport the water from the stilling basin to the main channel of Salt Creek. Riprap is provided downstream of the stilling basin and in the backfill and graded area adjacent to the stilling basin as protection against erosion. The top of the retaining walls in the chute section and stilling basin are provided with a minimum freeboard above the probable maximum flood water surface profile. The service spillway is not safety-related and does not perform an intended function and therefore, is not in the scope of license renewal.

Auxiliary Spillway:

The auxiliary (emergency) spillway is located east of the main dam. It is designed to pass floods more severe than the 100-year flood and up to and including the probable maximum flood. The auxiliary spillway provides protection to the dam against overtopping. The crest control section consists of asphalt concrete laid on compacted aggregate materials. Concrete cutoffs and riprap are provided upstream and downstream of the asphalt concrete crest to protect the crest against scouring. A rock trench is provided at the end of the downstream riprap. The auxiliary spillway is not safety-related and does not perform an intended function and therefore, is not in the scope of license renewal.

Outlet Works:

The lake outlet works is located on the west abutment of the main dam, east of the service spillway. The lake outlet works is provided to release a minimum flow to the creek downstream of the main dam. The lake outlet works consists of a submerged concrete intake structure of the drop inlet type, with a precast, prestressed concrete entrance pipe, wetwell type concrete control house with three cast iron sluice gates at different levels, and a precast, prestressed concrete outlet pipe terminating at the spillway stilling basin. The outlet works is not safety-related and does not perform an intended function and therefore, is not in the scope of license renewal.

Ultimate Heat Sink:

The UHS is a submerged pond within the Cooling Lake that is adjacent to the Screen House, where the shutdown service water pumps are located. The cooling water is pumped from the UHS to the station by the shutdown service water pumps. The shutdown service water system discharge pipes transport the water back to the UHS through a UHS discharge structure located south of the Screen House. The cooling water and pumps are also required for the station blackout recovery phase.

The submerged pond was formed by the construction of a submerged dam across the North Fork channel. The submerged dam is located one mile west of the Screen House. It consists of homogeneous compacted backfill materials. Compacted soil-cement is provided at the top and side slopes of the submerged dam and extends into a horizontal apron downstream of the toe of the dam. Fill is provided at the end of the soil-cement apron in some areas to create a stilling pool downstream of the submerged dam.

A submerged baffle dike is installed to increase the cooling time during the return of the circulating water to the Screen House. The baffle dike consists of homogeneous compacted backfill materials. The compacted soil-cement provided over the surface of the submerged dam and baffle dike will protect these structures against the erosive effect due to a postulated breach in the main dam and the occurrence of a probable maximum flood on North Fork coincident with the 100-year drought lake water level. Earthen elements of the UHS pond are nonsafety-related.

The UHS is designed to provide sufficient water volume and cooling capability for station shutdown operation for a minimum period of 30 days without requiring makeup water. In addition to the water requirements for station shutdown operation, an additional minimum volume of water in the UHS is made available for fire protection requirements. Therefore, it is in the scope of license renewal.

UHS Discharge Structure:

The UHS discharge structure is a reinforced concrete structure located alongside of the UHS south of the Screen House and the submerged baffle dike. The UHS discharge structure accommodates the shutdown service water discharge pipes, which transfer cooling water back to the UHS. This UHS discharge structure is Seismic Category I. Therefore, the structure is in the scope of license renewal.

Station Discharge Flume:

The discharge flume is provided to transport the station discharge from the circulating water pipe discharge structure into the Salt Creek finger of the lake. The flume is located east of the station area and runs east toward the Cooling Lake. A layer of crushed stone is provided on the side slopes of the flume for protection against erosion due to wind wave action in the flume. Riprap is provided on the lake side of the embankment fills for protection against erosion due to wind wave action in the lake. Baffled drop structures are provided at two locations along the flume to allow the flume to follow ground topography and to prevent scouring in the flume during station operations at drought conditions in the Cooling Lake. Drainage crossings under the flume are provided at two locations to drain the areas north of the flume. The drainage structures consist of corrugated metal pipe. Anti-seep collars and erosion protection are provided on the drainage structures. A series of cooling towers are located next to the discharge flume and are used when discharge temperatures have the potential to exceed limitations set in the environmental permit. The discharge flume, including the cooling towers and other associated structures, is not safety-related and does not perform an intended function and therefore, is not in the scope of license renewal.

Included within the boundary of the Cooling Lake and determined to be within the scope of license renewal are the elements of the UHS, including reinforced concrete elements, earthen and riprap elements, and anchor walls that are part of the submerged UHS pond (including the submerged dam and baffle dike) and UHS discharge structure.

Included in the boundary of the Cooling Lake and determined to be not in scope for license renewal are the Cooling Lake main dam, service spillway, auxiliary spillway, outlet works, and discharge flume. These structures are nonsafety-related and are designed to provide and maintain a volume of water for nonsafety-related cooling purposes or prevent flooding damage to the main dam. They are not necessary for the function of the UHS, fire protection, or to provide flood protection for the station (flood protection features in the Screen House are provided up to an elevation that is higher than the top of the main dam, and all other buildings are founded on an elevation above the top of the main dam). Additionally, there are other features in the immediate vicinity of the Cooling Lake that are associated with access to the lake and public recreation on the lake. These structural components and features do not perform a license renewal intended function and their failure will not prevent satisfactory accomplishment of a safety-related function and therefore, are not in the scope of license renewal.

Not included within the boundary of the Cooling Lake is the Screen House, which is evaluated separately.

For more detailed information, see USAR Sections listed below.

The Cooling Lake is shown on the license renewal boundary drawing listed below.

Reason for Scope Determination

The Cooling Lake meets 10 CFR 54.4(a)(1) because it is a safety-related structure that is relied upon to remain functional during and following design basis events. The Cooling Lake meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Cooling Lake also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Station Blackout (10 CFR 50.63). The Cooling Lake is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provides physical support, shelter, and protection for safety-related systems, structures, and components (SSCs). 10 CFR 54.4(a)(1)

2. Provides Ultimate Heat Sink (UHS) during design basis events. 10 CFR 54.4(a)(1)

3. Provides a source of cooling water for plant safe shutdown. 10 CFR 54.4(a)(1)

4. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of functions(s) identified for 10 CFR 54.4(a)(1). 10 CFR 54.4(a)(2)

5. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). The Cooling Lake provides the source of water for fire protection requirements. 10 CFR 54.4(a)(3)

6. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

USAR References

1.2.2.1.2.2
1.2.2.8.4
2.4.3
2.4.8.1
2.4.8.1.1
2.4.8.1.2
2.4.8.1.3

2.4.8.1.4
2.4.8.1.5
2.4.8.2
2.4.11.6
2.5.5.2.2
A2.5
3.8.4.1
3.8.4.1.8
9.2.5

<u>License Renewal Boundary Drawings</u>
LR-CPS-S-001

Table 2.4-4 **<u>Cooling Lake</u>**
Components Subject to Aging Management Review

Component Type	Intended Function
Concrete: All (accessible)	Direct Flow, Structural Support
Concrete: All (inaccessible)	Direct Flow, Structural Support
Concrete: Below-grade exterior (accessible)	Direct Flow, Structural Support
Concrete: Below-grade exterior (inaccessible)	Direct Flow, Structural Support
Earthen water-control structures: Embankments (dikes)	Direct Flow, Water Retaining Boundary

The aging management review results for these components are provided in:

Table 3.5.2-4 Cooling Lake
Summary of Aging Management Evaluation

2.4.5 Diesel Generator Building

Description

The Diesel Generator Building houses the diesel generators, diesel fuel oil tanks, and associated diesel generator heating and ventilation equipment. The Diesel Generator Building is part of the power generation complex which includes several contiguous buildings. The Diesel Generator Building is located adjacent to the Fuel Building and Control Building. The shear walls for the Auxiliary Building, Turbine Building, Radwaste Building, and Diesel Generator Building are interconnected. These shear walls act together to resist lateral loads applied to these buildings. Therefore, the shear walls for these buildings are Seismic Category I. The Diesel Generator Building is also Seismic Category I. Although Unit 2 was not constructed, the Diesel Generator Building was designed and built to house the diesel generators for both units.

The Diesel Generator Building is comprised of a reinforced concrete substructure supported on a reinforced concrete mat foundation on soil with a steel frame above the grade floor. Exterior walls are reinforced concrete. The roof is reinforced concrete with built up roofing. The Diesel Generator Building is designed to withstand tornados, missiles, and flooding.

The Diesel Generator Building has intake and exhaust vents for ventilation. The diesel generator exhaust system is located within the Diesel Generator Building with the exception of the exhaust silencer which is located on the roof of the building. The diesel air intake line and exhaust line are included in the Diesel Generator and Auxiliaries System. Any ducting or HVAC equipment penetrating the wall or roof of the Diesel Generator Building is also included with the Safety-Related Ventilation System except for the common HVAC vent stack.

The purpose of the Diesel Generator Building is to provide structural support, shelter, access control, and protection to safety-related systems, components, and structures housed within it during operation and during postulated design basis accidents. The fuel oil storage tanks are located on the lower level, and diesel generators and day tanks are located at grade level. The FLEX diesel generator, which does not perform a license renewal intended function, is located in the area of the Diesel Generator Building designated for Unit 2. The reinforced concrete construction provides tornado and missile protection.

Each diesel generator set is enclosed in its own reinforced concrete missile protected room which is designed to provide physical separation for redundant mechanical and electrical safety-related components. The Division I and Division II rooms each contain two diesel engines, a fuel oil storage tank, day tank, a transfer pump, an electric generator, and necessary piping, valves, and instrumentation. The Division III (HPCS) room contains a fuel oil storage tank, a transfer pump, one diesel engine, one electric generator, and necessary piping, valves, and instrumentation. The lower elevations contain the fuel oil storage tanks. HVAC equipment is located above grade level. The common HVAC vent stack is located inside the west wall of the Diesel Generator Building and continues up through the building to the top of the building and penetrates the roof. The common HVAC vent stack extends upward along the outside of the Primary Containment and is supported by the upper dome and exterior wall of the steel enclosure portions of the Primary Containment. The common HVAC vent stack has been designed as a stiffened box girder to resist the design bases events and is included within the scope of the Diesel Generator Building.

Included in the boundary of the Diesel Generator Building and determined to be in scope for license renewal are the common HVAC vent stack, concrete anchors, concrete embedments, curbs, equipment supports and foundations, hatches, plugs, masonry walls, reinforced concrete elements, steel components, and steel elements.

Not included within the boundary of the Diesel Generator Building are the cranes and hoists, intake and exhaust lines, ducting and HVAC equipment, fire barriers, component supports, and structural commodities. Cranes and hoists are evaluated separately with the Cranes, Hoists, and Refueling Equipment System. The diesel air intake line and exhaust line are included in the Diesel Generator and Auxiliaries System. Any ducting or HVAC equipment penetrating the wall or roof of the Diesel Generator Building is included with the Safety-Related Ventilation System except for the common HVAC vent stack. Fire barriers (doors, dampers, fire rated enclosures, fire proofing material, penetration seals, fire barrier function of walls and slabs) are evaluated with the Fire Protection System. Component supports, including their respective bolting, are evaluated with the Component Supports Commodity Group. The Structural Commodity Group evaluates components such as structural miscellaneous – vent components (e.g., bird screens); steel components (e.g., cable trays); compressible joints and seals; conduit; doors; louvers; miscellaneous structural steel including platforms, stairs, ladders; panels, racks, cabinets, and other enclosures for electrical equipment and instrumentation; penetration seals; penetration sleeves including end caps; roofing; structural sealants, seismic gap seals, gaskets, flashing and other sealants and gap seals; and tube track. In addition, mechanical and electrical systems and components, housed in or located within the Diesel Generator Building, are evaluated with their respective mechanical and electrical license renewal systems or commodities group.

For more detailed information, see the USAR Sections listed below. The Diesel Generator Building is shown on the license renewal boundary drawing listed below.

Reason for Scope Determination

The Diesel Generator Building meets 10 CFR 54.4(a)(1) because it is a safety-related structure that is relied upon to remain functional during and following design basis events. The Diesel Generator Building meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Diesel Generator Building also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provides physical support, shelter, and protection for safety-related systems, structures, and components. 10 CFR 54.4(a)(1)

2. Provides for the discharge of treated gaseous waste to meet the requirements of 10 CFR 50.67 or 10 CFR 100. 10 CFR 54.4(a)(1)

3. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of

function(s) identified for 10 CFR 54.4 (a)(1). 10 CFR 54.4(a)(2)

4. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). 10 CFR 54.4(a)(3)

5. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). 10 CFR 54.4(a)(3)

6. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient without Scram (10 CFR 50.62). 10 CFR 54.4(a)(3)

7. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

<u>USAR References</u>
Table 3.2-1
3.3.2.3
Table 3.5-5
D3.6.3.5
3.8.4.1.4
3.11
9.3
9.5.4.2
12.1
15.8
15.9
Appendix E

<u>License Renewal Boundary Drawings</u>
LR-CPS-S-001

Table 2.4-5 Diesel Generator Building
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements: Anchors	Structural Support
Concrete Elements: Curbs	Direct Flow
Concrete Elements: Embedments	Structural Support
Concrete: Above-grade exterior (accessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support
Concrete: Above-grade exterior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support
Concrete: All (accessible)	Structural Support
Concrete: All (inaccessible)	Structural Support
Concrete: Below-grade exterior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support
Concrete: Foundation (inaccessible)	Flood Barrier, Shelter/Protection, Structural Support
Concrete: Interior	Shelter/Protection, Structural Support
Equipment supports and foundations	Structural Support
Hatches/Plugs	Shelter/Protection, Structural Support
Masonry walls: Interior	Shelter/Protection, Structural Support
Steel components: structural steel	Structural Support
Structural Miscellaneous- vent (HVAC Vent Stack)	Missile Barrier, Structural Support

The aging management review results for these components are provided in:

Table 3.5.2-5 Diesel Generator Building
Summary of Aging Management Evaluation

2.4.6 Fuel Building

Description

The purpose of the Fuel Building is to provide structural support, shelter, and protection to systems, structures, and components (SSCs) housed within the building during normal station operations, and during and following postulated design basis accidents, and extreme environmental conditions. The Fuel Building is designed to support and protect safety-related systems and components. The high pressure core spray pump is in a flood protected compartment in the lowest level of the Fuel Building. The Fuel Building houses the fuel storage and shipping area and the integrated fuel pool cooling and cleanup equipment. The Fuel Building accommodates the fuel shipping cask railroad car or transporter used for dry cask storage operations. The reinforced concrete construction above the main floor provides missile and tornado protection. The three pools in the Fuel Building provide for fuel transfer, spent fuel storage, and cask loading. The pools are lined with stainless steel plate welded to reinforced members embedded in concrete. Channels are located behind the weld seams of the pool liners and are monitored to detect possible leakage from the pools.

The Fuel Building is a Seismic Category I multi-story structure. Portions of the structure are constructed above and below grade. The reinforced concrete Fuel Building is located next to the Primary Containment, Auxiliary Building, and Diesel Generator Building. The Fuel Building is supported by a reinforced concrete basemat which is continuous with the basemats of the Primary Containment and Auxiliary, Turbine, Control, Diesel Generator, and Radwaste Buildings. Major power block structures are underlain by compacted fill resting on hard Illinoian till. The building is structurally connected with shared shear walls to the Auxiliary and Diesel Generator Building above the basemats. The Fuel Building is structurally isolated from Primary Containment above the basemat.

The main structure is constructed of cast-in-place, reinforced concrete. Lateral stability is provided by shear walls. The reinforced concrete slabs are supported by concrete beams that rest on concrete columns and walls. Masonry walls are used to sub-divide internal spaces.

New fuel is placed in dry storage in the new fuel storage vault located inside the Fuel Building. The storage vault provides adequate shielding for radiation protection. New fuel storage rack spacing precludes criticality. Irradiated fuel is also stored in the Fuel Building. Storage racks preclude unintended criticality. Irradiated fuel is stored under water in the Fuel Building spent fuel pool and cask storage pool. The cask storage pool is used for the loading and transfer of spent fuel storage casks.

The inclined fuel transfer system is used to transfer fuel, control rods, defective fuel storage containers, and other small items between the Primary Containment and the Fuel Building pools by means of a carriage traveling in a transfer tube. A primary containment isolation assembly containing a blind flange and a bellows which connects from the Primary Containment isolation assembly to the Fuel Building penetration are provided to isolate the Primary Containment from the fuel transfer tube and the Fuel Building.

The secondary containment utilizes a system for controlling the release of radioactive materials from the Primary Containment and other plant areas including the Fuel Building.

The secondary containment is sufficiently leak tight such that the Standby Gas Treatment System can maintain the required negative pressure following a design basis accident. The secondary containment completely encloses the Primary Containment, except for the upper personnel hatch, and consists of the containment gas control boundary, the containment gas control boundary extension (siding within the Auxiliary Building), portions of the Auxiliary Building, and the Fuel Building.

Included in the boundary of the Fuel Building are concrete anchors, concrete embedments, curbs, equipment supports and foundations, hatches, plugs, masonry walls, metal components such as metal decking, reinforced concrete elements of the building, steel components, steel elements, and structural bolting. The Fuel Building includes pool liners and associated pool gates and gate seals.

Not included within the evaluation boundary of the Fuel Building are the fire barriers, component supports, and structural commodities. Fire barriers (doors, dampers, fire rated enclosures, fire proofing material, penetration seals, fire barrier function of walls and slabs) and ventilation dampers are evaluated with the Fire Protection System. Component supports, including their respective bolting, are evaluated with the Component Supports Commodity Group. Structural commodities include roofing, flashing, penetration seals, doors, other seals, other hazard barriers and elastomers, louvers and miscellaneous vent components. Also included in the Structural Commodity Group are miscellaneous steel (e.g., stairs, ladders, platforms, hatches, including their respective bolting) as well as electrical and instrumentation enclosures and raceways (e.g., conduit, cable trays, tube track, cabinets, electrical enclosures, racks, frames and panels, including their respective bolting). Roof drains, equipment drains, and floor drains, are evaluated under the Plant Drainage System. Hoists, cranes, fuel handling platform, and elevators are evaluated under the Cranes, Hoists, and Refueling Equipment System. New and spent fuel storage racks and associated neutron absorbing materials are evaluated with the Fuel Pool Cooling and Storage system.

For more detailed information, see USAR Sections listed below. The Fuel Building is shown on the license renewal boundary drawing listed below.

Reason for Scope Determination

The Fuel Building meets 10 CFR 54.4(a)(1) because it is a safety-related structure that is relied upon to remain functional during and following design basis events. The Fuel Building meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Fuel Building also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provides physical support, shelter, and protection for safety-related systems, structures, and components. 10 CFR 54.4(a)(1)

2. Provides protection for safe storage of new and spent fuel. 10 CFR 54.4(a)(1)
3. Provide secondary containment boundary. 10 CFR 54.4(a)(1)
4. Controls the potential release of fission products to the external environment so that offsite consequences of design basis events are within acceptable limits. 10 CFR 54.4(a)(1)
5. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4 (a)(1). 10 CFR 54.4(a)(2)
6. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). 10 CFR 54.4(a)(3)
7. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). 10 CFR 54.4(a)(3)
8. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients without Scram (10 CFR 50.62). 10 CFR 54.4(a)(3)
9. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.2
3.1.2.6.2.1
3.1.2.6.3
D3.6.3.3
3.8.4.1.2
3.11
6.2.3
6.3.1.1.3
7.1.2.2.4.3
9.1
9.5.1.2
12.1.2.1.2
15.8
15.9
15 - Appendix A
Appendix E Fire Protection Evaluation Report
Appendix F Fire Protection Safe Shutdown Analysis

<u>License Renewal Boundary Drawings</u>
LR-CPS-S-001

Table 2.4-6 **Fuel Building**
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements (Missile Barrier)	Missile Barrier
Concrete Elements: Anchors	Structural Support
Concrete Elements: Curbs	Direct Flow
Concrete Elements: Embedments	Structural Support
Concrete: Above-grade exterior (accessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Concrete: Above-grade exterior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Pressure Barrier, Structural Support
Concrete: All (accessible)	Structural Support
Concrete: All (inaccessible)	Structural Support
Concrete: Below-grade exterior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Pressure Barrier, Structural Support
Concrete: Foundation (inaccessible)	Flood Barrier, Shelter/Protection, Structural Support
Concrete: Interior	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Equipment supports and foundations	Structural Support
Hatches/Plugs	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Masonry walls: Interior	Shelter/Protection, Shielding, Structural Support
Spent fuel pool gates	Water retaining boundary
Spent fuel pool gates (Gate Seals)	Water retaining boundary
Steel Components (missile barrier)	Missile Barrier
Steel components: structural steel	Structural Support
Steel elements: liner, liner anchors, integral attachments (Fuel Pool Liner)	Water retaining boundary
Structural Miscellaneous - Siding (Gas Control Boundary)	Shelter/Protection, Structural Pressure Barrier
Structural Miscellaneous - Siding (Railroad Bay)	Shelter/Protection, Structural Pressure Barrier

The aging management review results for these components are provided in:

Table 3.5.2-6 Fuel Building
Summary of Aging Management Evaluation

2.4.7 Insulation Commodities Group

Description

The Insulation Commodities Group consists of thermal insulation and metallic insulation jacketing installed on piping and other mechanical components within the scope of license renewal. Insulation materials used at the station include both originally installed materials and replacement materials. Stainless steel reflective metallic insulation (RMI) is used for thermal piping insulation inside Primary Containment (e.g., main steam piping, reactor water clean-up piping and equipment, feedwater piping, reactor recirculation piping, and the reactor pressure vessel). RMI is installed in sections with overlapping edges and seismic quick-release latches with integral keepers. Calcium silicate thermal insulation is used on high-temperature piping penetrations outside Primary Containment. Additional types of insulation used outside Primary Containment include fiberglass, cork, foam glass, and canvas blanket type insulation. Insulation installed over electric heat tracing consists of fiberglass with aluminum jacketing.

Thermal insulation in Primary Containment piping penetrations with temperatures above 200 degrees F protects the surrounding concrete from localized overheating. Thermal insulation also provides personnel protection, improves thermal efficiency of plant systems, provides freeze protection for outdoor heat traced piping, and prevents sweating for piping that is normally at temperatures below the ambient dew point.

Included within the evaluation boundary of the Insulation Commodities Group and determined to be within the scope of license renewal are thermal insulation in Primary Containment penetrations with process piping above 200 degrees F. Also, included within the evaluation boundary and determined to be within the scope of license renewal are thermal insulation and metallic insulation jacketing on the reactor core isolation cooling (RCIC) storage tank insulation and heat-trace for freeze protection on outdoor safety-related piping and components to ensure that the process temperatures will be within design limits ensuring that the heat-traced equipment will function.

Included within the evaluation boundary of the Insulation Commodities Group and determined to be not in the scope for license renewal are thermal insulation and metallic insulation jacketing (including calcium silicate, cork, and foam glass), except as described above in the in-scope section, anti-sweat insulation, and insulation on mechanical components. Fire barriers (including fire proofing material) are evaluated with the Fire Protection System.

For more detailed information, see USAR Sections listed below.

Insulation is not shown on the license renewal boundary drawing since insulation is included where located on piping and other mechanical components in scope for license renewal.

Reason for Scope Determination

The Insulation Commodities Group is not in scope under 10 CFR 54.4(a)(1) because no portions of the system are safety-related or relied upon to remain functional during and following design basis events. The Insulation Commodities Group meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the system could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Insulation Commodities Group is not in scope under 10 CFR 54.4(a)(3) because it is not relied upon 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Resist nonsafety-related SSC failure that could prevent satisfactory accomplishment of a safety-related function. 10 CFR 54.4(a)(2)

USAR References
3.1.2.4.3.1
3.1.2.4.7.1
5.2.3.2.4
5.2.4.3.1
5.2.4.3.2
5.3.3.1.4.4
5.4.1.3
6.1.1.1.3.d
6.2.1.2.2

License Renewal Boundary Drawings
LR-CPS-S-001

Table 2.4-7 Insulation Commodities Group
Components Subject to Aging Management Review

Component Type	Intended Function
Insulation - Thermal	Thermal Insulation
Insulation Jacketing - Thermal (includes Clamps, Bands, and Fasteners)	Thermal Insulation Jacket Integrity

The aging management review results for these components are provided in:

Table 3.5.2-7 Insulation Commodities Group
Summary of Aging Management Evaluation

2.4.8 Primary Containment

Description

The Primary Containment structure is a Seismic Category I structure consisting of the concrete containment vessel, a steel enclosure, and containment internal structures. The Primary Containment, which is a reinforced concrete containment vessel, uses a BWR Mark III design for pressure suppression. The Seismic Category I Primary Containment structure houses the major portion of the nuclear steam supply system, the drywell, the reactor shield wall, the reactor pedestal, the suppression pool and weir wall, and the containment pool.

Concrete Containment Vessel (CCV)

The CCV consists of a free-standing, right circular cylinder with a hemispherical domed roof and a flat basemat. It is constructed of reinforced concrete and lined on the inside of the walls and dome with stainless steel plate below elevation 735 feet and carbon steel plate above elevation 735 feet. The transition in liner plate material at elevation 735 feet is about four feet above the top of the suppression pool. The liner plates serve as a leak tight membrane. The reinforced concrete containment basemat is continuous with the adjacent Auxiliary and Fuel Buildings. The major power block structures are supported on compacted structural fill with a six-inch concrete mud mat.

The CCV provides support for the polar crane, galleries, and the access ramp to the refueling floor. The lower section of the CCV acts as the outer boundary of the suppression pool.

Large penetrations through the CCV wall include two steel double door personnel access locks and a circular steel equipment hatch. Access to containment is permitted through the personnel locks; one at the refueling floor and one at the grade floor. Evaluated with the Control Building is an enclosed elevated walkway that connects the personnel lock at the refueling floor with the Control Building. The equipment hatch, located at the grade floor, allows movement of equipment into and out of containment. Small penetrations through the CCV wall include pipe penetrations, electrical penetrations, and the fuel transfer penetration.

The original design of the CCV does not include a moisture barrier at the bottom of the cylinder liner, which in this area is stainless steel at the bottom of the suppression pool, at the top of the basemat. Leak test channels are provided at the liner seams in the suppression pool area and in the containment wall up to elevation 757 feet. These channels contain vent holes which can be visually inspected for blockage.

Containment Exterior Structures

The steel enclosure, also called the containment gas control boundary, is a Seismic Category I structure, which surrounds the top of the CCV. The steel enclosure also extends above the Auxiliary and Fuel Buildings, conforms to the shape of the CCV, and is separated from it by approximately four feet. The enclosure is supported on top of the Auxiliary and Fuel Buildings. The steel enclosure completely encloses the Primary Containment except for the upper personnel hatch.

The upper dome and exterior wall of the steel enclosure also provide support for the common HVAC vent stack, which is evaluated with the Diesel Generator Building.

The secondary containment utilizes a system for controlling the release of radioactive materials from the Primary Containment and other plant areas. The secondary containment includes portions of the Auxiliary Building, the Fuel Building, pipe tunnels, and the containment gas control boundary steel enclosure. The secondary containment is sufficiently leak tight such that the Standby Gas Treatment System can maintain the required negative pressure following a design basis accident.

Containment Internal Structures

Internal structures of the containment vessel support and shield the reactor, support the recirculation pumps, support piping and auxiliary equipment, form the pressure suppression system, and provide a pool and platforms for refueling operations. The internal structures include the reactor shield wall, drywell structure, suppression pool weir wall, reactor pedestal, miscellaneous platforms and galleries, containment pool, refueling floor, equipment rooms, process pipe tunnel, and support system for the recirculation pumps.

Drywell

The drywell is a cylindrical reinforced concrete structure rigidly attached to the basemat of the containment structure. The drywell surrounds the reactor pressure vessel and its support structure and is equipped with a removable steel head which allows access to the reactor. The lower portion of the drywell wall is submerged in the suppression pool. Three rows of vents, 34 vents per row, penetrate the drywell wall below the normal level of the suppression pool. The surfaces of the drywell wall exposed to the suppression pool are lined with stainless steel clad plate. Above the level of the suppression pool a carbon steel form plate is installed on the interior surfaces of the cylinder walls and top slab. Access to the drywell is provided by the drywell personnel lock, a personnel hatch located in the drywell ceiling, and the drywell equipment hatch. The personnel lock consists of an interlocked, double-door, welded steel assembly. Pipe and electrical penetrations also penetrate the drywell wall.

Reactor Shield Wall

The reactor shield wall is an open-ended cylindrical shell two feet thick, placed around the reactor pressure vessel. The primary function of the shield wall is to act as a radiation and heat barrier between the reactor pressure vessel and the drywell wall. The shield wall also provides support for pipes, pipe whip restraints, snubbers, and gallery work. Openings are provided for pipe penetrations and inservice inspection.

The shield wall consists of two concentric steel cylindrical shells, stiffened with radially placed diaphragms, and filled with concrete in between the two shells. It is supported on top of the reactor pedestal ring girder.

Reactor Pedestal

The reactor pedestal supports the reactor pressure vessel and reactor shield wall. The pedestal shell is a steel structure consisting of two concentric cylindrical shells connected by radially placed steel diaphragms for the entire height of the cylinders. The top of the pedestal consists of a ring girder to which the reactor shield wall is welded. The reactor vessel base is anchored to the ring girder by pretensioned bolts which are designed to carry the loads through friction. Openings are provided through the pedestal for access, control rod drive piping, and nuclear instrumentation. To increase the stability of the structure, the annulus between the steel cylinders is filled with concrete.

Suppression Pool and Weir Wall

The lower section of the CCV acts as the outer boundary of the suppression pool. The suppression pool is concentric around the drywell centerline and filled with water. A cylindrical reinforced concrete weir wall, extending from the outer edge of the drywell sump floor, acts as the inner boundary of the suppression pool. The weir wall is lined with a stainless steel plate on the suppression pool side. The suppression pool serves as a heat sink during normal operational transients and accident conditions. The suppression pool contains the designed amount of water required to rapidly condense the steam.

Containment Pool

The containment pool, used for refueling operations, provides reactor shielding, an area for fuel transfer during refueling, and makeup water to the suppression pool. The pool forms a rectangular box across the drywell and is supported on the drywell walls. The interior of the pool is lined with stainless steel plate.

Components not included in the evaluation boundary of the Primary Containment are component supports, electrical enclosures (conduit, cable trays, cabinets, enclosures, racks, frames and panels for electrical equipment and instrumentation), cranes, miscellaneous steel, and containment isolation valves. Component supports are evaluated in the Component Supports Commodity Group. Conduit, cable trays, cabinets, enclosures, racks, frames and panels for electrical equipment and instrumentation are evaluated in the Structural Commodity Group. Miscellaneous structural components such as grating, handrails, ladders, platforms, and toe boards are also evaluated with the Structural Commodity Group. The cranes are evaluated with the Cranes, Hoists and Refueling Equipment System. The containment isolation valves are evaluated with the individual mechanical systems. Ventilation components, such as dampers and ducting, are evaluated with the ventilation systems. In addition, other mechanical and electrical systems and components housed in or located within the boundary of the Primary Containment structure are evaluated with their respective mechanical and electrical license renewal systems or commodities group.

The Primary Containment structure is discussed in the USAR Sections listed below. The Primary Containment structure is shown on the license renewal boundary drawing listed below.

<u>Reason for Scope Determination</u>

The Primary Containment meets 10 CFR 54.4(a)(1) because it is a safety-related structure that is relied upon to remain functional during and following design basis events. The Primary Containment meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Primary Containment also meets 10 CFR 54.4(a)(3) because it is relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

<u>Intended Functions</u>

1. Provides physical support, shelter, and protection for safety-related systems, structures, and components. 10 CFR 54.4(a)(1)

2. Provides Primary Containment boundary. 10 CFR 54.4(a)(1)

3. Controls the potential release of fission products to the external environment so that offsite consequences of design basis events are within acceptable limits. 10 CFR 54.4(a)(1)

4. Controls the release of fission products to the secondary containment in the event of a design basis loss-of-coolant accident (LOCA) so that offsite consequences are within acceptable limits. 10 CFR 54.4(a)(1)

5. Provides a source of water for emergency core cooling systems. 10 CFR 54.4(a)(1)

6. Provides sufficient air and water volumes to absorb the energy released to the containment in the event of design basis events so that the pressure is within acceptable limits. 10 CFR 54.4(a)(1)

7. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). 10 CFR 54.4(a)(2)

8. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Fire Protection (10 CFR 50.48). 10 CFR 54.4(a)(3)

9. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Environmental Qualification (10 CFR 50.49). 10 CFR 54.4(a)(3)

10. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Anticipated Transients without Scram (10 CFR 50.62). 10 CFR 54.4(a)(3)

11. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.1.6
1.2.1.1.2
1.2.2.2
1.2.2.4.9.1
2.5
3.1.2.2.7.1
3.8.1.1
3.8.3.1
3.8.3.1.2
6.2.1.1
6.2.3
B.5.3.1.3

<u>License Renewal Boundary Drawings</u>
LR-CPS-S-001

Table 2.4-8 Primary Containment
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Containment Closure)	Structural Pressure Barrier, Structural Support
Bolting (Drywell Closure)	Structural Pressure Barrier, Structural Support
Bolting (Structural)	Structural Support
Concrete Elements: Anchors	Structural Support
Concrete Elements: Curbs	Direct Flow
Concrete Elements: Embedments	Structural Support
Concrete: Dome; wall; basemat; reinforcing steel (accessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Concrete: Dome; wall; basemat; reinforcing steel (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Concrete: Interior (Containment Pool)	Shielding, Structural Support
Concrete: Interior (Drywell)	HELB/MELB Shielding, Shelter/Protection, Structural Pressure Barrier, Structural Support
Concrete: Interior (Reactor Pedestal)	Structural Support
Concrete: Interior (Reactor Shield Wall)	HELB/MELB Shielding, Shielding, Structural Support
Concrete: Interior (Suppression Pool and Weir Wall)	Structural Support
Concrete: Interior (accessible)	Missile Barrier, Shelter/Protection, Shielding, Structural Support
Concrete: Interior (inaccessible)	Missile Barrier, Shelter/Protection, Shielding, Structural Support
Containment Liner (accessible)	Structural Pressure Barrier, Structural Support
Containment Liner (inaccessible)	Structural Pressure Barrier, Structural Support
Equipment supports and foundations	Structural Support
Hatches/Plugs	Missile Barrier, Shelter/Protection, Shielding, Structural Pressure Barrier
Masonry walls: Interior	Shielding, Structural Support
Penetration - Containment Electrical	Shelter/Protection, Structural Pressure Barrier, Structural Support
Penetration - Containment Mechanical	Shelter/Protection, Structural Pressure Barrier, Structural Support
Penetration - Drywell Electrical	Shelter/Protection, Structural Pressure Barrier, Structural Support
Penetration - Drywell Mechanical	Expansion/Separation
	Shelter/Protection, Structural Pressure Barrier, Structural Support
Personnel airlock, equipment hatch (Containment)	Shelter/Protection, Structural Pressure Barrier, Structural Support
Personnel airlock, equipment hatch (Drywell)	Shelter/Protection, Structural Pressure Barrier, Structural Support
Personnel airlock, equipment hatch: Locks, hinges, and closure mechanisms	Structural Pressure Barrier, Structural Support
Pipe Whip Restraints and Jet Impingement Shields	Pipe Whip Restraint, HELB/MELB Shielding

Component Type	Intended Function
Seals, gaskets (caulking, flashing and other sealants)	Shelter/Protection, Water Retaining Boundary
Service Level I Coatings	Maintain Adhesion
Sliding Surfaces	Structural Support
Steel Components (Containment Pool Gates)	Water retaining boundary
Steel Components (Drywell Head Including Support Ring)	HELB/MELB Shielding, Shelter/Protection, Structural Pressure Boundary, Structural Support
Steel Components (Inclined Fuel Transfer Tube Penetration Including Bellows)	Expansion/Separation
	Shelter/Protection, Structural Pressure Barrier, Structural Support
Steel Components (Reactor Pedestal Ring Girder)	Structural Support
Steel Components (Refueling Bellows)	Expansion/Separation, Water Retaining Boundary
Steel Components (Refueling Bulkhead)	Water retaining boundary
Steel Components: structural steel	Structural Support
Steel Elements: liner, liner anchors, integral attachments (Containment Pool)	Shelter/Protection, Structural Support, Water Retaining Boundary
Steel Elements: liner, liner anchors, integral attachments (Drywell)	Shelter/Protection, Structural Pressure Barrier,Structural Support
Steel Elements: liner, liner anchors, integral attachments (Weir Wall)	Shelter/Protection, Structural Support, Water Retaining Boundary
Structural Miscellaneous - Siding (Gas Control Boundary)	Shelter/Protection, Structural Pressure Barrier

The aging management review results for these components are provided in:

Table 3.5.2-8 Primary Containment
Summary of Aging Management Evaluation

2.4.9 Radwaste Building

Description

The Radwaste Building contains major components of the solid, liquid, and gaseous radwaste processing equipment and shipping facilities as well as the maintenance shops, maintenance offices, machine shop, storeroom, electrical equipment, radwaste operations center, tool rooms, and the instrument calibration facility. The Radwaste Building is connected to the administration building by an elevated walkway. The walkway is not in scope. The Radwaste Building is a multi-story reinforced concrete structure. Portions of the structure are constructed above and below grade. The Radwaste Building is supported by a reinforced concrete basemat which is continuous with the basemats of the Auxiliary, Diesel Generator, Control, and Turbine Buildings. Major power block structures are underlain by compacted fill resting on hard Illinoian till. The Radwaste Building is constructed of cast-in-place, reinforced concrete. Lateral stability is provided by reinforced concrete floor and roof slabs and by heavy shear walls. The Radwaste Building reinforced concrete floor slabs are designed as flat plates supported by the concrete walls and columns. The Seismic Category I portion of the Radwaste Building is the grade floor portion and below.

The Radwaste Building houses station systems which are required to process and dispose of radioactive wastes generated during power operation. The reinforced concrete construction prevents the dispersion of waste material by tornadic winds.

The Radwaste Building is divided into compartments designed to protect nonsafety-related systems and components. Among these compartments are the radwaste collection tanks, radwaste processing, make up demineralizers, radwaste control room, switchgear compartments, and miscellaneous equipment compartments.

The purpose of the Radwaste Building is to provide structural support, shelter, and protection to systems, structures, and components (SSCs) along with personnel housed within the building during normal station operations. The Radwaste Building does not house any safety-related equipment but is located adjacent to the safety-related structures and shares shear walls and a common basemat. The Radwaste Building supports and protects nonsafety-related equipment. Included in the boundary of the Radwaste Building are concrete anchors, concrete embedments, curbs, equipment supports and foundations, hatches, plugs, masonry walls, reinforced concrete elements of the building, steel components, steel elements, and structural bolting.

Included within the boundary of the Radwaste Building and determined not to be within the scope of license renewal are certain architectural elements in the maintenance shops, miscellaneous maintenance support areas and offices, the storeroom, and tool rooms that include drywall partitions and soffits, and suspended ceilings. These components and structures are nonsafety-related and are provided to facilitate miscellaneous operational support. These components and structures do not perform a license renewal intended function, such that their failure will not prevent satisfactory accomplishment of a safety-related function.

Not included within the evaluation boundary of the Radwaste Building are the fire barriers, component supports, and structural commodities. Fire barriers (doors, dampers, fire rated enclosures, fire proofing material, penetration seals, fire barrier function of walls and slabs) and ventilation dampers are evaluated with the Fire Protection System. Component supports, including their respective bolting, are evaluated with the Component Supports Commodity Group. The Structural Commodity Group includes structural steel, with their respective bolting, roofing, flashing, penetration seals, doors, other seals, other hazard barriers and elastomers, louvers and miscellaneous vent components. Also included in Structural Commodity Group are miscellaneous steel (e.g., stairs, ladders, platforms, hatches, including their respective bolting) as well as electrical and instrumentation enclosures and raceways (e.g., conduit, cable trays, tube track, cabinets, electrical enclosures, racks, frames and panels, including their respective bolting). Roof drains, equipment drains, and floor drains, are evaluated under the Plant Drainage System. Hoists, cranes, and elevators are evaluated under the Cranes, Hoists, and Refueling Equipment System.

For more detailed information, see USAR Sections listed below. The Radwaste Building structure is shown on the license renewal boundary drawing listed below.

Reason for Scope Determination

The Radwaste Building is not in scope under 10 CFR 54.4(a)(1) because no portions of the structure are safety-related or relied upon to remain functional during and following design basis events. The Radwaste Building meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Radwaste Building also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48). The Radwaste Building is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4 (a)(1). 10 CFR 54.4(a)(2)

2. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). 10 CFR 54.4(a)(3)

USAR References
1.2.2.2
2.5.4.5.1.5
2.5.4.5.2.4
3.3.2.3
3.8.4.1.5
11.2.1.3
11.4.1.3
Appendix E

Appendix F

<u>License Renewal Boundary Drawings</u>
LR-CPS-S-001

Table 2.4-9 Radwaste Building
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements: Anchors	Structural Support
Concrete Elements: Curbs	Direct Flow
Concrete Elements: Embedments	Structural Support
Concrete: Above-grade exterior (accessible)	Flood Barrier, Shelter/Protection, Shielding, Structural Support
Concrete: Above-grade exterior (inaccessible)	Flood Barrier, Shelter/Protection, Shielding, Structural Support
Concrete: All (accessible)	Structural Support
Concrete: All (inaccessible)	Structural Support
Concrete: Below-grade exterior (inaccessible)	Flood Barrier, Shelter/Protection, Structural Support, Water Retaining Boundary
Concrete: Foundation (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Shielding, Structural Support, Water Retaining Boundary
Concrete: Interior	Flood Barrier, Shelter/Protection, Shielding, Structural Support, Water Retaining Boundary
Equipment supports and foundations	Structural Support
Hatches/Plugs	Shelter/Protection, Shielding, Structural Support
Masonry walls: Above-grade exterior	Shelter/Protection, Shielding, Structural Support
Masonry walls: Interior	Shelter/Protection, Shielding, Structural Support
Steel components: structural steel	Structural Support

The aging management review results for these components are provided in:

Table 3.5.2-9 Radwaste Building
Summary of Aging Management Evaluation

2.4.10 Screen House

Description

The Screen House is a reinforced concrete, Seismic Category I structure located northwest of the station. The Screen House is supported by a reinforced concrete basemat and substructure. The shutdown service water cubicles in the Unit 1 superstructure are reinforced concrete. The remainder of the Unit 1 superstructure is structural steel construction. Construction of the Unit 2 superstructure was cancelled. Masonry wall partitions and reinforced concrete are used to providing enclosures for equipment including the diesel fire pumps and associated equipment.

The Screen House houses the plant service water pumps and strainers, the shutdown service water pumps and strainers, the diesel-driven fire pumps and associated equipment, the circulating water pumps, and the traveling screens. The Screen House contains the three shutdown service water pumps. The shutdown service water system equipment is the only equipment in the Screen House that is required to safely shut down the reactor or to maintain it in a safe shutdown condition. The shutdown service water pumps are located in the northeast corner of the building. Each shutdown service water pump is located in its own missile-protected cubicle and physically separated from all other pumps. Associated support equipment for each pump is also located in its respective cubicle. Consequently, no postulated pipe failure in either pump room would disable the redundant pump for that unit. Each cubicle is flood protected by bulkhead doors. The Screen House basin is constructed with two separated inlet channels to provide water to the redundant shutdown service water pumps. Material placed as structural backfill around the Screen House consists of compacted material.

Flood protection for the safety-related systems and components in the Screen House are provided to an elevation higher than the maximum (1 percent) wave runup elevation taking probable maximum flood level into consideration. Flood protection measures include: (a) water stops in construction joints, (b) water seal rings for penetrations in exterior walls, (c) watertight doors in interior and entrance walls, and (d) hatches on the roof for access, which is the top of the watertight enclosure around the Seismic Category I equipment. The design of the Screen House also considered the adverse effects of ice formation and the probable maximum winter flood on the lake water level.

A FLEX building is located on the Unit 2 side of the Screen House substructure. The FLEX building, including the equipment located inside it, does not perform a license renewal intended function and, therefore, is not within the scope of license renewal, with the exception of the foundation.

Included within the boundary of the Screen House and determined to be within the scope of license renewal are reinforced concrete elements, concrete embedments, concrete anchors, equipment supports and foundations, hatches and plugs, steel components (structural steel), steel elements (bar grills), and masonry walls.

Included in the boundary for the Screen House structure and determined not to be in scope for license renewal are components that are provided for maintenance activities, such as stop logs and removable baskets in the trash sumps, features associated with the circulating water pumps (that are not in scope) such as the turning vanes, and precast concrete panels that are part of the bridge deck. These components do not perform a license renewal intended function and their failure does not prevent satisfactory accomplishment of a safety-related function. Also included in the boundary for the Screen House structure and determined not to be subject to aging management review for license renewal are active components such as motor operated sluice gates, trash rakes and traveling screen rotating assemblies.

Not included in the boundary of the Screen House structure are cranes and hoists, fire barriers, structural commodities, and components supports. Cranes and hoists are evaluated separately with the Cranes, Hoists, and Refueling Equipment System, fire barriers are evaluated separately with the Fire Protection System. Component supports, including their respective bolting, are evaluated separately with the Component Supports Commodity Group. The Structural Commodity Group evaluates components such as steel components (e.g., cable trays); compressible joints and seals; conduit; doors; louvers; miscellaneous structural steel including platforms, stairs, ladders; panels, racks, cabinets, and other enclosures for electrical equipment and instrumentation; penetration seals; penetration sleeves including end caps; roofing; structural sealants, gaskets, moisture barriers and water stops, flashing and other sealants and gap seals; and tube track. In addition, mechanical and electrical systems and components housed in or located at the Screen House are evaluated with their respective mechanical and electrical license renewal systems or commodities group. Also not included is the Cooling Lake, which is evaluated separately.

For more detailed information, see USAR Sections 3.8.4.1, 3.8.4.1.7, D3.6.3.6, and additional sections listed below.

Reason for Scope Determination

The Screen House meets 10 CFR 54.4(a)(1) because it is a safety-related structure that is relied upon to remain functional during and following design basis events. The Screen House meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Screen House also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63). The Screen House is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49).

Intended Functions

1. Provides physical support, shelter, and protection for safety-related systems, structures, and components. 10 CFR 54.4(a)(1)

2. Provides a source of cooling water for plant safe shutdown. 10 CFR 54.4(a)(1)

3. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). 10 CFR 54.4(a)(2)

4. Provides physical support, shelter, and protection for systems, structures, and components (SSCs) relied upon 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). 10 CFR 54.4(a)(3)

5. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Anticipated Transients without Scram (10 CFR 50.62). 10 CFR 54.4(a)(3)

6. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.2.2.2
2.4.1.1
2.4.2.2
2.4.7
2.4.10
2.4.11.5
2.4.11.6
2.4.14.1
2.5.4.5.2
Table 3.2-1
3.3.2.3
3.5.1.1
3.8.4.1
3.8.4.1.7
3.8.4.3
3.8.5.1.1
9.2.1.2.3
D3.6.3.6
D3.6.4
Appendix E

<u>License Renewal Boundary Drawings</u>
LR-CPS-S-001

Table 2.4-10 Screen House
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements: Anchors	Structural Support
Concrete Elements: Curbs	Direct Flow
Concrete Elements: Embedments	Structural Support
Concrete: Above-grade exterior (accessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support
Concrete: All (accessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support, Water retaining boundary
Concrete: All (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support, Water retaining boundary
Concrete: Below-grade exterior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support
Concrete: Foundation (accessible)	Flood Barrier, Structural support, Water retaining boundary
Concrete: Foundation (inaccessible)	Flood Barrier, Structural support, Water retaining boundary
Concrete: Interior (accessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support
Concrete: Interior (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support
Equipment supports and foundations	Structural Support
Hatches/Plugs	Missile Barrier, Shelter/Protection, Structural Support
Masonry walls: Above-grade exterior	Shelter/Protection, Structural Support
Masonry walls: Interior	Shelter/Protection, Structural Support
Precast Concrete - Beams and Panel (Roof slab)	Missile Barrier, Shelter/Protection
Steel Components (Bar Grill)	Filter
Steel components: structural steel	Structural Support
Structural Miscellaneous- Siding	Shelter/Protection

The aging management review results for these components are provided in:

Table 3.5.2-10 Screen House
Summary of Aging Management Evaluation

2.4.11 <u>Structural Commodity Group</u>

Description

The Structural Commodity Group is comprised of components that share material and environment properties allowing common programs across all in scope structures to manage their aging effects. Structural commodities include cable trays; conduit; doors; louvers; shields; structural miscellaneous (e.g., catwalks, stairs, handrails, ladders, platforms); panels, racks, cabinets, and other enclosures; penetration seals and sleeves; roofing, seals, gaskets, compressible joints and seals, and moisture barriers (caulking, flashing, and other sealants); tube track; and structural bolting and concrete anchors associated with these commodities. These structural commodities are installed throughout the station structures. Structural commodities are located in the structures that are within the scope of license renewal. Structural components used for equipment support are evaluated in the Component Supports Commodity Group.

Cable Trays:

Cable trays within the scope of license renewal include cable trays and cable tray covers that provide license renewal intended functions of structural support, shelter, and protection for various electrical and control system power, control, and instrumentation cables that are within the scope of license renewal. This type of commodity also includes wireway gutters.

Conduit:

Conduit and raceways within the scope of license renewal include rigid and flexible electrical conduits and fittings that provide license renewal intended functions of structural support, shelter, and protection for various electrical and control system power, control and instrumentation cables that are within the scope of license renewal.

Doors:

Doors within the scope of license renewal include those doors that perform various license renewal intended functions for shelter and protection, flood barrier, structural pressure barrier, and high energy and medium energy line break (HELB/MELB) shielding for structures that are within the scope of license renewal. Not included in the boundary for this commodity are fire barrier functions for doors that perform an intended function for fire protection as well as the containment airlocks and equipment hatches. Fire barrier functions for doors are evaluated with the license renewal Fire Protection System. Containment airlocks and equipment hatches are evaluated with the license renewal Primary Containment structure.

Louvers, Roof Scuttles, and Vents:

Louvers, roof scuttles, and vents within scope of license renewal include those stationary louvers, roof scuttles, and vents, as well as blowout panels, that perform a license renewal intended function for shelter and protection located in structures that are within the scope of license renewal. Bird screens are within the scope of license renewal where attached to stationary louvers that are within the scope of license renewal.

Shields:

Shields within the scope of license renewal, includes metal shielding that performs a license renewal intended function of shelter and protection, missile barrier, and radiation shielding for components that are within the scope of license renewal. Missile and radiation shields as well as spray shields and drip shields are also included in the Structural Commodity Group.

Structural Miscellaneous:

Structural miscellaneous includes platforms, grating, stairs, ladders, steel curbs, handrails, kick plates, metal decking, hatches, and permanent scaffolding. These components that perform license renewal intended functions such as structural support or shelter and protection are located within structures that are within the scope of license renewal.

Panels, Racks, Cabinets, and Other Enclosures:

Panels, Racks, Cabinets, and Other Enclosures within the scope of license renewal include those items that perform license renewal intended functions for shelter, protection, and structural support for electrical and instrumentation equipment and components within the scope of license renewal. The electrical and instrumentation enclosures include components such as electrical panels, frames and racks, cabinets, and boxes, and enclosures that contain sample stations.

Penetration Seals and Sleeves:

Penetration seals and sleeves within the scope of license renewal include penetration seals and sleeves in walls, floors and ceilings that perform license renewal intended functions such as structural pressure boundary, flood barrier, radiation shielding, and HELB/MELB shielding for structures and components within the scope of license renewal. Not included in the boundary for this commodity are drywell and Primary Containment penetrations and fire barrier penetration seals. Drywell and primary containment penetrations are identified and evaluated with Primary Containment. The fire barrier functions for fire barrier penetration seals are identified and evaluated with the license renewal Fire Protection System.

Roofing, Seals, Gaskets, Compressible Joints, and Moisture Barriers (caulking, flashing, and other sealants):

Roofing within the scope of license renewal include those roofs that perform license renewal intended functions for shelter and protection for structures which are within the scope of license renewal. Seals, gaskets (including elastomers), compressible joints, and moisture barriers within the scope of license renewal include those items that perform license renewal intended functions including shelter and protection, structural pressure boundary, flood barrier, water retention, radiation shielding, and HELB/MELB shielding for structures and components that are within the scope of license renewal. Elastomer components include expansion joint seals (seismic joint seal material, control joint seal material, and seismic separation joint seal material), gaskets at hatches and doors, spent fuel pool gate seals, blowout panel seals, and metal siding gap seals as well as permanent lead shielding blankets. This commodity group also includes flexible sections of iso-phase and non-segregated bus ductwork. Not included in the boundary for this commodity group are seals, gaskets, and moisture barriers used for Primary Containment pressure boundary integrity and the fire protection function for seals, gaskets, and moisture barriers used for fire protection. Seals, gaskets, and moisture barriers used for Primary Containment pressure boundary integrity are evaluated in Primary Containment. The fire barrier functions of seals, gaskets, and moisture barriers used for fire protection are evaluated with the license renewal Fire Protection System. Not included in the boundary for this commodity are the structural components that support the roofs. Structural components that support the roofs are evaluated with the associated structures.

Tube Track:

Tube track, also called instrument tubing tray, within the scope of license renewal includes tube track that performs license renewal intended functions for structural support, as well as shelter and protection for various instrumentation tubing that is within the scope of license renewal.

Structural Bolting and Concrete Anchors:

Bolting and anchors within the scope of license renewal includes fasteners that perform license renewal intended functions for structural support for structural commodities within the scope of license renewal.

Structural commodities that are in scope for license renewal are located in structures and areas with mechanical or electrical components which are also in scope. Structural commodities are not in scope for license renewal where installed in other structures and areas where there are no mechanical or electrical components in scope.

The fire barrier functions of components such as fire rated doors, dampers, fire rated enclosures, fire proofing material, penetration seals, and the fire protection function of walls and slabs are evaluated with the Fire Protection System. In addition, the mechanical and electrical systems and components housed in or located within electrical and instrumentation enclosures and raceways are evaluated with their respective mechanical and electrical license renewal systems or commodities group. Not included in the boundary of the Structural Commodity Group are concrete equipment foundations, pipe whip restraints, columns, concrete embedments, and concrete anchors used for component supports. These commodities are evaluated separately with the license renewal structure or commodity group that contains them.

For more detailed information, see USAR Sections listed below.

The Structural Commodity Group within the scope of license renewal are not shown on the license renewal boundary drawing since these commodities are included within structures in scope for license renewal.

<u>Reason for Scope Determination</u>

The Structural Commodity Group meets 10 CFR 54.4(a)(1) because it includes structural commodities that are relied upon to remain functional during and following design basis events. The Structural Commodity Group meets 10 CFR 54.4(a)(2) because failure of nonsafety-related structural commodities could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Structural Commodity Group also meets

10 CFR 54.4(a)(3) because structural commodities are relied upon in the 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), Anticipated Transient Without Scram (10 CFR 50.62), and Station Blackout (10 CFR 50.63).

Intended Functions

1. Provides physical support, shelter, and protection for safety-related systems, structures, and components. 10 CFR 54.4(a)(1)

2. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4 (a)(1). 10 CFR 54.4(a)(2)

3. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). 10 CFR 54.4(a)(3)

4. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49). 10 CFR 54.4 (a)(3).

5. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transients Without Scram (10 CFR 50.62). 10 CFR 54.4(a)(3)

6. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

USAR References
3.2.1
Table 3.2-1
Table 3.5-5
3.8.4.1.1
3.8.4.1.7
3.10.3
3.11
6.2.3.2
6.4.2.1
6.4.4.1
6.6.2
7.2.1.1.4.7
7.2.1.1.10
7.3.1.1.2.3
7.3.1.1.2.10

8.3.1.4.2.1
8.3.1.4.2.2
8.3.1.4.2.3
8.3.1.4.3
8.3.2.1
8.3.2.1.1
12.3.1.4.3
12.3.2.4
15.8
15.9
15 Appendix A
Appendix E Fire Protection Evaluation Report
Appendix E Section 3.1.2.2.5
Appendix E Section 4.0
Appendix F Fire Protection Safe Shutdown Analysis

License Renewal Boundary Drawings
LR-CPS-S-001

Table 2.4-11 Structural Commodity Group
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Cable Trays	Shelter/Protection, Structural Support
Concrete Elements: Anchors	Structural Support
Conduit	Shelter/Protection, Structural Support
Doors	Flood Barrier, HELB/MELB Shielding, Shelter Protection, Structural Pressure Barrier
Miscellaneous steel (catwalks, stairs, handrails, ladders, vents and louvers, platforms, etc.)	Missile Barrier, Shielding, Shelter/Protection, Structural Support
Panels, Racks, Cabinets, and Other Enclosures	Shelter/Protection, Structural Support
Penetration Seals	Flood Barrier, HELB/MELB Shielding, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support
Penetration Sleeves	Flood Barrier, HELB/MELB Shielding, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support, Water Retaining Boundary
Roofing	Shelter/Protection
Seals, gaskets, and moisture barriers (caulking, flashing and other sealants)	Flood Barrier, HELB/MELB Shielding, Shelter/Protection, Shielding, Structural Pressure Barrier, Structural Support, Water Retaining Boundary
Structural Miscellaneous (catwalks, grating, handrails, kick plates, ladders, manhole covers, platforms, stairs, etc)	Shelter/Protection, Structural Support
Tube Track	Shelter/Protection, Structural Support

The aging management review results for these components are provided in:

Table 3.5.2-11 Structural Commodity Group
Summary of Aging Management Evaluation

2.4.12 Switchyard Structures

Description

The Switchyard Structures include the transmission towers and associated foundations, and the switchyard relay house and associated cable trenches. The Switchyard Structures support the connection between the offsite transmission network and the onsite distribution, including unit generators. The switchyard is located north of the power block.

Transmission towers are metal structures supported by reinforced concrete foundations on soil located in the switchyard. The transmission towers provide support for transmission conductors which connect the station to and from the switchyard and from the switchyard to offsite substations. Transmission towers provide essential power for normal plant and emergency operations, equipment relied upon for post Fire Safe Shutdown, and for recovery from Station Blackout. The transmission towers and their foundations between the power block and the first circuit switcher in the switchyard downstream of the reserve auxiliary transformers (RATs) and the emergency reserve auxiliary transformer (ERAT) are within the scope of license renewal.

The switchyard relay house is a single-story steel structure with steel siding above grade, with reinforced concrete walls below grade supported on a reinforced concrete foundation slab on soil which contain duct runs and cable trays.

The Switchyard Structures are nonsafety-related and not Seismic Category I. The purpose of the Switchyard Structures is to provide physical support, shelter, and protection for Offsite Power System components, as well as serving as the electrical transmission terminals for the unit. The Offsite Power System includes 345-kV and 138-kV power sources. The Offsite Power System is a nonsafety-related electrical system designed to transmit electrical power generated by the main generator and provide offsite sources of electrical power to the station. The transmission towers and associated foundations and supports for breakers located in the Switchyard Structures are relied on to provide physical support and the switchyard relay house provides physical support, shelter, and protection for components relied upon to provide offsite power during Station Blackout (SBO) and Fire Safe Shutdown and are therefore, in scope for license renewal. The remainder of the Switchyard Structures are not in scope for license renewal as they do not support the connection of the offsite transmission network to equipment within the scope of license renewal.

Included in the boundary of the Switchyard Structures and determined to be within the scope of license renewal are structural bolting, concrete, concrete anchors, concrete curbs and embedments, concrete foundations, hatches, plugs, and steel components (e.g., towers). Switchyard Structures that provide structural support, shelter, and protection for the Offsite Power System components are in scope for license renewal. Other components and structures do not perform an intended function and are therefore, not in the scope of license renewal.

Not included in the evaluation boundary of the Switchyard Structures are structural commodities, and component supports other than the substation equipment supports and components and commodities which are evaluated separately under the respective system or commodity grouping. Other component supports are identified and evaluated separately with the Component Supports Commodity Group. Structural commodities are identified and separately evaluated within the Structural Commodity Group. Mechanical and electrical systems and components housed or located in the vicinity of the Switchyard Structures are evaluated with their respective mechanical and electrical license renewal system or component groups.

For more detailed information see USAR Sections listed below.

The Switchyard Structures boundaries are shown on license renewal boundary drawing listed below.

Reason for Scope Determination

The Switchyard Structures are not in scope under 10 CFR 54.4(a)(1) because no portions of the structures are safety-related or relied upon to remain functional during and following design basis events. The Switchyard Structures are not in scope under 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structures would not prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Switchyard Structures meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Station Blackout (10 CFR 50.63). The Switchyard Structures are not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). 10 CFR 54.4(a)(3)

2. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

USAR References
1.2.2.6.1
3.1.2.2.8
8.1.2
8.1.5
8.2.1
8.2.2
15.2.6
15.9.3.7
Appendix E
Appendix F

License Renewal Boundary Drawings
LR-CPS-S-001

Table 2.4-12 Switchyard Structures
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements: Anchors	Structural Support
Concrete Elements: Embedments	Structural Support
Concrete: All (accessible)	Structural Support
Concrete: All (inaccessible)	Structural Support
Concrete: Below-grade exterior (inaccessible)	Shelter/Protection, Structural Support
Concrete: Foundation (accessible)	Shelter/Protection, Structural Support
Concrete: Foundation (inaccessible)	Shelter/Protection, Structural Support
Concrete: Interior	Shelter/Protection, Structural Support
Equipment supports and foundations (Including Transmission Tower Foundations)	Structural Support
Manholes, Handholes & Duct Banks	Missile Barrier, Shelter/Protection
Steel components: structural steel (Transmission Towers)	Structural Support
Steel components: structural steel	Structural Support
Structural Miscellaneous- Siding	Shelter/Protection

The aging management review results for these components are provided in:

Table 3.5.2-12 Switchyard Structures
Summary of Aging Management Evaluation

2.4.13 Tank Foundations and Dikes

Description

Tank Foundations and Dikes consist of the foundations and dikes associated with large storage tanks that are located outdoors. This includes the cycled condensate storage tank foundation, the RCIC storage tank foundation and dike, the CO2 storage tank foundations, the clearwell tank foundation, the filtered water storage tank foundation, the potable water storage tank foundation, and the demineralized water storage tank foundation.

The cycled condensate storage tank foundation is located south of the Diesel Generator Building at grade level. The foundation sits on a mechanically stabilized earth retaining wall. The cycled condensate storage tank sits in a larger containment tank with internal piping for overflow. The containment tank sits on a reinforced concrete foundation. The cycled condensate storage tank and the cycled condensate storage containment tank included in the Condensate System do not have an intended function for license renewal. These nonsafety-related tanks are separated from safety-related systems, structures, and components such that failure would not impact a safety-related function. The foundation for these tanks is not within the scope of license renewal.

The RCIC storage tank and dike are located adjacent to the Fuel Building and Diesel Generator Building. The RCIC tank is supported by a reinforced concrete ring wall foundation. The remainder of the tank bottom is supported by a layer of oiled sand fill on top of compacted structural backfill. The RCIC storage tank foundation is within the scope of license renewal. The dike surrounding the storage tank is for spill mitigation and does not have an intended function and is not within the scope of license renewal.

The CO2 storage tank foundations are located outdoors along the north side of the Radwaste Building. The tanks are part of the diesel generator carbon dioxide fire suppression system and are credited to support the Fire Protection System. The CO2 storage tank foundations are reinforced concrete and provide anchorage for the CO2 equipment skid that includes the CO2 storage tank cylinders. The CO2 equipment foundation is within the scope of license renewal.

The CO2 tanks and the RCIC storage tank are credited to support fire protection (Fire Safe Shutdown), and the RCIC storage tank is credited to support Station Blackout. The foundations supporting these tanks perform an intended function and are in scope for license renewal. These nonsafety-related tanks are evaluated with their respective mechanical system. The valve enclosure associated with the RCIC storage tank provides shelter and protection for valves and piping connected to the RCIC storage tank and is in scope for license renewal.

The clearwell storage tank, filtered water storage tank, and potable water storage tank in the demineralized water makeup system are located adjacent to the makeup water pump house. These nonsafety-related tanks are separated from safety-related systems, structures, and components such that failure would not impact a safety-related function. These tank foundations do not perform an intended function and are not within the scope of license renewal.

The demineralized water storage tank is located north of the Turbine Building. The nonsafety-related tank is separated from safety-related systems, structures, and components such that its failure would not impact a safety-related function. The demineralized water storage tank foundation does not perform an intended function and is not within the scope of license renewal.

The purpose of the Tank Foundation and Dikes is to provide structural support for nonsafety-related components and commodities including systems and components which support Fire Safe Shutdown and Station Blackout. The RCIC storage tank foundation and the CO2 storage tank foundation are within the scope of license renewal. The cycled condensate storage tank foundation, clearwell tank foundation, filtered water storage tank foundation, potable water storage tank foundation, and demineralized water storage tank foundation are not within the scope of license renewal.

Included in the boundary of the Tank Foundation and Dikes and determined to be in scope are anchorage-related bolting, concrete anchors, concrete elements, and steel elements (valve enclosure) associated with the CO2 equipment skid and the RCIC storage tank and valve enclosure.

Not included in the boundary of the Tank Foundation and Dikes are component supports, piping and component insulation. Component supports, including their respective bolting, are evaluated with the Component Supports Commodity Group. Other structural commodities are evaluated with the Structural Commodity Group. In addition, the tanks and associated mechanical and electrical systems and components located in the vicinity of these tanks are evaluated with their respective mechanical and electrical license renewal system or component groups.

For more detailed information, see USAR Sections 9.2.6, 9.5.1.2.2.6, 11.2.1.5.1, and Table 11.2-4.

The Tank Foundations and Dikes are shown on the license renewal boundary drawing listed below.

Reason for Scope Determination

The Tank Foundations and Dikes are not in scope under 10 CFR 54.4(a)(1) because no portions of the structures are safety-related or relied upon to remain functional during and following design basis events. The Tank Foundations and Dikes are not in scope under 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structures would not prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Tank Foundations and Dikes meet 10 CFR 54.4(a)(3) because they are relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Station Blackout (10 CFR 50.63). The Tank Foundations and Dikes are not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provides physical support, shelter, and protection for systems, structures, and

components relied upon 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). 10 CFR 54.4(a)(3)

2. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

USAR References
Table 3.2-1
7.4
9.2.3.2
9.2.6
9.5.1.2.2.6
11.2.1.5.1
Table 11.2-4
12.2.2.3
15.9.3.1
Appendix E
Appendix F

License Renewal Boundary Drawings
LR-CPS-S-001

Table 2.4-13 Tank Foundations and Dikes
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements: Anchors	Structural Support
Concrete Elements: Embedments	Structural Support
Concrete: All (accessible)	Structural Support
Concrete: All (inaccessible)	Structural Support
Concrete: Foundation (accessible)	Shelter/Protection, Structural Support
Concrete: Foundation (inaccessible)	Shelter/Protection, Structural Support
Steel components: structural steel (RCIC Valve Enclosure)	Shelter/Protection

The aging management review results for these components are provided in:

Table 3.5.2-13 Tank Foundations and Dikes
Summary of Aging Management Evaluation

2.4.14 Turbine Building

Description

The Turbine Building houses the turbine-generator and condenser, which are supported by a concrete foundation. The reactor feed pumps, condensate pumps, and feedwater heater bay are also located in the Turbine Building. The Turbine Building is a steel framed and reinforced concrete structure enclosed with metal siding above elevation 800 feet. The structure is a part of the power generation complex which includes several contiguous buildings. The Clinton Power Station power block structures are supported by a single common basemat. The Turbine Building is located adjacent to the Auxiliary Building and Radwaste Building. The shear walls for the Auxiliary Building, Turbine Building, Radwaste Building, and Diesel Generator Building are interconnected. These shear walls act together to resist lateral loads applied to these buildings. The Turbine Building is classified as Non-Seismic Category I. However, the structure is interconnected with Seismic Category I structures through the shear walls.

The Turbine Building is a multi-story structure comprised of a concrete substructure supported on a reinforced concrete mat foundation which is continuous with the mats under the Auxiliary Building and the Radwaste Building. The Turbine Building grade is 737 feet. The exterior walls above grade to elevation 800 feet are reinforced concrete and the walls above elevation 800 feet are made of metal siding composed of double span blow-in and blow-out panels consisting of face and liner sheets interconnected by sub-girts. Structural steel columns support the Turbine Building crane and the roof. The Turbine Building siding and roof decking is designed to blow off in tornado level winds, and the structure is designed to withstand tornado loads on the exposed structural frame and the remaining siding. The integrity of the Turbine Building under the design-basis tornado is assured.

The purpose of the Turbine Building is to provide structural support, shelter, and protection for nonsafety-related systems, structures, and components during normal plant operation. The Turbine Building provides structural support for reactor protection system components that provide anticipatory trip for the reactor based upon secondary system parameters. If these cables or devices failed, other parameters not measured in the Turbine Building would provide the necessary signal to shut down the reactor. The Turbine Building contains steam and power conversion systems components and their support systems, and components that support Fire Protection and Station Blackout.

Included in the boundary of the Turbine Building and determined to be within the scope of license renewal are the blow-out panels, concrete anchors, concrete embedments, curbs, equipment supports and foundations, hatches, plugs, masonry walls, metal siding, reinforced concrete elements, steel components, steel elements, and structural bolting. The Turbine Building is in scope for license renewal in its entirety except for architectural elements in the miscellaneous operational and maintenance support areas that include furniture, drywall partitions and soffits, storage enclosures and suspended ceilings which do not perform an intended function for license renewal and are not in scope.

Not included within the evaluation boundary of the Turbine Building are the fire barriers, component supports, and structural commodities. Fire barriers are evaluated separately with the Fire Protection System. Component supports, including their respective bolting, are evaluated with the Component Supports Commodity Group. Structural commodities, including their respective bolting, are evaluated with the Structural Commodity Group. Structural commodities include roofing, flashing, penetration seals, doors, other seals, other hazard barriers and elastomers, louvers and miscellaneous vent components. Also included in the Structural Commodity Group is miscellaneous steel (e.g., stairs, ladders, platforms, hatches, including their respective bolting) as well as electrical and instrumentation enclosures and raceways (e.g., conduit, cable trays, tube track, cabinets, electrical enclosures, racks, frames and panels, including their respective bolting). Roof drains, equipment drains, and floor drains, are evaluated under the Plant Drainage System. Hoists, cranes, fuel handling platform, and elevators are evaluated under the Cranes, Hoists, and Refueling Equipment System. In addition, mechanical and electrical systems and components housed in or located within the Turbine Building are evaluated with their respective mechanical and electrical license renewal system or commodity group.

For more detailed information, see the USAR Sections listed below. The Turbine Building boundaries are the exterior of the structure and are shown on license renewal boundary drawing listed below.

Reason for Scope Determination

The Turbine Building is not in scope under 10 CFR 54.4(a)(1) because no portions of the structure are safety-related or relied upon to remain functional during and following design basis events. The Turbine Building meets 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Turbine Building also meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and 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), and Station Blackout (10 CFR 50.63). The Turbine Building is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provides structural support or restraint to SSCs in the scope of license renewal. 10 CFR 54.4(a)(2)

2. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). 10 CFR 54.4(a)(2)

3. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). 10 CFR 54.4(a)(3)

4. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for Environmental Qualification (10 CFR 50.49). 10 CFR 54.4(a)(3)

5. Provides physical support, shelter, and protection for systems structures and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

<u>USAR References</u>
1.1
1.2.2.2
3.11
Table 3.2-1
3.3.2.3
Table 3.5-5
3.6.1
3.7.2
3.8.5.1
3.9.1
9.4.4.2 f
9.5.1.2
12.1
15.9
Appendix E 3.1.2.11

<u>License Renewal Boundary Drawings</u>
LR-CPS-S-001

Table 2.4-14 Turbine Building
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements: Anchors	Structural Support
Concrete Elements: Curbs	Direct Flow
Concrete Elements: Embedments	Structural Support
Concrete: Above-grade exterior (accessible)	Flood Barrier, Shelter/Protection, Shielding, Structural Support
Concrete: Above-grade exterior (inaccessible)	Flood Barrier, Shelter/Protection, Shielding, Structural Support
Concrete: All (accessible)	Structural Support
Concrete: All (inaccessible)	Structural Support
Concrete: Below-grade exterior (inaccessible)	Flood Barrier, Shelter/Protection, Structural Support
Concrete: Foundation (inaccessible)	Flood Barrier, Shelter/Protection, Structural Support
Concrete: Interior	Flood Barrier, Shelter/Protection, Shielding, Structural Support
Equipment supports and foundations	Structural Support
Hatches/Plugs	Shelter/Protection, Shielding, Structural Support
Masonry walls: Interior	Shelter/Protection, Shielding, Structural Support
Steel components: structural steel	Structural Support
Structural Miscellaneous- Siding	Shelter/Protection, Pressure Relief

The aging management review results for these components are provided in:

Table 3.5.2-14 Turbine Building
Summary of Aging Management Evaluation

2.4.15 Yard Structures

Description

Yard Structures include transformer foundations and walls, a valve pit, electrical manholes and cable duct banks, the make-up water pump house, light poles, the hydrogen tank storage pad, fire hose storage foundations and hose houses, yard drainage (oil separators), miscellaneous yard structures (e.g., storage pads), and the meteorological tower complex and microwave tower.

Transformer Foundations:

The transformer foundations and walls consist of reinforced concrete slabs and walls for the unit auxiliary transformers (UATs), reserve auxiliary transformers (RATs), emergency reserve auxiliary transformers (ERATs), main power transformers (MPTs), and spare transformer storage pads. The RATs and MPTs are located along the north wall of the Turbine Building. The ERAT is located in the yard west of the service building. The UATs are located north of the service building. The RATB and ERAT are used to supply safety-related equipment during normal and emergency plant operating conditions, and they provide power to equipment relied upon for post Fire Safe Shutdown and for recovery from Station Blackout. The ERAT and RATB foundations are within the scope of license renewal.

Valve Pit:

The valve pit located in the yard area is the fuel oil storage fill station valve pit. The valve pit consists of a reinforced concrete structure buried below grade. The valve pit has a removable opening cover to allow for plant personnel access. The valve pit serves as an intermediate access point for valves in buried piping. The valve pit contains valves and buried piping included in the Diesel Generator and Auxiliaries System credited for Fire Protection and Station Blackout, therefore, the valve pit is within the scope of license renewal.

Electrical Manholes and Cable Duct Banks:

Manholes and duct banks consist of reinforced concrete structures buried below grade. These structures have a removable opening cover to allow for plant personnel access. Manholes serve as intermediate access point(s) for electrical, telephone, or control cable lines routed in the yard area. Duct banks are comprised of multiple conduits containing safety-related electrical cables in an excavated trench in the yard that are encased in concrete and then backfilled with soil. The duct banks also are used to route nonsafety-related cables between structures and within the switchyard areas. The manholes and duct banks that contain safety-related power cables for the shutdown service water pumps (Open Cycle Cooling Water System) and control cables for the diesel engine-driven fire pumps in the Screen House are within the scope of license renewal.

Make-Up Water Pump House:

The make-up water pump house (MWPH) is located just south of the security gatehouse. The building houses equipment used to provide filtered and potable water for station needs. The building also contains the fire protection jockey pump which is in scope for license renewal. Therefore, the MWPH is in scope for license renewal.

Light Poles:

Light poles are metal poles that are mounted on concrete foundations located in the yard area. The light poles provide area lighting and are nonsafety-related. Light poles do not perform an intended function and are not within the scope of license renewal.

Hydrogen Tank Storage Pad:

The hydrogen tank storage pad is located north of the Turbine Building. The pad consists of a reinforced concrete foundation used for the storage of hydrogen tanks on trailers. The hydrogen tank storage pad does not perform an intended function and is not within the scope of license renewal.

Fire Hose Storage Foundations and Hose Houses:

The fire hose storage foundation pads are reinforced concrete pads on grade and provide level support for the storage of outdoor fire hose and firefighting equipment. Two-way hydrants controlled by individual curb box valves are installed along the main loop approximately 40 feet from the building at intervals of approximately 325 feet (400 feet maximum). A standard hose house is provided at each hydrant in accordance with NFPA codes. The fire hose storage foundation pads and hose houses do not perform an intended function and are therefore, not within the scope of license renewal.

Yard Drainage:

The yard drainage structures include drainage ditches, culverts, and storm sewer system. The ditches, culverts, and storm sewer drainage systems are comprised of buried corrugated metal pipe or reinforced concrete pipe. The yard drainage also contains catch basins and outdoor oil separator 1 and outdoor oil separator 2 at grade. The oil separators are used to separate oily waste from wastewater prior to discharge. The yard drainage is not relied upon to prevent flooding at the plant. Therefore, since none of these items are required for intended functions, yard drainage related structures are not within the scope of license renewal.

Miscellaneous Yard Structures:

Miscellaneous yard structures are comprised of civil features located in the yard area that are not uniquely tied to any structure. These miscellaneous yard structures include various storage pads, roadways, sidewalks, and bollards which include small storage structures. These miscellaneous yard structures are nonsafety-related and separated from safety-related systems, structures, and components such that their failure would not impact a safety-related function. These miscellaneous yard structures do not perform an intended function and are therefore, not within the scope of license renewal.

Meteorological Tower Complex and Microwave Tower:

The meteorological tower complex is located southeast of the Diesel Generator Building. The meteorological tower consists of a steel tower founded on a concrete foundation. The equipment enclosure is a commercial grade metal enclosure on a concrete foundation. The purpose of the meteorological tower is to provide support, shelter, and protection for the meteorological instrumentation which is utilized to obtain data. The microwave tower is northwest of the Turbine Building and it has meteorological monitoring instruments to act as a backup to the meteorological tower. The meteorological tower and microwave tower are nonsafety-related and separated from safety-related systems, structures, and components such that its failure would not impact a safety-related function. The meteorological tower complex and microwave tower do not perform an intended function for license renewal and is therefore, not within the scope of license renewal.

Included within the boundary of Yard Structures and determined to be in scope of license renewal are electrical manholes and cable duct banks, the fuel oil storage fill station valve pit, MWPH, and concrete foundations and walls. The other structures and components within the Yard Structures evaluation boundary do not perform a license renewal intended function and are therefore, not within the scope of license renewal.

Not included in the evaluation boundary of the Yard Structures are component supports, tanks, tank foundations and dikes, fire protection components, buried piping and piping components, and switchyard structures. Component supports, including their respective bolting and UAT bus duct, are evaluated with the Component Supports Commodity Group. Structural commodities, including their respective bolting, are evaluated with the Structural Commodity Group. In addition, mechanical and electrical systems and components housed in or located in the yard facility are evaluated with their respective mechanical and electrical license renewal system or commodity groups. The tank foundations are evaluated within Tank Foundations and Dikes. Miscellaneous structures that are not within the scope of license renewal, including Dry Cask Storage, are evaluated within Miscellaneous Not in Scope Structures. The fire protection components are evaluated separately within the Fire Protection System. Buried piping and piping components in valve pits are evaluated within their respective mechanical systems. The components in the 345-kV switchyard and transmission towers are evaluated with Switchyard Structures.

For more detailed information, see USAR Sections listed below.

The Yard Structures are shown on the license renewal boundary drawing listed below.

<u>Reason for Scope Determination</u>

The Yard Structures meet 10 CFR 54.4(a)(1) because they are a safety-related structures that are relied upon to remain functional during and following design basis events. The Yard Structures meet 10 CFR 54.4(a)(2) because failure of nonsafety-related portions of the structures could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Yard Structures also meet 10 CFR 54.4(a)(3) because they are relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Fire Protection (10 CFR 50.48) and Station Blackout (10 CFR 50.63). The Yard Structures are not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) and Anticipated Transient Without Scram (10 CFR 50.62).

Intended Functions

1. Provides physical support, shelter, and protection for safety-related systems, structures, and components. 10 CFR 54.4(a)(1)

2. Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4 (a)(1). 10 CFR 54.4(a)(2)

3. Provides physical support, shelter, and protection for systems, structures, and components relied upon 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). 10 CFR 54.4(a)(3)

4. Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Station Blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

USAR References
1.2.2.6.1
2.3.3
Table 3.5-5
3.7.3.12
8.2.1
8.3.1
9.5.1
15.9
Appendix E
Appendix F

License Renewal Boundary Drawings
LR-CPS-S-001

Table 2.4-15 Yard Structures
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (Structural)	Structural Support
Concrete Elements: Anchors	Structural Support
Concrete Elements: Embedments	Structural Support
Concrete: All (accessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support
Concrete: All (inaccessible)	Flood Barrier, Missile Barrier, Shelter/Protection, Structural Support
Concrete: Foundation (accessible)	Flood Barrier, Shelter/Protection, Structural Support
Concrete: Foundation (inaccessible)	Flood Barrier, Shelter/Protection, Structural Support
Concrete: Interior	Shelter/Protection, Structural Support
Equipment supports and foundations	Structural Support
Hatches/Plugs	Shelter/Protection, Structural Support
Manholes, Handholes & Duct Banks	Missile Barrier, Shelter/Protection
Steel components: structural steel	Structural Support
Structural Miscellaneous - Siding	Shelter/Protection

The aging management review results for these components are provided in:

Table 3.5.2-15 Yard Structures
Summary of Aging Management Evaluation

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL COMPONENTS

The determination of electrical systems that fall within the scope of license renewal is made through the application of the process described in Section 2.1. The results of the electrical systems scoping review are contained in Section 2.2.

Subsection 2.1.6.1 provides the screening methodology for determining which electrical components and commodity groups within the scope of 10 CFR 54.4 meet the requirements contained in 10 CFR 54.21(a)(1). The electrical commodity groups that meet those screening requirements are identified in this section. These identified electrical commodity groups consequently require an aging management review.

As described in Subsection 2.1.6.1, the screening was performed on a commodity group basis for the in scope electrical and I&C systems as well as the electrical and I&C component types associated with in scope mechanical systems listed in Table 2.2-1.

Components which support or interface with electrical and I&C components, for example, cable trays, conduits, instrument racks, panels, and enclosures, are assessed as part of the Component Supports Commodity Group in Section 2.4.5.

2.5.1 ELECTRICAL SYSTEMS

The results of the electrical system scoping review are contained in Section 2.2. Additional system details are included in the USAR Sections 7 and 8. In addition to the electrical and I&C systems and components, certain switchyard components are credited to restore offsite power following a station blackout (SBO). The boundary for offsite power restoration following an SBO is shown in a simplified diagram in Figure 2.1-2.

2.5.2 ELECTRICAL COMMODITIES

2.5.2.1 Identification of Electrical Commodities

The first step of the screening process for electrical commodities is to use plant documentation to identify the electrical components and commodities within the electrical, civil, and mechanical systems based on plant design documentation, drawings, and the CPS Equipment List, as well as by interfacing with the parallel mechanical and civil screening efforts. The electrical components and commodities identified at CPS are listed below. This list includes electrical components and commodities identified in NEI 95-10 Appendix B in addition to components and commodities added per NUREG-1800 Table 2.1-5.

Electrical Components and Commodities for In Scope Systems:

- Alarm Units
- Analyzers
- Annunciators
- Batteries
- Cable Connections (Metallic Parts)
- Cable Tie Wraps
- Chargers
- Circuit Breakers
- Communication Equipment
- Connection Contacts
- Converters
- Electric Heaters
- Electrical Controls and Panel Internal Assemblies
- Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements
- Electrical Penetrations
- Elements, RTDs, Sensors, Thermocouples, Transducers
- Fuse Holders
- Fuses
- Generators, Motors
- Heat Trace
- High Voltage Insulators
- Inaccessible Switchyard Cable Bus
- Indicators
- Insulated Cables and Connections
- Inverters
- Isolators
- Light Bulbs
- Loop Controllers
- Metal Enclosed Bus
- Meters
- Motor Generator Sets
- Power Supplies
- Radiation Monitors
- Recorders
- Regulators
- Relays
- Signal Conditioners
- Solenoid Operators
- Solid State Devices
- Splices
- Surge Arresters
- Switches
- Switchgear, Load Centers, Motor Control Centers, Distribution Panels
- Switchyard Bus and Connections
- Terminal Blocks
- Transformers

- Transmission Conductors
- Transmission Connectors
- Transmitters
- Uninsulated Ground Conductors

2.5.2.2 Application of Screening Criterion 10 CFR 54.21(a)(1)(i) to the Electrical Components and Commodities

Following the identification of the electrical components and commodities, the criteria of 10 CFR 54.21 (a)(1)(i) were applied to identify components and commodities that perform their functions without moving parts or without a change in configuration or properties. The following electrical commodities were determined to meet the screening criteria of 10 CFR 54.21 (a)(1)(i):

- Cable Connections (Metallic Parts)
- Cable Tie Wraps
- Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements
- Electrical Penetrations
- Fuse Holders
- High Voltage Insulators
- Inaccessible Switchyard Cable Bus
- Insulated Cables and Connections
- Metal Enclosed Bus
- Splices
- Switchyard Bus and Connections
- Terminal Blocks
- Transmission Conductors
- Transmission Connectors
- Uninsulated Ground Conductors

2.5.2.3 Elimination of Electrical Commodity Groups with No License Renewal Intended Functions

The following electrical commodities were determined to not have a license renewal intended function:

Cable Tie Wraps

Tie wraps are used in cable installations as cable ties. Cable ties hold groups of cables together for restraint and ease of maintenance. Cable ties are used to bundle wires and cables together to keep the wire and cable runs neat and orderly. Cable ties are used to restrain wires and cables within raceways to facilitate cable installation. There are no current license basis requirements for CPS that cable tie wraps remain functional during and following design basis events. Cable ties are not credited for maintaining cable ampacity, ensuring maintenance of cable minimum bending radius, or maintaining cables within vertical raceways at CPS. The seismic qualification of cable trays does not credit the use of cable ties. Cable tie wraps are not credited in the CPS design basis in terms of any 10 CFR 54.4 intended function. Therefore, cable tie wraps are not within the scope of license renewal and therefore, are not subject to aging management review.

Uninsulated Ground Conductors

The uninsulated ground conductor commodity is comprised of grounding cable and associated connectors. Ground conductors are provided for equipment and personnel protection. They do not perform an intended function for license renewal. Therefore, uninsulated ground conductors are not within the scope of license renewal and therefore, are not subject to aging management review.

2.5.2.4 Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical Commodities

The 10 CFR 54.21(a)(1)(ii) screening criterion was applied to the specific commodities that remained following application of the 10 CFR 54.21(a)(1)(i) criterion. 10 CFR 54.21(a)(1)(ii) allows the exclusion of those commodities that are subject to replacement based on a qualified life or specified time period. The only electrical commodities identified for exclusion by the criteria of 10 CFR 54.21(a)(1)(ii) are electrical and I&C components and commodities included in the Environmental Qualification (EQ) Program. This is because electrical and I&C components and commodities included in the EQ Program have defined qualified lives and are replaced prior to the expiration of their qualified lives. No electrical and I&C components and commodities within the EQ Program are subject to aging management review in accordance with the screening criteria of 10 CFR 54.21(a)(1)(ii). See Section 4.4 for the TLAA evaluation of the Environmental Qualification (EQ) of Electric Components program. The remaining commodities, all or part of which are not in the EQ Program, require aging management review and are discussed below.

2.5.2.5 Electrical Commodities Subject to Aging Management Review

The electrical commodities subject to aging management review are identified in Table 2.5.2-1, along with the associated intended functions. These electrical commodities are further described below.

2.5.2.5.1 Cable Connections (Metallic Parts)

The Cable Connectors (Metallic Parts) commodity includes metallic portions of cable connections that are not included in the EQ Program. The metallic connections evaluated include splices, threaded connectors, compression-type termination lugs, and terminal blocks. The connections are subject to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation. NUREG-1801 XI.E6 aging management program (AMP) manages aging effects. The NUREG-1801 XI.E6 AMP builds upon existing thermography practices by adding additional thermography and/or contact resistance measurement, as required to include a representative sample. Therefore, Cable Connections (Metallic Parts) meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to aging management review.

2.5.2.5.2 Electrical Penetrations

Electrical penetrations at CPS are environmentally qualified. They are evaluated as a time-limited aging analysis, Section 2.5.2.4, and ultimately managed by the Environmental Qualification (EQ) of Electric Components (B.3.1.2) program. The electrical continuity of electrical penetration pigtails that could potentially be exposed to an adverse localized environment is included in the evaluation for Insulation Material for Electrical Cables and Connections, Section 2.5.2.5.5. The shelter, protection and pressure boundary intended functions of electrical penetrations are included in the evaluation for Primary Containment, Section 2.4.8.

2.5.2.5.3 Fuse Holders

The Fuse Holder includes the fuse holder metallic clamps and are not part of active equipment. Fuse holders are in scope for license renewal at CPS by meeting 10 CFR 54.4 (a)(1), (a)(2) functional, and (a)(3) license renewal scoping criteria. In accordance with the bounding approach described in NEI 95-10, the fuse holders are an electrical commodity group and are assessed for aging management review by applying the criteria of 10 CFR 54.21(a)(1)(i). Numerous fuse holders are included in the EQ Program and, therefore, are not subject to an aging management review in accordance with the screening criteria of 10 CFR 54.21 (a)(1)(ii). The resulting fuse holder population evaluated for aging effects are those that are passive and long lived, i.e., those that are not part of active equipment or assembly. Therefore, Fuse Holders (Metallic Clamps) meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to aging management review. Insulating portions of fuse holders are evaluated with insulation material for electrical cables and connections in Section 2.5.2.5.5.

2.5.2.5.4 High Voltage Insulators

The high-voltage insulators (HVIs) evaluated for CPS are those used to support in scope, uninsulated, high voltage electrical commodities such as transmission conductors and switchyard bus. The supported commodities are those credited for supplying power to in scope components and for recovery of offsite power following a station blackout event.

The High Voltage Insulators provide physical support for Switchyard Bus, Transmission Conductors, and switchyard active components that are part of the circuits that supply power from the electric utility transmission system to plant buses. These circuits provide power to in scope license renewal components used for recovery from a station blackout event. High Voltage Insulators are not included in the EQ program. Therefore, High Voltage Insulators meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

2.5.2.5.5 Insulation Material for Electrical Cables and Connections

The insulated cables and connections commodities are separated for aging management review into subcategories based on their treatment NUREG-1801:

- Insulation Material for Electrical Cables and Connections
- Insulation Material for Electrical Cables and Connections Used in Instrumentation Circuits
- Conductor Insulation for Inaccessible Power Cables Greater Than or Equal to 400V.

Insulated cables and connections included in this review are:

- Non-EQ Insulated Cables and Connections
- Electrical Penetration Pigtails and Connections
- Splices
- Inaccessible Switchyard Cable Bus

- Insulation Portions of Terminal Blocks
- Insulating Portions of Fuse Holders.

Numerous insulated cables and connections are included in the EQ Program and, therefore, are not subject to an aging management review in accordance with the screening criteria of 10 CFR 54.21 (a)(1)(ii). Insulated cables and connections not included in the EQ Program meet the criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

Insulated cables and connections inside the enclosure of an active device (e.g., motor leads and connections, cables, and connections internal to relays, chargers, switchgear, transformers, power supplies) are maintained along with the other subcomponents inside the enclosure and are not subject to an aging management review.

2.5.2.5.6 Metal Enclosed Bus

The Metal Enclosed Bus (MEB) distribute 4 kV power from the Safeguard Transformers to the 4 kV Class 1E switchgear utilizing non-segregated bus work. These portions of the power distribution system are in the scope of license renewal and supply electrical power from the switchyard to plant buses to power in scope license renewal components during recovery from a station blackout event. The metal enclosed bus is not in the EQ Program. Therefore, Metal Enclosed Bus meets the screening criterion of 10 CFR 54.21(a)(1)(ii) and is subject to aging management review.

2.5.2.5.7 Switchyard Bus and Connections, Transmission Conductors, and Transmission Connectors

The Switchyard Bus and Connections are part of the switchyard circuits that supply power from the utility transmission system to plant buses. These circuits provide power to in scope license renewal components used for recovery from a station blackout. The Switchyard Bus and Connections are not included in the EQ program. Therefore, Switchyard Bus and Connections meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

The Transmission Conductors and Connectors are part of the switchyard circuits that supply power from the electric utility grid to plant buses to power in scope license renewal components used for recovery from a station blackout. The Transmission Conductors and Connectors are not included in the EQ program. Therefore, Transmission Conductors and Connectors meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

Table 2.5.2-1 Electrical Commodities Subject to Aging Management Review

Commodity	Intended Function
Cable Connections (Metallic Parts)	Electrical Continuity
Fuse Holders (Metallic Clamps)	Electrical Continuity
High Voltage Insulators	Insulate (Electrical)
Insulation Material for Electrical Cables and Connections	Insulate (Electrical)
Metal Enclosed Bus	Electrical Continuity
	Insulate (Electrical)
	Shelter, Protection
Switchyard Bus and Connections, Transmission Conductors, and Transmission Connectors	Electrical Continuity

The aging management review results for these commodities are provided in Table 3.6.2-1 Electrical Commodities – Summary of Aging Management Evaluation.

3.0 AGING MANAGEMENT REVIEW RESULTS

This section provides the results of the aging management review for those structures and components identified in Section 2.0 as being subject to aging management review.

Descriptions of the service environments that were used in the aging management review to determine aging effects requiring management are included in Table 3.0-1, Clinton Service Environments. The environments used in the aging management reviews are listed in the Clinton AMR Environment column. The third column identifies one or more of the NUREG-1801 environments that were used when comparing the Clinton Aging Management Review results to the NUREG-1801 results.

Most of the Aging Management Review (AMR) results information in Section 3 is presented in the following two tables:

- **Table 3.x.1** - where '3' indicates the LRA section number, 'x' indicates the subsection number from NUREG-1800, and '1' indicates that this is the first table type in Section 3. For example, in the RPV, Internals, and Reactor Coolant System subsection, this table would be number 3.1.1; in the Engineered Safety Features subsection, this table would be 3.2.1; and so on. For ease of discussion, this table will hereafter be referred to in this Section as "Table 1."

- **Table 3.x.2-y** - where '3' indicates the LRA section number, 'x' indicates the subsection number from NUREG-1800, and '2' indicates that this is the second table type in Section 3; and 'y' indicates the table number for a specific system. For example, for the Reactor Vessel, within the Reactor Vessel, Internals, and Reactor Coolant System subsection, this table would be 3.1.2-2 and for the Reactor Vessel Internals, it would be table 3.1.2-3. For the High Pressure Core Spray System, within the Engineered Safety Features (ESF) subsection, this table would be 3.2.2-1. For the next system within the ESF subsection, it would be table 3.2.2-2. For ease of discussion, this table will hereafter be referred to in this section as "Table 2."

<u>TABLE DESCRIPTION</u>

NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," contains the generic evaluation of existing plant programs. It documents the technical basis for determining where existing programs are adequate without modification, and where existing programs should be augmented for the extended period of operation. The evaluation results documented in NUREG-1801 indicate that many of the existing programs are adequate to manage the aging effects for particular structures or components, within the scope of license renewal, without change. NUREG-1801 also contains recommendations on specific areas for which existing programs should be augmented for license renewal. In order to take full advantage of NUREG-1801, a comparison between the Clinton AMR results and the tables of NUREG-1801 has been performed. The Table 2's provide the results of these comparisons for each of the CPS systems, structures, and commodity groups. The Table 1's provide a summary for each of the NUREG-1800 subsections, including reference to the discussion of any applicable further evaluations.

Table 1

The purpose of Table 1 is to provide a summary comparison of how the facility aligns with the corresponding tables of NUREG-1800. The table is essentially the same as Tables 3.1-1 through 3.6-1 provided in NUREG-1800, except that the "ID" and "Type" columns have been replaced by an "Item Number" column and the "Rev2 Item" and "Rev1 Item" columns have been replaced by a "Discussion" column.

The "Item Number" column provides the reviewer with a means to cross-reference from Table 2 to Table 1.

The "Discussion" column is used to provide clarifying or amplifying information. The following are examples of information that might be contained within this column:

- When "Further Evaluation Recommended" is "Yes," information or reference to where that information is located
- The name of a plant-specific aging management program being used, if applicable
- Exceptions to the NUREG-1800 assumptions, if applicable
- A discussion of how the line is consistent with the corresponding line item in NUREG-1800, when that may not be intuitively obvious
- A discussion of how the item is different than the corresponding line item in NUREG-1800 when it may appear to be consistent (e.g., when there is exception taken to an aging management program that is listed in NUREG-1800), if applicable

The format of Table 1 provides the reviewer with a means of aligning a specific Table 1 row with the corresponding NUREG-1800 table row, thereby allowing for the ease of checking consistency.

Table 2

Table 2 provides the detailed results of the aging management reviews for those components identified in LRA Section 2 as being subject to aging management review. There will be a Table 2 for each of the systems within a Chapter 3 Section grouping. For example, for Clinton, the Engineered Safety Features System Group contains table's specific to the High Pressure Core Spray (HPCS) System, Low Pressure Core Spray (LPCS) System, Reactor Core Isolation Cooling (RCIC) System, Residual Heat Removal (RHR) System, and Standby Gas Treatment (SGT) System.

Table 2 consists of the following nine columns:

- Component Type
- Intended Function
- Material
- Environment
- Aging Effect Requiring Management
- Aging Management Programs
- NUREG-1801 Item
- Table 1 Item
- Notes

Component Type – The first column identifies all of the component types from Section 2 of the LRA that are subject to aging management review. They are listed in alphabetical order.

Intended Function – The second column contains the license renewal intended functions for the listed component types. Definitions of intended functions are contained in Table 2.1-1.

Material – The third column lists the particular materials of construction for the component type.

Environment – The fourth column lists the environments to which the component types are exposed. Service environments are indicated and a list of these environments is provided in Table 3.0-1.

Aging Effect Requiring Management – As part of the aging management review process, the aging effects that are required to be managed in order to maintain the intended function of the component type are identified for the material and environment combination. These aging effects requiring management are listed in the fifth column.

Aging Management Programs – The aging management programs used to manage the aging effects requiring management are listed in the sixth column of Table 2. Aging management programs are described in Appendix B.

NUREG-1801 Item – Each combination of component type, material, environment, aging effect requiring management, and aging management program that is listed in Table 2, is compared to NUREG-1801, with consideration given to the standard notes, to identify consistency. Consistency is documented by noting the appropriate NUREG-1801 item number in the seventh column of Table 2. If there is no corresponding item number in NUREG-1801, this field in column seven is left blank. Thus, a reviewer can readily identify the correlation between the plant-specific tables and the NUREG-1801 tables.

Table 1 Item – Each combination of component, material, environment, aging effect requiring management, and aging management program that has an identified NUREG-1801 item number must also have a Table 3.x.1 line item reference number. The corresponding line item from Table 1 is listed in the eighth column of Table 2. If there is no corresponding item in NUREG-1801, this field in column eight is left blank. The Table 1 Item allows correlation of the information from the two tables.

Notes – The notes provided in each Table 2 describe how the information in the table aligns with the information in NUREG-1801. Each Table 2 contains standard lettered notes and, if applicable, plant-specific numbered notes.

The standard lettered notes (e.g., A, B, C) provide standard information regarding comparison of the Clinton aging management review results with the NUREG-1801 Aging Management Table line item identified in the seventh column. In addition to the standard lettered notes, numbered plant-specific notes provide additional clarifying information when appropriate.

TABLE USAGE

Table 1

The reviewer evaluates each row in Table 1 by moving from left to right across the table. Since the Component, Aging Effect, Aging Management Programs and Further Evaluation Recommended information is taken directly from NUREG-1800, no further analysis of those columns is required. The information intended to help the reviewer the most in this table is contained within the Discussion column. Here the reviewer will be given plant-specific information necessary to determine, in summary, how the Clinton evaluations and programs align with NUREG-1800. This may be in the form of descriptive information within the Discussion column, or the reviewer may be referred to other locations within the LRA for further information.

Table 2

Table 2 contains all of the Aging Management Review information for the plant, whether or not it aligns with NUREG-1801. For a given row within the table, the reviewer is able to see the intended function, material, environment, aging effect requiring management and aging management program combination for a particular component type within a system. In addition, if there is a correlation between the combination in Table 2 and a combination in NUREG-1801, this will be identified by a referenced item number in column seven, NUREG-1801 Item. The reviewer can refer to the item number in NUREG-1801, if desired, to verify the correlation. If the column is blank, no corresponding combination in NUREG-1801 was found. As the reviewer continues across the table from left to right, within a given row, the next column is labeled Table 1 Item. If there is a reference number in this column, the reviewer is able to use that reference number to locate the corresponding row in Table 1 and see how the aging management program for this particular combination aligns with NUREG-1800.

Table 2 provides the reviewer with a means to navigate from the components subject to Aging Management Review (AMR) in LRA Section 2 all the way through the evaluation of the programs that will be used to manage the effects of aging of those components.

A listing of the acronyms used in this section is provided in Section 1.6.

Cumulative Fatigue Damage and TLAAs in Table 2

A fatigue analysis is considered to be a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3 when it is within the current licensing basis and is based upon transient cycle assumptions associated with 40 years of plant operation. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1).

Table 1 and Table 2 include an entry in the Aging Management Program column indicating "TLAA" for each line item that has a component for which a fatigue TLAA has been identified. See LRA Section 4.3 for details regarding the Clinton fatigue design bases, fatigue TLAAs identified, and TLAA evaluations for the period of extended operation.

Table 3.0-1 – Clinton Service Environments

Clinton AMR Environment	Description	NUREG-1801 Environments Used for AMR Comparison
Adverse Localized Environment	The Adverse Localized Environment represents conditions with excessive heat, radiation, moisture, or voltage, sometimes in the presence of oxygen. The effect can be concentrated or applicable to a general plant area.	Adverse localized environment caused by heat, radiation, or moisture Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage Adverse localized environment caused by significant moisture
Air – Indoor, Uncontrolled	The Air - Indoor Uncontrolled environment is for indoor locations that are sheltered or protected from weather. It is associated with systems with temperatures higher than the dew point (i.e., condensation can occur, but only rarely); equipment and surfaces are normally dry.	Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage Air Air - indoor, uncontrolled Any environment System temperature up to 288°C (550°F) Various
Air – Outdoor	The Air – Outdoor environment includes atmospheric air with ambient temperatures and a relative humidity up to 100%. This environment may be subject to periodic wetting and wind. The Air-Outdoor (External) environment is considered bounding for situations where piping and components are located in below grade enclosed vaults, tunnels, or pits.	Air – outdoor Any environment Various
Air with Reactor Coolant Leakage	The Air with Reactor Coolant Leakage environment is applicable to closure bolting only which is located in the vicinity of the RPV. The Air with reactor coolant or steam leakage environment is a high temperature leakage environment.	Air with reactor coolant leakage Air Air with steam or water leakage System temperature up to 288°C (550˚F)

Clinton AMR Environment	Description	NUREG-1801 Environments Used for AMR Comparison
Air/Gas-Dry	The Air/Gas-Dry environment includes air with a very limited percentage of moisture present that has been treated to reduce the dewpoint well below the system operating temperature. This includes air within air-conditioned spaces and it also includes commercial grade gases (such as nitrogen, freon, etc.) that are provided as a high quality product with little if any external contaminants (bottled gas). This environment does not include air within piping systems downstream of dryers because these dryers require a program to assure they remain functional. For these systems, the Condensation environment is used.	Gas
Closed Cycle Cooling Water	Closed Cycle Cooling Water includes treated water subject to the Closed Treated Water Systems program, which is Aging Management Program XI.M21A in NUREG-1801. The Closed Treated Water Systems program relies on maintenance of system corrosion inhibitor concentrations within specified limits of Electric Power Research Institute TR-107396 and Technical Report 1007820 to minimize corrosion. Demineralized water is treated with corrosion inhibitors, pH control agents, or biocides, as needed.	Closed-cycle cooling water Treated Water (for Wall Thinning/Erosion only)
Closed Cycle Cooling Water >140°F	The Closed Cycle Cooling Water >140°F environment is the same as the Closed Cycle Cooling Water environment, except the Closed Cycle Cooling Water >140°F environment is used for components with an operating temperature >140°F that are constructed of stainless steel.	Closed-cycle cooling water Closed-cycle cooling water >60°C (>140°F)
Concrete	The Concrete environment is one where components are embedded in concrete. This environment is considered aggressive if the concrete pH <11.5 or chlorides concentration >500 ppm.	Concrete

Clinton AMR Environment	Description	NUREG-1801 Environments Used for AMR Comparison
Condensation	The Condensation environment is an air environment containing warm or moist air where condensation may occur and periodically wet the component surface. This environment includes air with enough moisture to facilitate loss of material caused by pitting and crevice corrosion for most common materials. Although condensation may occur, it is not expected to be significant enough to result in ponding and pooling that can pose a spatial interaction concern. Ponding and pooling to this degree, as would expected to be found in HVAC drip pans and drains lines, is considered Waste Water. The condensation air environment is used for air drawn inside ventilation systems and air spaces within tanks. Certain components reside inside larger components such that their external surfaces are exposed to the internal environment of the larger component (e.g., tubes in air coolers). For these situations, Condensation is designated as the external environment. The Condensation environment is also used for certain insulated components. Because of air in-leakage through minor gaps in insulation, condensation can occur underneath the insulation on components when the operating temperature of the component is below the dew point of the air on the external surfaces of the insulation.	Condensation
Diesel Exhaust	The Diesel Exhaust environment represents the exhaust from diesel engines. It is considered to have the potential to concentrate contaminants and be subject to wetting through condensation.	Diesel Exhaust
Fuel Oil	The Fuel Oil environment includes fuel oil for the emergency diesel generators, diesel-driven fire pumps, etc. Water contamination of fuel oil is assumed.	Fuel oil

Clinton AMR Environment	Description	NUREG-1801 Environments Used for AMR Comparison
Groundwater/Soil	The Groundwater/Soil environment is the external environment for structural components buried in the soil where there is groundwater present. This environment includes freeze-thaw temperature cycles above the frost line.	Air – Outdoor (for concrete freeze-thaw aging mechanisms above the frost line) Any environment Ground water/soil Soil
Lubricating Oil	Lubricating oils are low to medium viscosity hydrocarbons used for bearing, gear, and engine lubrication; also, functionally encompasses hydraulic oil (non-water based). Water contamination of lubricating oil is assumed.	Lubricating oil
Raw Water	The cooling lake and river water to the cooling lake, as well as ground water from wells, provide the sources of raw water utilized by Clinton. Raw water is also rain or ground water. Raw water is water that has not been demineralized or treated to any significant extent. This can include water for use in open-cycle cooling water and fire protection systems. Potable water, water that is used for drinking or other personal use, is considered raw water. Raw water in plant systems may have been rough filtered to remove large particles and may contain a biocide additive for control of micro- and macro-organisms.	Raw water Raw water (potable) Waste water
Reactor Coolant	The Reactor Coolant environment is demineralized water used within the reactor coolant system to transfer heat from the fuel inside the reactor vessel core. The Reactor Coolant environment also includes Steam. The temperature of the Reactor Coolant environment is assumed to be >482 °F. The Reactor Coolant environment has been selected for the following systems for consistency with the NUREG-1801 terminology: Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant Pressure Boundary System.	Reactor coolant Reactor coolant >250°C (>482°F) Reactor coolant >250°C (>482°F) and neutron flux Reactor coolant and neutron flux Treated water >60°C (>140°F)

Clinton AMR Environment	Description	NUREG-1801 Environments Used for AMR Comparison
Reactor Coolant and Neutron Flux	The Reactor Coolant and Neutron Flux environment is used for components within the reactor vessel and reactor vessel internals systems that are in contact with reactor coolant and are exposed to neutron fluence projected to exceed 1.0 x 10^{17} n/cm^2 (E >0.1 MeV) within 60 years. The temperature of the Reactor Coolant and Neutron Flux environment is always assumed to be >482°F.	Reactor coolant Reactor coolant >250°C (>482°F) and neutron flux Reactor coolant and neutron flux
Sodium Pentaborate Solution	The Sodium Pentaborate Solution environment is treated water that contains sodium pentaborate. This is confined to the Standby Liquid Control system at Clinton which is contained within a limited area of the secondary containment.	Sodium Pentaborate solution
Soil	The Soil environment is the external environment for components buried in the soil, and it includes ground water in the soil.	Soil
Steam	The Steam environment is the internal environment associated with dry steam, such as main steam up to the main turbine. The Water Chemistry Program is used for managing aging effects in dry steam environments, but the One-Time Inspection Program is not required by NUREG-1801. Wet steam environments for Clinton are typically described as either Treated Water or Reactor Coolant, depending upon location, but may use the NUREG-1801 steam environment for cumulative fatigue damage or loss of material aging effects.	Steam Treated water Reactor coolant
Treated Water	Treated water is demineralized water or chemically purified water and is the base water for all clean systems. Depending on the system, treated water may require further processing. Treated water may be deaerated and include corrosion inhibitors, biocides, or some combination of these treatments. The treated water environment includes all wet steam environments.	Air - indoor, uncontrolled (for TLAA items only) Any environment Treated water Treated water <60C (<140 F)

Clinton AMR Environment	Description	NUREG-1801 Environments Used for AMR Comparison
Treated Water >140°F	The Treated Water >140°F environment is the same as the Treated Water environment, except the Treated Water >140°F environment is used for systems operating at temperatures >140°F that are constructed of stainless steel. For materials other than stainless steel, the Treated Water environment is used. The Treated Water >140°F environment includes wet steam. Dry steam, such as main steam, is addressed as its own environment.	Treated water >60°C (>140°F) Treated water
Waste Water	Waste Water includes radioactive, potentially radioactive, or non-radioactive waters that are collected from equipment and floor drains, vent system drains, and waters processed by the radwaste system. Waste water may contain contaminants, including oil, depending on location, as well as originally treated water that is not monitored by a chemistry program.	Waste water Raw water Air – indoor, uncontrolled (for hardening/wear of elastomers only)
Water – Flowing	The Water – Flowing environment is water that is refreshed, thus having larger impact on leaching; this can be raw water, groundwater, groundwater intrusion, or flowing water under a foundation.	Groundwater/soil (for water control structures only)
Water – Standing	The Water – Standing environment is water that is stagnant and unrefreshed, thus possibly resulting in increased ionic strength of solution up to saturation. This can be raw water or groundwater.	Water – standing

3.1 AGING MANAGEMENT OF REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

3.1.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.1, Reactor Vessel, Internals, and Reactor Coolant System, as being subject to aging management review. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Reactor Coolant Pressure Boundary System (2.3.1.1)
- Reactor Vessel (2.3.1.2)
- Reactor Vessel Internals (2.3.1.3)

3.1.2 RESULTS

The following tables summarize the results of the aging management review for Reactor Vessel, Internals, and Reactor Coolant System.

Table 3.1.2-1 Reactor Coolant Pressure Boundary System - Summary of Aging Management Evaluation

Table 3.1.2-2 Reactor Vessel - Summary of Aging Management Evaluation

Table 3.1.2-3 Reactor Vessel Internals - Summary of Aging Management Evaluation

3.1.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.1.2.1.1 Reactor Coolant Pressure Boundary System

Materials

The materials of construction for the Reactor Coolant Pressure Boundary System components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Cast Austenitic Stainless Steel (CASS)
- Copper Alloy with 15 percent Zinc or less
- Glass
- Stainless Steel
- Stainless Steel Bolting

Environments

The Reactor Coolant Pressure Boundary System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air with Reactor Coolant Leakage
- Closed Cycle Cooling Water
- Lubricating Oil
- Reactor Coolant
- Steam
- Treated Water
- Treated Water > 140 degrees F

Aging Effect Requiring Management

The following aging effects associated with the Reactor Coolant Pressure Boundary System components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Fracture Toughness
- Loss of Material
- Loss of Preload
- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Reactor Coolant Pressure Boundary System components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)
- Bolting Integrity (B.2.1.11)
- BWR Stress Corrosion Cracking (B.2.1.7)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Flow-Accelerated Corrosion (B.2.1.10)
- Lubricating Oil Analysis (B.2.1.26)
- One-Time Inspection (B.2.1.21)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.1.23)

- TLAA
- Water Chemistry (B.2.1.2)

3.1.2.1.2 Reactor Vessel

Materials

The materials of construction for the Reactor Vessel components are:

- Carbon or Low Alloy Steel with Stainless Steel Cladding
- Carbon Steel
- High Strength Low Alloy Steel Bolting with Yield Strength of 150 ksi or Greater
- Nickel Alloy
- Stainless Steel

Environments

The Reactor Vessel components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air with Reactor Coolant Leakage
- Reactor Coolant
- Reactor Coolant and Neutron Flux

Aging Effect Requiring Management

The following aging effects associated with the Reactor Vessel components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Fracture Toughness
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Reactor Vessel components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)
- Bolting Integrity (B.2.1.11)
- BWR Control Rod Drive Return Line Nozzle (B.2.1.6)
- BWR Feedwater Nozzle (B.2.1.5)

- BWR Penetrations (B.2.1.8)
- BWR Stress Corrosion Cracking (B.2.1.7)
- BWR Vessel ID Attachment Welds (B.2.1.4)
- BWR Vessel Internals (B.2.1.9)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- One-Time Inspection (B.2.1.21)
- Reactor Head Closure Stud Bolting (B.2.1.3)
- Reactor Vessel Surveillance (B.2.1.20)
- TLAA
- Water Chemistry (B.2.1.2)

3.1.2.1.3 Reactor Vessel Internals

Materials

The materials of construction for the Reactor Vessel Internals components are:

- Cast Austenitic Stainless Steel (CASS)
- Nickel Alloy
- Stainless Steel
- Stainless Steel Bolting
- X-750 alloy

Environments

The Reactor Vessel Internals components are exposed to the following environments:

- Air/Gas - Dry
- Reactor Coolant
- Reactor Coolant and Neutron Flux

Aging Effect Requiring Management

The following aging effects associated with the Reactor Vessel Internals components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Fracture Toughness
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Reactor Vessel Internals components:

- BWR Vessel Internals (B.2.1.9)
- TLAA
- Water Chemistry (B.2.1.2)

3.1.2.2 AMR Results for Which Further Evaluation is Recommended by the GALL Report

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the license renewal application. For the Reactor Vessel, Internals, Reactor Coolant System, those programs are addressed in the following subsections.

3.1.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of metal fatigue as a TLAA for the Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant Pressure Boundary systems is discussed in Section 4.3.

3.1.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

1. *Loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. The existing program relies on control of water chemistry to mitigate corrosion and Inservice Inspection (ISI) to detect loss of material. The extent and schedule of the existing steam generator inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds. However, according to NRC Information Notice (IN) 90-04, the program may not be sufficient to detect pitting and crevice corrosion, if general and pitting corrosion of the shell is known to exist. The GALL Report recommends augmented inspection to manage this aging effect. Furthermore, the GALL Report clarifies that this issue is limited to Westinghouse Model 44 and 51 Steam Generators, where a high-stress region exists at the shell to transition cone weld. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

   Item Number 3.1.1-12 is applicable to PWRs only and is not used for Clinton Power Station

2. *Loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR steam generator shell assembly exposed to secondary feedwater and steam. The existing program relies on control of secondary water chemistry to mitigate corrosion. However, some applicants have replaced only the bottom part of their recirculating steam generators, generating a cut in the middle of the transition cone, and, consequently, a new transition cone closure weld. The GALL Report recommends volumetric examinations performed in accordance with the requirements of ASME Code Section XI for upper shell-to and lower shell-to*

transition cones with gross structural discontinuities for managing loss of material due to general, pitting, and crevice corrosion in the welds for Westinghouse Model 44 and 51 Steam Generators, where a high-stress region exists at the shell to transition cone weld.

The new continuous circumferential weld, resulting from cutting the transition cone as discussed above, is a different situation from the SG transition cone welds containing geometric discontinuities. Control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. The new transition area weld is a field-weld as opposed to having been made in a controlled manufacturing facility, and the surface conditions of the transition weld may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion than those of the upper and lower transition cone welds. Crediting of the ISI program for the new SG transition cone weld may not be an effective basis for managing loss of material in this weld, as the ISI criteria would only perform a VT-2 visual leakage examination of the weld as part of the system leakage test performed pursuant to ASME Section XI requirements. In addition, ASME Section XI does not require licensees to remove insulation when performing visual examination on non-borated treated water systems. Therefore, the effectiveness of the chemistry control program should be verified to ensure that loss of material due to general, pitting and crevice corrosion is not occurring.

For the new continuous circumferential weld, the GALL Report recommends further evaluation to verify the effectiveness of the chemistry control program. A one-time inspection at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly, such that the component's intended function will be maintained during the period of extended operation. Furthermore, the GALL Report clarifies that this issue is limited to replacement recirculating steam generators with a new transition cone closure weld.

Item Number 3.1.1-12 is applicable to PWRs only and is not used for Clinton Power Station.

3.1.2.2.3 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement

1. *Neutron irradiation embrittlement is a TLAA to be evaluated for the period of extended operation for all ferritic materials that have a neutron fluence greater than 10^{17} n/cm2 (E >1 MeV) at the end of the license renewal term. 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)(1). This TLAA is addressed separately in Section 4.2, "Reactor Vessel Neutron Embrittlement Analysis," of this SRP-LR.*

   The evaluation of neutron irradiation embrittlement for all ferritic reactor vessel components that have a neutron fluence greater than 1 x 10^{17} n/cm^2 (E>1 MeV) at the end of the license renewal term is performed as a TLAA as discussed in Section 4.2.

2. *Loss of fracture toughness due to neutron irradiation embrittlement could occur in BWR and PWR reactor vessel beltline shell, nozzle, and welds exposed to reactor coolant and neutron flux. A reactor vessel materials surveillance program monitors*

neutron irradiation embrittlement of the reactor vessel. The reactor vessel surveillance program is plant-specific, depending on matters such as the composition of limiting materials, availability of surveillance capsules, and projected fluence levels. In accordance with 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to implementation. Untested capsules placed in storage must be maintained for future insertion. Thus, further staff evaluation is required for license renewal. Specific recommendations for an acceptable AMP are provided in Chapter XI, Section M31 of the GALL Report.

The Reactor Vessel Surveillance (B.2.1.20) aging management program will be implemented to manage the loss of fracture toughness of the reactor vessel beltline components and welds exposed to a reactor coolant and neutron flux environment. The program meets the requirements of 10 CFR 50, Appendix H. The program evaluates neutron embrittlement by projecting Upper Shelf Energy (USE) for reactor materials and impact on Adjusted Reference Temperature for the development of pressure-temperature limit curves. Embrittlement evaluations are performed in accordance with Regulatory Guide 1.99, Rev. 2. The schedule for removing surveillance capsules is in accordance the timetable specified in BWRVIP-86-R1-A for the current license term and the period of extended operation.

3. *Ductility – Reduction in Fracture Toughness is a plant-specific TLAA for Babcock and Wilcox (B&W) reactor internals to be evaluated for the period of extended operation in accordance with the staff's safety evaluation concerning "Demonstration of the Management of Aging Effects for the Reactor Vessel Internals," Babcock and Wilcox Owners Group report number BAW-2248, which is included in BAW-2248A, March 2000. Plant-specific TLAAs are addressed in Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-LR.*

   Item Number 3.1.1-15 is applicable to PWRs only and is not used for Clinton Power Station.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

1. *Cracking due to stress corrosion cracking (SCC) and intergranular stress corrosion cracking (IGSCC) could occur in the stainless steel and nickel alloy BWR top head enclosure vessel flange leak detection lines. The GALL Report recommends that a plant-specific AMP be evaluated because existing programs may not be capable of mitigating or detecting cracking due to SCC and IGSCC. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

   Item Number 3.1.1-16 is not used. The reactor vessel flange leak detection line is carbon steel piping and is therefore not susceptible to stress corrosion cracking (SCC) or intergranular stress corrosion cracking (IGSCC).

2. *Cracking due to SCC and IGSCC could occur in stainless steel BWR isolation condenser components exposed to reactor coolant. The existing program relies on control of reactor water chemistry to mitigate SCC and on ASME Section XI ISI to detect cracking. However, the existing program should be augmented to detect cracking due to SCC and IGSCC. The GALL Report recommends an augmented program to include temperature and radioactivity monitoring of the shell-side water*

and eddy current testing of tubes to ensure that the component's intended function will be maintained during the period of extended operation. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Item Number 3.1.1-17 is not used since the Clinton Power Station BWR design does not include an isolation condenser.

3.1.2.2.5 Crack Growth due to Cyclic Loading

Crack growth due to cyclic loading could occur in reactor vessel shell forgings clad with stainless steel using a high-heat-input welding process. Growth of intergranular separations (underclad cracks) in the heat-affected zone under austenitic stainless steel cladding is a TLAA to be evaluated for the period of extended operation for all the SA-508-Cl-2 forgings where the cladding was deposited with a high heat input welding process. The methodology for evaluating the underclad flaw should be consistent with the flaw evaluation procedure and criterion in the ASME Section XI Code, 2004 edition[1]. See the SRP-LR, Section 4.7, "Other Plant-Specific Time-Limited Aging Analysis," for generic guidance for meeting the requirements of 10 CFR 54.21(c).

Item Number 3.1.1-18 is applicable to PWRs only and is not used for Clinton Power Station.

3.1.2.2.6 Cracking due to Stress Corrosion Cracking

1. *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. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed. The GALL Report recommends that a plant-specific AMP be evaluated to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

   Item Number 3.1.1-19 is applicable to PWRs only and is not used for Clinton Power Station.

2. *Cracking due to SCC could occur in Class 1 PWR cast austenitic stainless steel (CASS) reactor coolant system piping, piping components, and piping elements exposed to reactor coolant. The existing program relies on control of water chemistry to mitigate SCC; however, SCC could occur for CASS components that do not meet the NUREG-0313 guidelines with regard to ferrite and carbon content. The GALL Report recommends further evaluation of a plant-specific program for these components to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

   Item Number 3.1.1-20 is applicable to PWRs only and is not used for Clinton Power Station.

[1] Refer to the GALL Report, Chapter I, for applicability of other editions of the ASME Code, Section XI.

3.1.2.2.7 Cracking due to Cyclic Loading

Cracking due to cyclic loading could occur in steel and stainless steel BWR isolation condenser components exposed to reactor coolant. The existing program relies on ASME Section XI ISI. However, the existing program should be augmented to detect cracking due to cyclic loading. The GALL Report recommends an augmented program to include temperature and radioactivity monitoring of the shell-side water and eddy current testing of tubes to ensure that the component's intended function will be maintained during the period of extended operation. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Item Number 3.1.1-21 is not used since the Clinton Power Station BWR design does not include an isolation condenser.

3.1.2.2.8 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. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Item Number 3.1.1-22 is applicable to PWRs only and is not used for Clinton Power Station. Loss of material due to erosion for the main steam line flow restrictors is evaluated as a TLAA in Section 4.7.

3.1.2.2.9 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking

Cracking due to SCC and irradiation-assisted stress corrosion cracking (IASCC) could occur in inaccessible locations for stainless steel and nickel-alloy Primary and Expansion PWR reactor vessel internal components. If aging effects are identified in accessible locations, the GALL Report recommends further evaluation of the aging effects in inaccessible locations on a plant-specific basis to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Item number 3.1.1-23 is applicable to PWRs only and is not applicable to Clinton Power Station. This paragraph for further evaluation from NUREG-1800 was removed by LR-ISG-2011-04.

3.1.2.2.10 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement, Change in Dimension due to Void Swelling, Loss of Preload due to Stress Relaxation, or Loss of Material due to Wear

Loss of fracture toughness due to neutron irradiation embrittlement, change in dimension due to void swelling, loss of preload due to stress relaxation, or loss of material due to wear could occur in inaccessible locations for stainless steel and nickel-alloy Primary and Expansion PWR reactor vessel internal components. If aging effects are identified in accessible locations, the GALL Report recommends further evaluation of the aging effects in inaccessible locations on a plant-specific basis to ensure that this aging effect *is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Item number 3.1.1-24 is applicable to PWRs only and is not applicable to Clinton Power Station. This paragraph for further evaluation from NUREG-1800 was removed by LR-ISG-2011-04.

3.1.2.2.11 Cracking due to Primary Water Stress Corrosion Cracking

1. *Foreign operating experience in steam generators with a similar design to that of Westinghouse Model 51 has identified extensive cracking due to primary water stress corrosion cracking (PWSCC) in steam generator (SG) divider plate assemblies fabricated of Alloy 600 and/or the associated Alloy 600 weld materials, even with proper primary water chemistry (EPRI TR-1014982). Cracks have been detected in the stub runner, adjacent to the tubesheet/stub runner weld and with depths of almost a third of the divider plate thickness. Therefore, the water chemistry program may not be effective in managing the aging effect of cracking due to PWSCC in SG divider plate assemblies. This is of particular concern for steam generators where the tube-tubesheet welds are considered structural welds and/or where the divider plate assembly contributes to the mechanical integrity of the tubesheet.*

   Although these SG divider plate cracks may not have a significant safety impact in and of themselves, these cracks could impact adjacent items, such as the tubesheet and the channel head, if they propagate to the boundary with these items. For the tubesheet, PWSCC cracks in the divider plate could propagate to the tubesheet cladding with possible consequences to the integrity of the tube/tubesheet welds. For the channel head, the PWSCC cracks in the divider plate could propagate to the SG triple point and potentially affect the pressure boundary of the SG channel head.

   The existing program relies on control of reactor water chemistry to mitigate cracking due to PWSCC. The GALL Report recommends that a plant-specific AMP be evaluated, along with the primary water chemistry program, because the existing primary water chemistry program may not be capable of mitigating cracking due to PWSCC. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

   Item Number 3.1.1-25 is applicable to PWRs only and is not used for Clinton Power Station.

2. *Cracking due to PWSCC could occur in steam generator nickel alloy tube-to-tubesheet welds exposed to reactor coolant. Unless the NRC has approved a redefinition of the pressure boundary in which the tube-to-tubesheet weld is no longer included, the effectiveness of the primary water chemistry program should be verified to ensure cracking is not occurring:*

   - *For plants with Alloy 600 steam generator tubes that have not been thermally treated and for which an alternate repair criteria such as C*, F* or W* has been permanently approved, the weld is no longer part of the pressure boundary and no plant specific aging management program is required;*

- *For plants with Alloy 600 steam generator tubes that have not been thermally treated and for which there is no permanently approved alternate repair criteria such as C*, F* or W*, a plant-specific AMP is required;*
- *For plants with Alloy 600TT steam generator tubes and for which an alternate repair criteria such as H* has been permanently approved, the weld is no longer part of the pressure boundary and no plant specific aging management program is required;*
- *For plants with Alloy 600TT steam generator tubes and for which there is no alternate repair criteria such as H* permanently approved, a plant-specific AMP is required;*
- *For plants with Alloy 690TT steam generator tubes with Alloy 690 tubesheet cladding, the water chemistry is sufficient, and no further action or plant-specific aging management program is required;*
- *For plants with Alloy 690TT steam generator tubes and with Alloy 600 tubesheet cladding, either a plant-specific program or a rationale for why such a program is not needed is required.*

The existing program relies on control of reactor water chemistry to mitigate cracking due to PWSCC. The GALL Report recommends that a plant-specific AMP be evaluated, along with the primary water chemistry program, because the existing primary water chemistry program may not be capable of mitigating cracking due to PWSCC. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Item Number 3.1.1-25 is applicable to PWRs only and is not used for Clinton Power Station.

3.1.2.2.12 Cracking due to Fatigue

EPRI 1016596, Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-Rev. 0) identifies cracking due to fatigue as an aging effect that can occur for the lower flange weld in the core support barrel assembly, fuel alignment plate in the upper internals assembly, and core support plate lower support structure in PWR internals designed by Combustion Engineering. The GALL Report recommends that inspection for cracking in this component be performed if acceptable fatigue life cannot be demonstrated by TLAA through the period of extended operation as defined in 10 CFR 54.3.

Item number 3.1.1-26 is applicable to PWRs only and is not applicable to Clinton Power Station. This paragraph for further evaluation from NUREG-1800 was removed by LR-ISG-2011-04.

3.1.2.2.13 Cracking due to Stress Corrosion Cracking and Fatigue

Cracking due to stress corrosion cracking and fatigue could occur in nickel alloy control rod guide tube assemblies, guide tube support pins exposed to reactor coolant, and neutron flux. The GALL Report, AMR Item IV.B2.RP-355, recommends further evaluation of a plant-specific AMP to ensure this aging effect is adequately managed. Acceptance *criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Item number 3.1.1-27 is applicable to PWRs only and is not applicable to Clinton Power Station. This paragraph for further evaluation from NUREG-1800 was removed by LR-ISG-2011-04.

3.1.2.2.14 Loss of Material due to Wear

Loss of material due to wear could occur in nickel alloy control rod guide tube assemblies, guide tube support pins and in Zircaloy-4 incore instrumentation lower thimble tubes exposed to reactor coolant, and neutron flux. The GALL Report, AMR Items IV.B2.RP-356 and IV.B3.RP-357, recommends further evaluation of a plant-specific AMP to ensure this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Item number 3.1.1-28 is applicable to PWRs only and is not applicable to Clinton Power Station. This paragraph for further evaluation from NUREG-1800 was removed by LR-ISG-2011-04.

3.1.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

QA provisions applicable to License Renewal are discussed in Appendix B, Section B.1.3.

3.1.2.2.16 Ongoing Review of Operating Experience

Ongoing review of operating experience is addressed in Appendix A, Section A.1.6 and Appendix B, Section B.1.4.

3.1.2.3 <u>Time-Limited Aging Analysis</u>

The time-limited aging analyses identified below are associated with the Reactor Vessel, Internals, and Reactor Coolant System components:

- Section 4.2, Reactor Pressure Vessel and Internals Neutron Embrittlement Analyses
  - Section 4.2.1, Reactor Pressure Vessel and Internals Neutron Fluence Analyses
  - Section 4.2.2, Reactor Pressure Vessel Upper-Shelf Energy (USE) Analyses
  - Section 4.2.3, Reactor Pressure Vessel Adjusted Reference Temperature (ART) Analyses
  - Section 4.2.4, Reactor Pressure Vessel Pressure-Temperature (P-T) Limits
  - Section 4.2.5, Reactor Pressure Vessel Circumferential Weld Failure Probability Analyses
  - Section 4.2.6, Reactor Pressure Vessel Axial Weld Failure Probability Analyses
  - Section 4.2.7, Reactor Pressure Vessel Reflood Thermal Shock Analysis
  - Section 4.2.8, Jet Pump Beam Bolts and Core Plate Bolts Preload Relaxation Analysis

  - Section 4.2.9, Core Shroud Repair Stabilizer Assembly Bracket Preload Relaxation Analysis
  - Section 4.2.10, Reactor Pressure Vessel Core Support Structure Strain Evaluation
  - Section 4.2.11, Top Guide IASCC Analysis
- Section 4.3, Metal Fatigue Analyses
  - Section 4.3.1, Transient Cycle and Cumulative Usage Projections for 60 Years
  - Section 4.3.2, ASME Section III, Class 1 and Environmentally Assisted Fatigue Analyses
  - Section 4.3.3, ASME Section III, Class 1 Components
  - Section 4.3.4, ASME Section III, Class 1 Fatigue Exemptions
  - Section 4.3.5, ASME Section III, Class 2, Class 3, and ANSI B31.1 Allowable Stress Analyses
  - Section 4.3.6, High-Energy Line Break (HELB) Analyses Based on Cumulative Fatigue Usage
  - Section 4.3.7, Reactor Vessel Internals
- Section 4.7, Other Plant-Specific Time-Limited Aging Analyses
  - Section 4.7.2, Main Steam Line Flow Restrictor Erosion Analysis

3.1.3 CONCLUSION

The Reactor Vessel, Internals, and Reactor Coolant System piping, fittings, and components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Reactor Vessel, Internals, and Reactor Coolant System components are identified in the summaries in Section 3.1.2.1 above.

A description of these 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 conclusions provided in Appendix B, the effects of aging associated with the Reactor Vessel, Internals, and Reactor Coolant System components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the current licensing basis during the period of extended operation.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-1	High strength, low-alloy steel top head closure stud assembly exposed to air with potential for reactor coolant leakage	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.1.2.2.1.
3.1.1-2	PWR Only				
3.1.1-3	Stainless steel or nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.1.2.2.1.
3.1.1-4	Steel pressure vessel support skirt and attachment welds	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.1.2.2.1.
3.1.1-5	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-6	Steel (with or without nickel-alloy or stainless steel cladding), or stainless steel; or nickel alloy reactor coolant pressure boundary components: piping, piping components, and piping elements exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.1.2.2.1.
3.1.1-7	Steel (with or without nickel-alloy or stainless steel cladding), or stainless steel; or nickel alloy reactor vessel components: flanges; nozzles; penetrations; safe ends; thermal sleeves; vessel shells, heads and welds exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.1.2.2.1.
3.1.1-8	PWR Only				
3.1.1-9	PWR Only				
3.1.1-10	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-11	Steel or stainless steel pump and valve closure bolting exposed to high temperatures and thermal cycles	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation; check ASME Code limits for allowable cycles (less than 7000 cycles) of thermal stress range. (SRP Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.1.2.2.1.
3.1.1-12	PWR Only				
3.1.1-13	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA is to be 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. TLAA will be used to manage loss of fracture toughness of the carbon or low alloy steel with stainless steel cladding and carbon steel components in the beltline region exposed to reactor coolant and neutron flux in the Reactor Vessel. See Subsection 3.1.2.2.3.1.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-14	Steel (with or without cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles	Loss of fracture toughness due to neutron irradiation embrittlement	Chapter XI.M31, “Reactor Vessel Surveillance”	Yes, plant specific or integrated surveillance program	Consistent with NUREG-1801 with exceptions. The Reactor Vessel Surveillance (B.2.1.20) program will be used to manage loss of fracture toughness of the carbon or low alloy steel with stainless steel cladding and carbon steel components in the beltline region exposed to reactor coolant and neutron flux in the Reactor Vessel. An exception applies to the NUREG-1801 recommendations for Reactor Vessel Surveillance (B.2.1.20) program implementation. See Subsection 3.1.2.2.3.2
3.1.1-15	PWR Only				
3.1.1-16	Stainless steel and nickel alloy top head enclosure vessel flange leak detection line	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	A plant-specific aging management program is to be evaluated because existing programs may not be capable of mitigating or detecting crack initiation and growth due to SCC in the vessel flange leak detection line	Yes, plant-specific	Not Applicable. There are no stainless steel or nickel alloy top head enclosure vessel flange leak detection piping components in the Reactor Vessel, Internals, and Reactor Coolant System. The top head enclosure vessel flange leak detection line is carbon steel piping that is not susceptible to stress corrosion cracking (SCC) or intergranular stress corrosion cracking (IGSCC). See Subsection 3.1.2.2.4.1.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-17	Stainless steel isolation condenser components exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry" for BWR water, and a plant-specific verification program	Yes, detection of aging effects is to be evaluated	Not Applicable. The Clinton Power Station BWR design does not include an isolation condenser. See Subsection 3.1.2.2.4.2.
3.1.1-18	PWR Only				
3.1.1-19	PWR Only				
3.1.1-20	PWR Only				
3.1.1-21	Steel and stainless steel isolation condenser components exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components The ISI program is to be augmented by a plant-specific verification program	Yes, detection of aging effects is to be evaluated	Not Applicable. The Clinton Power Station BWR design does not include an isolation condenser. See Subsection 3.1.2.2.7.
3.1.1-22	PWR Only				
3.1.1-23	Item 3.1.1-23 was removed by LR-ISG-2011-04.				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-24	Item 3.1.1-24 was removed by LR-ISG-2011-04.				
3.1.1-25	PWR Only				
3.1.1-26	Item 3.1.1-26 was removed by LR-ISG-2011-04.				
3.1.1-27	Item 3.1.1-27 was removed by LR-ISG-2011-04.				
3.1.1-28	PWR Only				
3.1.1-29	Nickel alloy core shroud and core plate access hole cover (welded covers) exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” and Chapter XI.M2, “Water Chemistry,” and for BWRs with a crevice in the access hole covers, augmented inspection using UT or other acceptable techniques	No	Not Applicable. The core shroud and core plate access hole covers are a nickel alloy and stainless steel welded design and are addressed in Item Number 3.1.1-103 for cracking.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-30	Stainless steel or nickel alloy penetration: drain line exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, cyclic loading	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801 with exceptions. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1) and Water Chemistry (B.2.1.2) program will be used to manage cracking of the carbon or low alloy steel with stainless steel cladding, nickel alloy, and stainless steel nozzles, vessel shell, bottom head, and welds exposed to reactor coolant in the Reactor Vessel. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-31	Steel and stainless steel isolation condenser components exposed to reactor coolant	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801 with exceptions. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1) program and Water Chemistry (B.2.1.2) program will be used to manage loss of material of the carbon steel piping and piping components exposed to reactor coolant in the Reactor Coolant Pressure Boundary System. The Clinton Power Station BWR design does not include an isolation condenser. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-32	PWR Only				
3.1.1-33	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-34	PWR Only				
3.1.1-35	PWR Only				
3.1.1-36	PWR Only				
3.1.1-37	PWR Only				
3.1.1-38	Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant >250 deg-C (>482 deg-F)	Loss of fracture toughness due to thermal aging embrittlement	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD” for Class 1 components. For pump casings and valve bodies, screening for susceptibility to thermal aging is not necessary.	No	Consistent with NUREG-1801. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1) program will be used to manage loss of fracture toughness of the cast austenitic stainless steel pump casings and valve bodies exposed to reactor coolant in the Reactor Coolant Pressure Boundary System.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-39	Steel, stainless steel, or steel with stainless steel cladding Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking (for stainless steel only), and thermal, mechanical, and vibratory loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, Chapter XI.M2, "Water Chemistry," and XI.M35, "One-Time Inspection of ASME Code Class 1 Small-bore Piping"	No	Consistent with NUREG-1801 with exceptions. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1) program, One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.1.23) program, and Water Chemistry (B.2.1.2) program will be used to manage cracking of the carbon steel and stainless steel piping, piping components: Class 1 piping, fittings and branch connections < NPS 4" exposed to reactor coolant in the Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-40	PWR Only				
3.1.1-40a	PWR Only				
3.1.1-41	Nickel alloy core shroud and core plate access hole cover (mechanical covers) exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry"	No	Not Applicable. The core shroud and core plate access hole covers are a nickel alloy and stainless steel welded design and are addressed in Item Number 3.1.1-103 for cracking.
3.1.1-42	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-43	Stainless steel and nickel-alloy reactor vessel internals exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801 with exceptions. The BWR Vessel Internals (B.2.1.9) program has been substituted for the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1) program, and will be used with the Water Chemistry (B.2.1.2) program to manage loss of material of stainless steel, and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux in the Reactor Vessel Internals. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-44	PWR Only				
3.1.1-45	PWR Only				
3.1.1-46	PWR Only				
3.1.1-47	PWR Only				
3.1.1-48	PWR Only				
3.1.1-49	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-50	Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive pressure housings exposed to reactor coolant >250 deg-C (>482 deg-F)	Loss of fracture toughness due to thermal aging embrittlement	Chapter XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No	Not Applicable. The Clinton Power Station BWR design does not include cast austenitic stainless steel Class 1 piping, piping components, and piping elements or control rod drive pressure housings exposed to reactor coolant >250 deg-C (>482 deg-F) in the Reactor Vessel, Internals, and Reactor Coolant System that perform a license renewal intended function. The CRD housings and flanges are nickel alloy and cast austenitic stainless steel but the CASS material is in a location where the water temperature is below the 482 deg-F threshold.
3.1.1-51a	PWR Only				
3.1.1-51b	PWR Only				
3.1.1-52a	PWR Only				
3.1.1-52b	PWR Only				
3.1.1-52c	PWR Only				
3.1.1-53a	PWR Only				
3.1.1-53b	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-53c	PWR Only				
3.1.1-54	PWR Only				
3.1.1-55a	PWR Only				
3.1.1-55b	PWR Only				
3.1.1-55c	PWR Only				
3.1.1-56a	PWR Only				
3.1.1-56b	PWR Only				
3.1.1-56c	PWR Only				
3.1.1-57	There is no Item Number 3.1.1-057 listed in NUREG-1800 or subsequent ISGs.				
3.1.1-58a	PWR Only				
3.1.1-58b	PWR Only				
3.1.1-59a	PWR Only				
3.1.1-59b	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-59c	PWR Only				
3.1.1-60	Steel piping, piping components, and piping elements exposed to reactor coolant	Wall thinning due to flow-accelerated corrosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No	Consistent with NUREG-1801 with exceptions. The Flow-Accelerated Corrosion (B.2.1.10) program will be used to manage wall thinning of the carbon steel piping and piping components exposed to reactor coolant in the Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Flow-Accelerated Corrosion (B.2.1.10) program implementation.
3.1.1-61	PWR Only				
3.1.1-62	PWR Only				
3.1.1-63	Steel or stainless steel closure bolting exposed to air with reactor coolant leakage	Loss of material due to general (steel only), pitting, and crevice corrosion or wear	Chapter XI.M18, “Bolting Integrity”	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage loss of material of the carbon and low alloy steel bolting and high strength low alloy steel bolting with yield strength of 150 ksi or greater exposed to air with reactor coolant leakage in the Reactor Coolant Pressure Boundary System and Reactor Vessel.
3.1.1-64	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-65	PWR Only				
3.1.1-66	PWR Only				
3.1.1-67	Steel or stainless steel closure bolting exposed to air – indoor with potential for reactor coolant leakage	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage loss of preload of the carbon and low alloy steel bolting, high strength low alloy steel bolting with yield strength of 150 ksi or greater, and stainless steel bolting exposed to air – indoor, uncontrolled and air with reactor coolant leakage in the Reactor Coolant Pressure Boundary System and Reactor Vessel.
3.1.1-68	PWR Only				
3.1.1-69	PWR Only				
3.1.1-70	PWR Only				
3.1.1-71	PWR Only				
3.1.1-72	PWR Only				
3.1.1-73	PWR Only				
3.1.1-74	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-75	PWR Only				
3.1.1-76	PWR Only				
3.1.1-77	PWR Only				
3.1.1-78	PWR Only				
3.1.1-79	Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor coolant pressure boundary components exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) program and Water Chemistry (B.2.1.2) program will be used to manage loss of material of the stainless steel piping and piping components exposed to reactor coolant in the Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-80	PWR Only				
3.1.1-81	PWR Only				
3.1.1-82	PWR Only				
3.1.1-83	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-84	Steel top head enclosure (without cladding) top head nozzles (vent, top head spray or RCIC, and spare) exposed to reactor coolant	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) program and Water Chemistry (B.2.1.2) program will be used to manage loss of material of carbon steel top head nozzles and other reactor vessel nozzles, safe-ends, and welds exposed to reactor coolant in the Reactor Vessel and Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-85	Stainless steel, nickel-alloy, and steel with nickel-alloy or stainless steel cladding reactor vessel flanges, nozzles, penetrations, safe ends, vessel shells, heads and welds exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 with exceptions. The Water Chemistry (B.2.1.2) program and One-Time Inspection (B.2.1.21) program will be used to manage loss of material of stainless steel, nickel-alloy, and carbon or low alloy steel with stainless steel cladding reactor vessel flanges, nozzles, penetrations, safe ends, thermal sleeves, internal attachments, vessel shells, heads and welds exposed to reactor coolant and neutron flux in the Reactor Vessel. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-86	PWR Only				
3.1.1-87	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-88	PWR Only				
3.1.1-89	PWR Only				
3.1.1-90	PWR Only				
3.1.1-91	High-strength low alloy steel closure head stud assembly exposed to air with potential for reactor coolant leakage	Cracking due to stress corrosion cracking; loss of material due to general, pitting, and crevice corrosion, or wear (BWR)	Chapter XI.M3, “Reactor Head Closure Stud Bolting”	No	Consistent with NUREG-1801. The Reactor Head Closure Stud Bolting (B.2.1.3) program will be used to manage cracking and loss of material of the high strength low alloy steel bolting with yield strength of 150 ksi or greater reactor vessel closure flange assembly components exposed to air with reactor coolant leakage in the Reactor Vessel.
3.1.1-92	PWR Only				
3.1.1-93	PWR Only				

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-94	Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M4, “BWR Vessel ID Attachment Welds,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801 with exceptions. The BWR Vessel ID Attachment Welds (B.2.1.4) and Water Chemistry (B.2.1.2) program will be used to manage cracking of the nickel alloy and stainless steel vessel shell attachment welds exposed to reactor coolant and neutron flux in the Reactor Vessel. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-95	Steel (with or without stainless steel cladding) feedwater nozzles exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M5, “BWR Feedwater Nozzle”	No	Consistent with NUREG-1801. The BWR Feedwater Nozzle (B.2.1.5) program will be used to manage cracking of the carbon steel feedwater nozzles exposed to reactor coolant in the Reactor Vessel.
3.1.1-96	Steel (with or without stainless steel cladding) control rod drive return line nozzles exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M6, “BWR Control Rod Drive Return Line Nozzle”	No	Consistent with NUREG-1801. The BWR Control Rod Drive Return Line Nozzle (B.2.1.6) program will be used to manage cracking of the carbon steel control rod drive return line nozzle exposed to reactor coolant in the Reactor Vessel.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-97	Stainless steel and nickel alloy piping, piping components, and piping elements greater than or equal to 4 NPS; nozzle safe ends and associated welds	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M7, “BWR Stress Corrosion Cracking,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801 with exceptions. The BWR Stress Corrosion Cracking (B.2.1.7) program and Water Chemistry (B.2.1.2) program will be used to manage cracking of stainless steel and nickel alloy piping, piping components, nozzle safe-ends and associated welds greater than or equal to 4-inch NPS that are exposed to reactor coolant in the Reactor Vessel and Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1) program has been substituted and will be used with the Water Chemistry (B.2.1.2) program to manage cracking of the CASS recirculation pump casings exposed to reactor coolant in the Reactor Coolant Pressure Boundary System.
3.1.1-98	Stainless steel or nickel alloy penetrations: instrumentation and standby liquid control exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, cyclic loading	Chapter XI.M8, “BWR Penetrations,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801 with exceptions. The BWR Penetrations (B.2.1.8) program and Water Chemistry (B.2.1.2) program will be used to manage cracking of stainless steel and nickel alloy penetrations, nozzles, nozzle safe-ends and associated welds that are exposed to reactor coolant in the Reactor Vessel. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-99	Cast austenitic stainless steel; PH martensitic stainless steel; martensitic stainless steel; X-750 alloy reactor internal components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Chapter XI.M9, "BWR Vessel Internals"	No	Consistent with NUREG-1801. The BWR Vessel Internals (B.2.1.9) program will be used to manage loss of fracture toughness of cast austenitic stainless steel and X-750 alloy reactor internal components exposed to reactor coolant and neutron flux in the Reactor Vessel Internals. PH martensitic stainless steels and martensitic stainless steels are not used within the Reactor Vessel Internals.
3.1.1-100	Stainless steel reactor vessel internals components (jet pump wedge surface) exposed to reactor coolant	Loss of material due to wear	Chapter XI.M9, "BWR Vessel Internals"	No	Consistent with NUREG-1801. The BWR Vessel Internals (B.2.1.9) program will be used to manage loss of material of the stainless steel steam dryer and the jet pump assemblies exposed to reactor coolant and neutron flux in the Reactor Vessel Internals.
3.1.1-101	Stainless steel steam dryers exposed to reactor coolant	Cracking due to flow-induced vibration	Chapter XI.M9, "BWR Vessel Internals" for steam dryer	No	Consistent with NUREG-1801. The BWR Vessel Internals (B.2.1.9) program will be used to manage cracking of the stainless steel steam dryer exposed to reactor coolant in the Reactor Vessel Internals.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-102	Stainless steel fuel supports and control rod drive assemblies control rod drive housing exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M9, “BWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801 with exceptions. The BWR Vessel Internals (B.2.1.9) program and Water Chemistry (B.2.1.2) program will be used to manage cracking of the stainless steel fuel supports, control rod drive assemblies, and steam dryer exposed to reactor coolant and neutron flux in the Reactor Vessel Internals. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-103	Stainless steel and nickel alloy reactor internal components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M9, “BWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801 with exceptions. The BWR Vessel Internals (B.2.1.9) program and Water Chemistry (B.2.1.2) program will be used to manage cracking of stainless steel and nickel alloy reactor internal components exposed to reactor coolant and neutron flux in the Reactor Vessel Internals. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-104	X-750 alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Cracking due to intergranular stress corrosion cracking	Chapter XI.M9, "BWR Vessel Internals" for core plate, and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801 with exceptions. The BWR Vessel Internals (B.2.1.9) program and Water Chemistry (B.2.1.2) program will be used to manage cracking of X-750 alloy reactor internal components exposed to reactor coolant and neutron flux in the Reactor Vessel Internals. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.1.1-105	Steel piping, piping components and piping element exposed to concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Not Applicable. There are no steel piping, piping components, or piping elements exposed to concrete in the Reactor Vessel, Internals, and Reactor Coolant System.
3.1.1-106	Nickel alloy piping, piping components and piping element exposed to air – indoor, uncontrolled, or air with borated water leakage	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Table 3.1.1 Summary of Aging Management Evaluations for the Reactor Vessel, Internals, Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-107	Stainless steel piping, piping components and piping element exposed to gas, concrete, air with borated water leakage, air – indoors, uncontrolled	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.
3.1.1-108	There is no Item Number 3.1.1-108 listed in NUREG-1800 or subsequent ISGs.				
3.1.1-109	There is no Item Number 3.1.1-109 listed in NUREG-1800 or subsequent ISGs.				
3.1.1-110	Any material, piping, piping components, and piping elements exposed to reactor coolant	Wall thinning due to erosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No	Not Applicable. There are no piping, piping components, and piping elements exposed to reactor coolant that have been identified as susceptible to wall thinning due to erosion in the Reactor Vessel, Internals, and Reactor Coolant System. Piping, piping components, and piping elements in the Reactor Vessel, Internals, and Reactor Coolant System exposed to reactor coolant that are susceptible to wall thinning due to flow-accelerated corrosion are managed by the Flow-Accelerated Corrosion (B.2.1.10) program as described in Item Number 3.1.1-060.

Table 3.1.2-1
Reactor Coolant Pressure Boundary System
Summary of Aging Management Evaluation

Table 3.1.2-1 Reactor Coolant Pressure Boundary System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Accumulator	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	C
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	C
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C1.RP-44	3.1.1-11	A, 2
				Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	IV.C1.RP-43	3.1.1-67	A
			Air with Reactor Coolant Leakage (External)	Cumulative Fatigue Damage	TLAA	IV.C1.RP-44	3.1.1-11	A, 2
				Loss of Material	Bolting Integrity (B.2.1.11)	IV.C1.RP-42	3.1.1-63	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	IV.C1.RP-43	3.1.1-67	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C1.RP-44	3.1.1-11	A, 2
				Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	IV.C1.RP-43	3.1.1-67	A
Flexible Connection	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.C.SP-88	3.4.1-11	C
					Water Chemistry (B.2.1.2)	VIII.C.SP-88	3.4.1-11	D
	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.C.SP-88	3.4.1-11	C
					Water Chemistry (B.2.1.2)	VIII.C.SP-88	3.4.1-11	D
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.C1.RP-158	3.1.1-79	A

Table 3.1.2-1 Reactor Coolant Pressure Boundary System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Flexible Connection	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	IV.C1.RP-158	3.1.1-79	B
Flow Device	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Throttle	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Flow Device (Main Steam Flow Restrictor)	Throttle	Cast Austenitic Stainless Steel (CASS)	Steam (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.B2.SP-98	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-98	3.4.1-11	B
				Loss of Material	TLAA			H, 1
					One-Time Inspection (B.2.1.21)	VIII.B2.SP-155	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-155	3.4.1-16	B
Heat Exchanger (HPU Oil Cooler) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-10	3.2.1-57	C
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-76	3.2.1-50	C
					One-Time Inspection (B.2.1.21)	V.D2.EP-76	3.2.1-50	C
Heat Exchanger (Recirculation Pump Motor Winding Cooler) Tubes	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	V.D2.EP-92	3.2.1-30	B
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-10	3.2.1-57	C
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	V.D2.EP-94	3.2.1-32	B

Table 3.1.2-1 Reactor Coolant Pressure Boundary System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Recirculation Pump Oil Cooler) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	C
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	C
Heat Exchanger (Recirculation Pump Seal Inner Tube) Tubes	Pressure Boundary	Stainless Steel	Closed Cycle Cooling Water (External)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	V.D2.EP-93	3.2.1-31	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.E.SP-80	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-80	3.4.1-16	B
Heat Exchanger (Recirculation Pump Seal Outer Tube) Tube Side Components	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	C
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	V.D2.EP-93	3.2.1-31	B
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled	None	None	VII.J.AP-14	3.3.1-117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1-117	A
Piping, piping components	Leakage Boundary	Aluminum	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-3	3.2.1-56	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-162	3.3.1-99	A
					One-Time Inspection (B.2.1.21)	VII.H2.AP-162	3.3.1-99	A
		Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	A
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	A

Table 3.1.2-1 Reactor Coolant Pressure Boundary System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.C1.AP-138	3.3.1-100	A
					One-Time Inspection (B.2.1.21)	VII.C1.AP-138	3.3.1-100	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.C1.RP-39	3.1.1-31	C
					Water Chemistry (B.2.1.2)	IV.C1.RP-39	3.1.1-31	D
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	IV.C1.R-23	3.1.1-60	D
			Steam (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B2.S-08	3.4.1-1	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-160	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-160	3.4.1-14	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	V.D2.E-07	3.2.1-11	D
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.C1.R-20	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.C1.R-20	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.C1.RP-158	3.1.1-79	A

Table 3.1.2-1 Reactor Coolant Pressure Boundary System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	IV.C1.RP-158	3.1.1-79	B
			Steam (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.B2.SP-98	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-98	3.4.1-11	B
				Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-155	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-155	3.4.1-16	B
Piping, piping components: Class 1 piping, fittings and branch connections < NPS 4”	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.C1.RP-230	3.1.1-39	A
					One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.1.23)	IV.C1.RP-230	3.1.1-39	A
					Water Chemistry (B.2.1.2)	IV.C1.RP-230	3.1.1-39	B
				Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.C1.RP-39	3.1.1-31	C
					Water Chemistry (B.2.1.2)	IV.C1.RP-39	3.1.1-31	D
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	IV.C1.R-23	3.1.1-60	D
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.C1.RP-230	3.1.1-39	A

Table 3.1.2-1 Reactor Coolant Pressure Boundary System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components: Class 1 piping, fittings and branch connections < NPS 4”	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking	One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.1.23)	IV.C1.RP-230	3.1.1-39	A
					Water Chemistry (B.2.1.2)	IV.C1.RP-230	3.1.1-39	B
				Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.C1.RP-158	3.1.1-79	A
					Water Chemistry (B.2.1.2)	IV.C1.RP-158	3.1.1-79	B
Pump Casing (Recirculation)	Pressure Boundary	Cast Austenitic Stainless Steel (CASS)	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.C1.R-20	3.1.1-97	E, 3
					Water Chemistry (B.2.1.2)	IV.C1.R-20	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Fracture Toughness	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.C1.R-08	3.1.1-38	A
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.C1.RP-158	3.1.1-79	A
					Water Chemistry (B.2.1.2)	IV.C1.RP-158	3.1.1-79	B
Reactor Vessel Flange Leak Detection Line	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Reactor Coolant (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
Tanks (HPU Reservoir)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	C

Table 3.1.2-1 Reactor Coolant Pressure Boundary System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (HPU Reservoir)	Leakage Boundary	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.C1.AP-138	3.3.1-100	C
					One-Time Inspection (B.2.1.21)	VII.C1.AP-138	3.3.1-100	C
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.C1.AP-138	3.3.1-100	A
					One-Time Inspection (B.2.1.21)	VII.C1.AP-138	3.3.1-100	A
			Steam (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.B2.SP-98	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-98	3.4.1-11	B
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-155	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-155	3.4.1-16	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.C1.RP-39	3.1.1-31	C
					Water Chemistry (B.2.1.2)	IV.C1.RP-39	3.1.1-31	D
			Steam (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B2.S-08	3.4.1-1	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-160	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-160	3.4.1-14	B

Table 3.1.2-1 Reactor Coolant Pressure Boundary System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Cast Austenitic Stainless Steel (CASS)	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.C1.R-20	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.C1.R-20	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Fracture Toughness	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.C1.R-08	3.1.1-38	A
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.C1.RP-158	3.1.1-79	A
					Water Chemistry (B.2.1.2)	IV.C1.RP-158	3.1.1-79	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.C1.R-20	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.C1.R-20	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.C1.RP-158	3.1.1-79	A
					Water Chemistry (B.2.1.2)	IV.C1.RP-158	3.1.1-79	B
			Steam (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.B2.SP-98	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-98	3.4.1-11	B
				Cumulative Fatigue Damage	TLAA	IV.C1.R-220	3.1.1-6	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-155	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-155	3.4.1-16	B

Table 3.1.2-1 Reactor Coolant Pressure Boundary System (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Program column indicates that erosion of the main steam line flow restrictors is evaluated in Section 4.7.
2. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.
3. The ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD (B.2.1.1) program is substituted to manage the aging effects applicable to this component type, material and environment combination.

Table 3.1.2-2
Reactor Vessel
Summary of Aging Management Evaluation

Table 3.1.2-2 Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Head Spray, Head Vent, Spare Nozzle)	Mechanical Closure	High Strength Low Alloy Steel Bolting with Yield Strength of 150 ksi or Greater	Air with Reactor Coolant Leakage (External)	Cracking	Bolting Integrity (B.2.1.11)	V.E.E-03	3.2.1-12	A
				Cumulative Fatigue Damage	TLAA	IV.C1.RP-44	3.1.1-11	A, 1
				Loss of Material	Bolting Integrity (B.2.1.11)	IV.C1.RP-42	3.1.1-63	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	IV.C1.RP-43	3.1.1-67	A
Bottom Head	Pressure Boundary	Carbon or Low Alloy Steel with Stainless Steel Cladding	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.A1.RP-371	3.1.1-30	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-371	3.1.1-30	D
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N1 Recirculation Outlet Nozzle	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N1 Recirculation Outlet Nozzle	Pressure Boundary	Carbon Steel	Reactor Coolant (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N1 Recirculation Outlet Nozzle Safe End and Weld	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-03	3.1.1-106	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.A1.R-68	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.A1.R-68	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.A1.R-68	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.A1.R-68	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N10 Control Rod Drive Return Line Nozzle (Capped)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cracking	BWR Control Rod Drive Return Line Nozzle (B.2.1.6)	IV.A1.R-66	3.1.1-96	A
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N10 Control Rod Drive Return Line Nozzle (Capped)	Pressure Boundary	Carbon Steel	Reactor Coolant (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N11 Core Differential Pressure and Liquid Control Nozzle Safe Ends and Welds	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	BWR Penetrations (B.2.1.8)	IV.A1.RP-369	3.1.1-98	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-369	3.1.1-98	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N11 Core Differential Pressure and Liquid Control Nozzle and Nozzle Sleeve	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-03	3.1.1-106	A
			Reactor Coolant (Internal)	Cracking	BWR Penetrations (B.2.1.8)	IV.A1.RP-369	3.1.1-98	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-369	3.1.1-98	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N12 through N14 Instrumentation Nozzles	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	BWR Penetrations (B.2.1.8)	IV.A1.RP-369	3.1.1-98	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-369	3.1.1-98	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N15 Bottom Head Drain Nozzle	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N15 Bottom Head Drain Nozzle Sleeve	Direct Flow	Nickel Alloy	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.A1.RP-371	3.1.1-30	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-371	3.1.1-30	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N16 Vibration Instrumentation Nozzle	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N16 Vibration Instrumentation Nozzle	Pressure Boundary	Carbon Steel	Reactor Coolant (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N17 Seal Leak Detection Nozzle	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-03	3.1.1-106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.A1.RP-371	3.1.1-30	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-371	3.1.1-30	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N18 Core Differential Pressure Nozzle	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-03	3.1.1-106	A
			Reactor Coolant (Internal)	Cracking	BWR Penetrations (B.2.1.8)	IV.A1.RP-369	3.1.1-98	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-369	3.1.1-98	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N18 Core Differential Pressure Nozzle Safe Ends and Welds	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N18 Core Differential Pressure Nozzle Safe Ends and Welds	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking	BWR Penetrations (B.2.1.8)	IV.A1.RP-369	3.1.1-98	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-369	3.1.1-98	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.A1.RP-371	3.1.1-30	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-371	3.1.1-30	B
N2 Recirculation Inlet Nozzle	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N2 Recirculation Inlet Nozzle Safe End Extension	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.A1.R-68	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.A1.R-68	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N2 Recirculation Inlet Nozzle Safe End and Weld	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-03	3.1.1-106	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.A1.R-68	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.A1.R-68	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N2 Recirculation Inlet Nozzle Thermal Sleeve	Direct Flow	Stainless Steel	Reactor Coolant (Internal)	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-100	3.1.1-103	C
					Water Chemistry (B.2.1.2)	IV.B1.R-100	3.1.1-103	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N2 Recirculation Inlet Nozzle Thermal Sleeve Extension	Direct Flow	Nickel Alloy	Reactor Coolant (Internal)	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-100	3.1.1-103	C
					Water Chemistry (B.2.1.2)	IV.B1.R-100	3.1.1-103	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N3 Steam Outlet Nozzle and Safe End	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N3 Steam Outlet Nozzle and Safe End	Pressure Boundary	Carbon Steel	Reactor Coolant (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N4 Feedwater Nozzle Safe End Extension	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N4 Feedwater Nozzle Safe End and Welds	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-03	3.1.1-106	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.A1.R-68	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.A1.R-68	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N4 Feedwater Nozzles	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cracking	BWR Feedwater Nozzle (B.2.1.5)	IV.A1.R-65	3.1.1-95	A
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N5 Core Spray Nozzle	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N5 Core Spray Nozzle Safe End Extension	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N5 Core Spray Nozzle Safe End and Welds	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-03	3.1.1-106	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.A1.R-68	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.A1.R-68	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N5 Core Spray Nozzle Thermal Sleeve	Direct Flow	Stainless Steel	Reactor Coolant (Internal)	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-99	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-99	3.1.1-103	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N5 Core Spray Nozzle Thermal Sleeve	Direct Flow	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N5 Core Spray Nozzle Thermal Sleeve Extension	Direct Flow	Nickel Alloy	Reactor Coolant (Internal)	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-100	3.1.1-103	C
					Water Chemistry (B.2.1.2)	IV.B1.R-100	3.1.1-103	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N6 RHR/LPCI Nozzle	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N6 RHR/LPCI Nozzle Safe End Extension	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N6 RHR/LPCI Nozzle Safe End and Welds	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-03	3.1.1-106	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.A1.R-68	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.A1.R-68	3.1.1-97	B

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N6 RHR/LPCI Nozzle Safe End and Welds	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N6 RHR/LPCI Nozzle Thermal Sleeve	Direct Flow	Stainless Steel	Reactor Coolant (Internal)	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-100	3.1.1-103	C
					Water Chemistry (B.2.1.2)	IV.B1.R-100	3.1.1-103	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N6 RHR/LPCI Nozzle Thermal Sleeve Extension	Direct Flow	Nickel Alloy	Reactor Coolant (Internal)	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-100	3.1.1-103	C
					Water Chemistry (B.2.1.2)	IV.B1.R-100	3.1.1-103	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
N7 Head Cooling RCIC and Vent Nozzle and Blind Flange	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	B
N8 Head Vent Spare Nozzle and Blind Flange	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
N8 Head Vent Spare Nozzle and Blind Flange	Pressure Boundary	Carbon Steel	Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	B
N9 Jet Pump Instrumentation Nozzle	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	D
N9 Jet Pump Instrumentation Nozzle Safe End and Welds	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	BWR Stress Corrosion Cracking (B.2.1.7)	IV.A1.R-68	3.1.1-97	A
					Water Chemistry (B.2.1.2)	IV.A1.R-68	3.1.1-97	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
Reactor Vessel Closure Flange Assembly Components	Mechanical Closure	High Strength Low Alloy Steel Bolting with Yield Strength of 150 ksi or Greater	Air with Reactor Coolant Leakage (External)	Cracking	Reactor Head Closure Stud Bolting (B.2.1.3)	IV.A1.RP-51	3.1.1-91	A
				Cumulative Fatigue Damage	TLAA	IV.A1.RP-201	3.1.1-1	A, 1

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Reactor Vessel Closure Flange Assembly Components	Mechanical Closure	High Strength Low Alloy Steel Bolting with Yield Strength of 150 ksi or Greater	Air with Reactor Coolant Leakage (External)	Loss of Material	Reactor Head Closure Stud Bolting (B.2.1.3)	IV.A1.RP-165	3.1.1-91	A
Reactor Vessel Components in the Beltline Region	Pressure Boundary	Carbon Steel	Reactor Coolant and Neutron Flux	Loss of Fracture Toughness	Reactor Vessel Surveillance (B.2.1.20)	IV.A1.RP-227	3.1.1-14	B
					TLAA	IV.A1.R-67	3.1.1-13	A, 2
		Carbon or Low Alloy Steel with Stainless Steel Cladding	Reactor Coolant and Neutron Flux	Loss of Fracture Toughness	Reactor Vessel Surveillance (B.2.1.20)	IV.A1.RP-227	3.1.1-14	B
					TLAA	IV.A1.R-62	3.1.1-13	A, 2
Support Skirt and Attachment Welds	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.A1.R-70	3.1.1-4	A, 1
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
Top Head and Flange	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-50	3.1.1-84	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-50	3.1.1-84	B
Vessel Penetrations and Welds	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-03	3.1.1-106	A
			Reactor Coolant (Internal)	Cracking	BWR Penetrations (B.2.1.8)	IV.A1.RP-369	3.1.1-98	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-369	3.1.1-98	B

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Vessel Penetrations and Welds	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	IV.E.RP-04	3.1.1-107	A
			Reactor Coolant (Internal)	Cracking	BWR Penetrations (B.2.1.8)	IV.A1.RP-369	3.1.1-98	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-369	3.1.1-98	B
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
Vessel Shell Attachment Welds	Structural Support to maintain core configuration and flow distribution	Nickel Alloy	Reactor Coolant	Cracking	BWR Vessel ID Attachment Welds (B.2.1.4)	IV.A1.R-64	3.1.1-94	A
					Water Chemistry (B.2.1.2)	IV.A1.R-64	3.1.1-94	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
		Stainless Steel	Reactor Coolant	Cracking	BWR Vessel ID Attachment Welds (B.2.1.4)	IV.A1.R-64	3.1.1-94	A
					Water Chemistry (B.2.1.2)	IV.A1.R-64	3.1.1-94	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B

Table 3.1.2-2 Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Vessel Shell Attachment Welds	Structural Support to maintain core configuration and flow distribution	Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel ID Attachment Welds (B.2.1.4)	IV.A1.R-64	3.1.1-94	A
					Water Chemistry (B.2.1.2)	IV.A1.R-64	3.1.1-94	B
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B
Vessel Shell and Welds	Pressure Boundary	Carbon or Low Alloy Steel with Stainless Steel Cladding	Air - Indoor, Uncontrolled (External)	None	None	V.E.E-44	3.2.1-40	I, 3
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1)	IV.A1.RP-371	3.1.1-30	C
					Water Chemistry (B.2.1.2)	IV.A1.RP-371	3.1.1-30	D
				Cumulative Fatigue Damage	TLAA	IV.A1.R-04	3.1.1-7	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	IV.A1.RP-157	3.1.1-85	A
					Water Chemistry (B.2.1.2)	IV.A1.RP-157	3.1.1-85	B

Table 3.1.2-2 Reactor Vessel (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.
2. The TLAA designation in the Aging Management Program column indicates loss of fracture toughness due to neutron embrittlement of this component is evaluated in Section 4.2.
3. During power operation the insulated reactor vessel, nozzles, and safe end components have external temperature greater than 212 degrees F and are at a higher temperature than the air-indoor (uncontrolled) environment. During plant shutdown the containment atmosphere is normally above the dewpoint temperature. Therefore, wetting due to condensation and moisture accumulation will not occur during power operation or plant outages and loss of material due to general corrosion does not apply.

Table 3.1.2-3
Reactor Vessel Internals
Summary of Aging Management Evaluation

Table 3.1.2-3 Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Control Rod Drive Guide Tube	Structural Support to maintain core configuration and flow distribution	Nickel Alloy	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-96	3.1.1-103	C
					Water Chemistry (B.2.1.2)	IV.B1.R-96	3.1.1-103	D
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
		Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-104	3.1.1-102	A
					Water Chemistry (B.2.1.2)	IV.B1.R-104	3.1.1-102	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Core Plate DP/SLC Line	Direct Flow	Nickel Alloy	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-96	3.1.1-103	C
					Water Chemistry (B.2.1.2)	IV.B1.R-96	3.1.1-103	D
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
		Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-99	3.1.1-103	C

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Core Plate DP/SLC Line	Direct Flow	Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	Water Chemistry (B.2.1.2)	IV.B1.R-99	3.1.1-103	D
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Core Shroud (including repairs) and Core Plate: Core Shroud (upper, central, lower)	Structural Support to maintain core configuration and flow distribution	Nickel Alloy	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-92	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-92	3.1.1-103	B
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
				Loss of Preload	TLAA			H, 4
		Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-92	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-92	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Core Shroud (including repairs) and Core Plate: Shroud support structure (shroud support cylinder, shroud support plate, shroud support legs)	Structural Support to maintain core configuration and flow distribution	Nickel Alloy	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-96	3.1.1-103	A

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Core Shroud (including repairs) and Core Plate: Shroud support structure (shroud support cylinder, shroud support plate, shroud support legs)	Structural Support to maintain core configuration and flow distribution	Nickel Alloy	Reactor Coolant and Neutron Flux	Cracking	Water Chemistry (B.2.1.2)	IV.B1.R-96	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Core Shroud and Core Plate: Access hole cover (welded covers)	Direct Flow	Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-97	3.1.1-103	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.R-97	3.1.1-103	D
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Core Shroud and Core Plate: Core plate, Core plate bolts, Core plate wedges	Structural Support to maintain core configuration and flow distribution	Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-93	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-93	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Core Shroud and Core Plate: Core plate, Core plate bolts, Core plate wedges	Structural Support to maintain core configuration and flow distribution	Stainless Steel Bolting	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-93	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-93	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Core Shroud and Core Plate: LPCI coupling	Direct Flow	Cast Austenitic Stainless Steel (CASS)	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-97	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-97	3.1.1-103	B
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
		Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-97	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-97	3.1.1-103	B
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
		X-750 alloy	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-381	3.1.1-104	A
					Water Chemistry (B.2.1.2)	IV.B1.RP-381	3.1.1-104	B
				Loss of Fracture Toughness	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-200	3.1.1-99	A
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Core Spray Lines and Spargers: Core spray lines (headers), Spray rings, Spray nozzles, Thermal sleeves	Direct Flow	Cast Austenitic Stainless Steel (CASS)	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-99	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-99	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Fracture Toughness	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-219	3.1.1-99	C
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
		Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-99	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-99	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Fuel Supports and Control Rod Drive Assemblies: Orificed Fuel Support	Structural Support to maintain core configuration and flow distribution	Cast Austenitic Stainless Steel (CASS)	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-104	3.1.1-102	A
					Water Chemistry (B.2.1.2)	IV.B1.R-104	3.1.1-102	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Fracture Toughness	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-220	3.1.1-99	A

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Fuel Supports and Control Rod Drive Assemblies: Orificed Fuel Support	Structural Support to maintain core configuration and flow distribution	Cast Austenitic Stainless Steel (CASS)	Reactor Coolant and Neutron Flux	Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
	Throttle	Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-104	3.1.1-102	C
					Water Chemistry (B.2.1.2)	IV.B1.R-104	3.1.1-102	D
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Instrumentation: Intermediate range monitor (IRM) dry tubes, Source range monitor (SRM) dry tubes, Incore neutron flux monitor guide tubes	Pressure Boundary	Nickel Alloy	Air/Gas - Dry (Internal)	None	None			G, 3
			Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-96	3.1.1-103	C
					Water Chemistry (B.2.1.2)	IV.B1.R-96	3.1.1-103	D
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
		Stainless Steel	Air/Gas - Dry (Internal)	None	None	IV.E.RP-07	3.1.1-107	A

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Instrumentation: Intermediate range monitor (IRM) dry tubes, Source range monitor (SRM) dry tubes, Incore neutron flux monitor guide tubes	Pressure Boundary	Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-105	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-105	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
	Structural Support to maintain core configuration and flow distribution	Nickel Alloy	Air/Gas - Dry (Internal)	None	None			G, 3
			Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-96	3.1.1-103	C
					Water Chemistry (B.2.1.2)	IV.B1.R-96	3.1.1-103	D
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
		Stainless Steel	Air/Gas - Dry (Internal)	None	None	IV.E.RP-07	3.1.1-107	A
			Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-105	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-105	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Instrumentation: Intermediate range monitor (IRM) dry tubes, Source range monitor (SRM) dry tubes, Incore neutron flux monitor guide tubes	Structural Support to maintain core configuration and flow distribution	Stainless Steel	Reactor Coolant and Neutron Flux	Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Jet Pump Assemblies: Adapter lower ring	Direct Flow	Nickel Alloy	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-100	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-100	3.1.1-103	B
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Jet Pump Assemblies: Castings	Direct Flow	Cast Austenitic Stainless Steel (CASS)	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-100	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-100	3.1.1-103	B
				Loss of Fracture Toughness	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-219	3.1.1-99	A
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Jet Pump Assemblies: Holddown beam	Direct Flow	X-750 alloy	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-381	3.1.1-104	A
					Water Chemistry (B.2.1.2)	IV.B1.RP-381	3.1.1-104	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Jet Pump Assemblies: Holddown beam	Direct Flow	X-750 alloy	Reactor Coolant and Neutron Flux	Loss of Fracture Toughness	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-200	3.1.1-99	A
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
Jet Pump Assemblies: Inlet riser, brace and sleeve, elbow, wedge, diffuser, holddown beam bolt	Direct Flow	Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-100	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-100	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
					BWR Vessel Internals (B.2.1.9)	IV.B1.RP-377	3.1.1-100	A
				Loss of Preload	TLAA			H, 4
Steam Dryer	Structural Integrity (Attached)	Stainless Steel	Reactor Coolant	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-155	3.1.1-101	A
						IV.B1.R-104	3.1.1-102	C
					Water Chemistry (B.2.1.2)	IV.B1.R-104	3.1.1-102	D
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B
					BWR Vessel Internals (B.2.1.9)	IV.B1.RP-377	3.1.1-100	C

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Top Guide	Structural Support to maintain core configuration and flow distribution	Stainless Steel	Reactor Coolant and Neutron Flux	Cracking	BWR Vessel Internals (B.2.1.9)	IV.B1.R-98	3.1.1-103	A
					Water Chemistry (B.2.1.2)	IV.B1.R-98	3.1.1-103	B
				Cumulative Fatigue Damage	TLAA	IV.B1.R-53	3.1.1-3	A, 1
				Loss of Material	BWR Vessel Internals (B.2.1.9)	IV.B1.RP-26	3.1.1-43	E, 2
					Water Chemistry (B.2.1.2)	IV.B1.RP-26	3.1.1-43	B

Table 3.1.2-3 Reactor Vessel Internals (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.
2. The BWR Vessel Internals AMP (B.2.1.9) is substituted to manage the aging effects applicable to this component type, material, and environment combination.
3. Nickel Alloy is evaluated to have no aging effects in an environment of Air/Gas - Dry consistent with other GALL entries for materials in dry air or gas.
4. The TLAA designation in the Aging Management Program column indicates that loss of preload due to thermal or irradiation-enhanced stress relaxation of the core shroud repair tie-rod and jet pump holddown beam bolt is evaluated in Section 4.2.

3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

3.2.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.2, Engineered Safety Features, as being subject to aging management review. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- High Pressure Core Spray System (2.3.2.1)
- Low Pressure Core Spray System (2.3.2.2)
- Reactor Core Isolation Cooling System (2.3.2.3)
- Residual Heat Removal System (2.3.2.4)
- Standby Gas Treatment System (2.3.2.5)

3.2.2 RESULTS

The following tables summarize the results of the aging management review for Engineered Safety Features.

Table 3.2.2-1 High Pressure Core Spray System - Summary of Aging Management Evaluation

Table 3.2.2-2 Low Pressure Core Spray System - Summary of Aging Management Evaluation

Table 3.2.2-3 Reactor Core Isolation Cooling System - Summary of Aging Management Evaluation

Table 3.2.2-4 Residual Heat Removal System - Summary of Aging Management Evaluation

Table 3.2.2-5 Standby Gas Treatment System - Summary of Aging Management Evaluation

3.2.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.2.2.1.1 High Pressure Core Spray System

Materials

The materials of construction for the High Pressure Core Spray System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Glass
- Gray Cast Iron
- Stainless Steel

- Stainless Steel Bolting

Environments

The High Pressure Core Spray System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Lubricating Oil
- Treated Water

Aging Effect Requiring Management

The following aging effects associated with the High Pressure Core Spray System components require management:

- Cumulative Fatigue Damage
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the High Pressure Core Spray System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Lubricating Oil Analysis (B.2.1.26)
- One-Time Inspection (B.2.1.21)
- TLAA
- Water Chemistry (B.2.1.2)

3.2.2.1.2 Low Pressure Core Spray System

Materials

The materials of construction for the Low Pressure Core Spray System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Stainless Steel
- Stainless Steel Bolting

Environments

The Low Pressure Core Spray System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Treated Water

Aging Effect Requiring Management

The following aging effects associated with the Low Pressure Core Spray System components require management:

- Cumulative Fatigue Damage
- Loss of Material
- Loss of Preload
- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Low Pressure Core Spray System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Flow-Accelerated Corrosion (B.2.1.10)
- One-Time Inspection (B.2.1.21)
- TLAA
- Water Chemistry (B.2.1.2)

3.2.2.1.3 Reactor Core Isolation Cooling System

Materials

The materials of construction for the Reactor Core Isolation Cooling System components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Ductile Cast Iron
- Glass
- Nickel Alloy
- Stainless Steel

- Stainless Steel Bolting

Environments

The Reactor Core Isolation Cooling System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Concrete
- Condensation
- Lubricating Oil
- Soil
- Steam
- Treated Water
- Treated Water > 140°F

Aging Effect Requiring Management

The following aging effects associated with the Reactor Core Isolation Cooling System components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer
- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Reactor Core Isolation Cooling System components:

- Aboveground Metallic Tanks (B.2.1.18)
- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Flow-Accelerated Corrosion (B.2.1.10)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Lubricating Oil Analysis (B.2.1.26)

- One-Time Inspection (B.2.1.21)
- TLAA
- Water Chemistry (B.2.1.2)

3.2.2.1.4 Residual Heat Removal System

Materials

The materials of construction for the Residual Heat Removal System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Stainless Steel
- Stainless Steel Bolting

Environments

The Residual Heat Removal System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
-
- Raw Water
- Treated Water
- Treated Water > 140°F

Aging Effect Requiring Management

The following aging effects associated with the Residual Heat Removal System components require management:

- Cracking
- Cumulative Fatigue Damage
- Flow Blockage
- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer
- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Residual Heat Removal System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Flow-Accelerated Corrosion (B.2.1.10)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- One-Time Inspection (B.2.1.21)
- Open-Cycle Cooling Water System (B.2.1.12)
- TLAA
- Water Chemistry (B.2.1.2)

3.2.2.1.5 Standby Gas Treatment System

Materials

The materials of construction for the Standby Gas Treatment System components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel (with internal coatings)
- Copper Alloy with 15% Zinc or less
- Copper Alloy with greater than 15% Zinc
- Elastomers
- Galvanized Steel
- Glass
- Gray Cast Iron
- Stainless Steel

Environments

The Standby Gas Treatment System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Condensation
- Raw Water

Aging Effect Requiring Management

The following aging effects associated with the Standby Gas Treatment System components require management:

- Hardening and Loss of Strength
- Loss of Coating or Lining Integrity
- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer

Aging Management Programs

The following aging management programs manage the aging effects for the Standby Gas Treatment System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)
- Open-Cycle Cooling Water System (B.2.1.12)

3.2.2.2 AMR Results for Which Further Evaluation is Recommended by the GALL Report

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the license renewal application. For the Engineered Safety Features, those programs are addressed in the following subsections.

3.2.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of metal fatigue as a TLAA for the High Pressure Core Spray System, Low Pressure Core Spray System, Reactor Core Isolation Cooling System, and Residual Heat Removal System is discussed in Section 4.3. The evaluation of primary containment fatigue as a TLAA for the Residual Heat Removal System is discussed in Section 4.6.

3.2.2.2.2 Loss of Material due to Cladding Breach

Loss of material due to cladding breach could occur for PWR steel pump casings with stainless steel cladding exposed to treated borated water. The GALL Report references NRC Information Notice 94-63, Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks, and recommends further evaluation of a plant-specific AMP to *ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Item Number 3.2.1-2 is applicable to PWRs only and is not used for Clinton Power Station.

3.2.2.2.3 Loss of Material due to Pitting and Crevice Corrosion

1. *Loss of material due to pitting and crevice corrosion could occur in partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed. The GALL Report recommends that a plant-specific AMP be evaluated because moisture and water can egress under the tank if the perimeter seal is degraded. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this SRP-LR).*

   Item Number 3.2.1-3 is applicable to PWRs and is not used for Clinton Power Station. There are no partially encased stainless steel tanks exposed to raw water in Engineered Safety Features systems at Clinton Power Station.

2. *Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The possibility of pitting and crevice corrosion also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Pitting and crevice corrosion is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.*

   GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external pitting or crevice corrosion is not expected. The GALL Report recommends further evaluation to determine whether an aging management program is needed to manage this aging effect based on the environmental conditions applicable to the plant and requirements applicable to the components.

   Item Number 3.2.1-4 is not applicable to Clinton Power Station. Loss of material due to pitting and crevice corrosion could occur for stainless steel components exposed to an aggressive air environment with the potential for the concentration of contaminants. Operating experience shows that the ambient air at Clinton Power Station is not aggressive such that loss of material of stainless steel components exposed to air is not an applicable aging effect.

3.2.2.2.4 Loss of Material due to Erosion

Loss of material due to erosion could occur in the stainless steel high-pressure safety injection (HPSI) pump miniflow recirculation orifice exposed to treated borated water. The GALL Report recommends a plant-specific AMP be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging. The GALL Report references Licensee Event Report (LER) 50-275/94-023 for evidence of erosion. Further evaluation is recommended to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this SRP-LR).

Item Number 3.2.1-5 is applicable to PWRs only and is not used for Clinton Power Station. Loss of material due to erosion for Engineered Safety Features systems at Clinton Power Station is addressed in Item Number 3.2.1-65.

3.2.2.2.5 Loss of Material due to General Corrosion and Fouling that Leads to Corrosion

Loss of material due to general corrosion and fouling that leads to corrosion can occur for steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled. This could result in plugging of the spray nozzles and flow orifices. This aging mechanism and effect will apply since the spray nozzles and flow orifices are occasionally wetted, even though the majority of the time this system is on standby. The wetting and drying of these components can accelerate corrosion and fouling. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this SRP-LR).

Item Number 3.2.1-6 is applicable to Clinton Power Station. This item considers the potential for flow blockage/fouling of containment spray nozzles and flow orifices exposed to an air – indoor (uncontrolled) environment. The Clinton Power Station containment spray nozzles and flow orifices within the Residual Heat Removal System are stainless steel. Loss of material is not an aging effect for stainless steel in the air-indoor uncontrolled environment.

The Residual Heat Removal System piping downstream of the inboard primary containment motor operated isolation valves up to the containment spray nozzles is carbon steel. The piping is normally isolated and not subject to flow, except when containment spray is initiated during accident conditions that require containment spray operation. Containment spray has never been initiated at Clinton Power Station. The system control circuitry includes interlocks that prevent inadvertent manual initiation of containment spray unless an initiation signal is present.

Clinton Power Station Technical Specifications includes a surveillance requirement to verify each spray nozzle is unobstructed following activities that could result in nozzle blockage. Normal plant operation and maintenance practices at Clinton Power Station are not expected to trigger the surveillance requirement. Only an unanticipated circumstance would initiate this surveillance, such as an inadvertent spray actuation, a major configuration change, or a loss of foreign material control when working within the affected boundary of the system.

A review of plant-specific OE has not identified flow blockage due to fouling of containment spray nozzles. It is not expected that corrosion or any other mechanism would cause obstruction of the nozzles in the future because 1) the temperature of the containment spray header piping is maintained near ambient conditions at all times and 2) the air in containment does not contain large amounts of contaminants.

3.2.2.2.6 Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air. The possibility of cracking also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Cracking is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.

GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external chloride stress corrosion cracking is not expected. The GALL Report recommends further evaluation to determine whether an aging management program is needed to manage this aging effect based on the environmental conditions applicable to the plant and requirements applicable to the components.

Item Number 3.2.1-7 is not applicable to Clinton Power Station. Cracking due to stress corrosion cracking could occur for stainless steel components exposed to an aggressive air environment with the potential for the concentration of contaminants. Operating experience shows that the ambient air at Clinton Power Station is not aggressive such that cracking of stainless steel components exposed to air is not an applicable aging effect.

3.2.2.2.7 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance (QA) provisions applicable to License Renewal are discussed in Appendix B, Section B.1.3.

3.2.2.2.8 Ongoing Review of Operating Experience

Ongoing review of operating experience is addressed in Appendix A, Section A.1.6 and Appendix B, Section B.1.4.

3.2.2.2.9 Loss of Material due to Recurring Internal Corrosion

Recurring internal corrosion can result in the need to augment AMPs beyond the recommendations in the GALL Report. During the search of plant-specific OE conducted during the LRA development, recurring internal corrosion can be identified by the number of occurrences of aging effects and the extent of degradation at each localized corrosion site. This further evaluation item is applicable if the search of plant-specific OE reveals repetitive occurrences (e.g., one per refueling outage cycle that has occurred over: (a) three or more sequential or nonsequential cycles for a 10-year OE search, or (b) two or more sequential or nonsequential cycles for a 5-year OE search) of aging effects with the same aging mechanism in which the aging effect resulted in the component either not meeting plant-specific acceptance criteria or experiencing a reduction in wall thickness greater than 50 percent (regardless of the minimum wall thickness.)

The GALL Report recommends that a plant-specific AMP, or a new or existing AMP, be evaluated for inclusion of augmented requirements to ensure the adequate management of any recurring aging effect(s). Potential augmented requirements include: alternative examination methods (e.g., volumetric versus external visual), augmented inspections (e.g., a greater number of locations, additional locations based on risk insights based on susceptibility to aging effect and consequences of failure, a greater frequency of inspections), and additional trending parameters and decision points where increased inspections would be implemented. Acceptance criteria are described in Appendix A.1, "Aging Management Review – Generic (Branch Technical Position RSLB-1)."

The applicant states: (a) why the program's examination methods will be sufficient to detect the recurring aging effect before affecting the ability of a component to perform its intended function, (b) the basis for the adequacy of augmented or lack of augmented inspections, (c) what parameters will be trended as well as the decision points where increased inspections would be implemented (e.g., the extent of degradation at individual corrosion sites, the rate of degradation change), (d) how inspections of components that are not easily accessed (i.e., buried, underground) will be conducted, and (e) how leaks in any involved buried or underground components will be identified.

Each plant-specific operating experience example should be evaluated to determine if the chosen AMP should be augmented even if the thresholds for significance of aging effect or frequency of occurrence of aging effect have not been exceeded. For example, during a 10-year search of plant specific operating experience, two instances of 360 degree 30 percent wall loss occurred at copper alloy to steel joints. Neither the significance of the aging effect nor the frequency of occurrence of aging effect threshold has been exceeded. Nevertheless, the operating experience should be evaluated to determine if the AMP that is proposed to manage the aging effect is sufficient (e.g., method of inspection, frequency of inspection, number of inspections) to provide reasonable assurance that the CLB intended functions of the component will be met throughout the period of extended operation. Likewise, the GALL Report AMR items associated with the new FE items only cite raw water and waste water environments because OE indicates that these are the predominant environments associated with recurring internal corrosion; however, if the search of plant-specific OE reveals recurring internal corrosion in other water environments (e.g., treated water), the aging effect should be addressed in a similar manner.

LR-ISG-2012-02 has been issued which addresses instances of recurring internal corrosion identified during review of plant specific operating experience. The operating experience for Clinton Power Station has been reviewed and instances of recurring internal corrosion in the Engineered Safety Features systems have not been identified with a frequency that is consistent with the thresholds discussed in LR-ISG-2012-02.

3.2.2.3 Time-Limited Aging Analysis

The time-limited aging analyses identified below are associated with the Engineered Safety Features components:

- Section 4.3, Metal Fatigue
- Section 4.6, Primary Containment Fatigue

3.2.3 CONCLUSION

The Engineered Safety Features piping, fittings, and components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Engineered Safety Features components are identified in the summaries in Section 3.2.2.1 above.

A description of these 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 conclusions provided in Appendix B, the effects of aging associated with the Engineered Safety Features components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the current licensing basis during the period of extended operation.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-1	Stainless steel, Steel Piping, piping components, and piping elements exposed to Treated water (borated)	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.2.2.2.1.
3.2.1-2	PWR Only				
3.2.1-3	PWR Only				
3.2.1-4	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Not Applicable. See subsection 3.2.2.2.3.2.
3.2.1-5	PWR Only				
3.2.1-6	Steel Drywell and suppression chamber spray system (internal surfaces): flow orifice; spray nozzles exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to general corrosion; fouling that leads to corrosion	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Consistent with NUREG-1801. The One-Time Inspection (B.2.1.21) program will be used to manage flow blockage/fouling of the stainless steel spray nozzles in the Residual Heat Removal system. See subsection 3.2.2.2.5.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-7	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Not Applicable. See subsection 3.2.2.2.6.
3.2.1-8	PWR Only				
3.2.1-9	PWR Only				
3.2.1-10	Cast austenitic stainless steel Piping, piping components, and piping elements exposed to Treated water (borated) >250°C (>482°F), Treated water >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Chapter XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No	Not Applicable. There are no cast austenitic stainless steel piping components, and piping elements exposed to treated water (borated) >250°C (>482°F) or treated water >250°C (>482°F) in ESF systems.
3.2.1-11	Steel Piping, piping components, and piping elements exposed to Steam, Treated water	Wall thinning due to flow-accelerated corrosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No	Consistent with NUREG-1801 with exceptions. The Flow-Accelerated Corrosion (B.2.1.10) program will be used to manage wall thinning of the carbon steel piping and piping components exposed to steam and treated water in the Reactor Core Isolation Cooling System and Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Flow-Accelerated Corrosion (B.2.1.10) program implementation.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-12	Steel, high-strength Closure bolting exposed to Air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage cracking of the high strength low alloy steel bolting with yield strength of 150 ksi or greater exposed to air with reactor coolant leakage in the Reactor Vessel.
3.2.1-13	Steel; stainless steel Bolting, Closure bolting exposed to Air – outdoor (External), Air – indoor, uncontrolled (External)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage loss of material of the carbon and low alloy steel and stainless steel bolting exposed to air - indoor uncontrolled and air - outdoor in the High Pressure Core Spray System, Low Pressure Core Spray System, Reactor Core Isolation Cooling System, Residual Heat Removal System, Standby Gas Treatment System, and Reactor Coolant Pressure Boundary System.
3.2.1-14	Steel Closure bolting exposed to Air with steam or water leakage	Loss of material due to general corrosion	Chapter XI.M18, "Bolting Integrity"	No	Not Applicable. The "air with steam or water leakage" environment was not used. Loss of material for bolting components in the ESF systems that are exposed to air environments is addressed in items 3.2.1-13.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-15	Copper alloy, Nickel alloy, Steel; stainless steel, Stainless steel, Steel; stainless steel Bolting, Closure bolting exposed to Any environment, Air – outdoor (External), Raw water, Treated borated water, Fuel oil, Treated water, Air – indoor, uncontrolled (External)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage loss of preload of the carbon and low alloy steel and stainless steel bolting exposed to air - indoor uncontrolled, air – outdoor, and treated water in the High Pressure Core Spray System, Low Pressure Core Spray System, Reactor Core Isolation Cooling System, Residual Heat Removal System, Standby Gas Treatment System, and the drywell head stainless steel closure bolting normally submerged in treated water in the containment pool.
3.2.1-16	Steel Containment isolation piping and components (Internal surfaces), Piping, piping components, and piping elements exposed to Treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) program will be used to manage loss of material of the carbon steel heat exchanger components, piping, and piping components exposed to treated water in the High Pressure Core Spray System, Low Pressure Core Spray System, Reactor Core Isolation Cooling System, Residual Heat Removal System, and Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-17	Aluminum, Stainless steel Piping, piping components, and piping elements exposed to Treated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) program will be used to manage loss of material of the stainless steel heat exchanger components, piping, piping components, and piping elements exposed to treated water and treated water > 140°F in the High Pressure Core Spray System, Low Pressure Core Spray System, Reactor Core Isolation Cooling System, Residual Heat Removal System, and Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation. The Bolting Integrity (B.2.1.11) program has been substituted and will be used to manage loss of material of stainless steel bolting exposed to treated water in the Residual Heat Removal System.
3.2.1-18	Stainless steel Containment isolation piping and components (Internal surfaces) exposed to Treated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Not Applicable. Stainless steel piping, piping components, and piping elements exposed to treated water in ESF systems are addressed by Item Number 3.2.1-17.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-19	Stainless steel Heat exchanger tubes exposed to Treated water, Treated water (borated)	Reduction of heat transfer due to fouling	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) program will be used to manage reduction of heat transfer of the stainless steel heat exchanger components exposed to treated water in the Reactor Core Isolation Cooling System and Residual Heat Removal System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.2.1-20	PWR Only				
3.2.1-21	PWR Only				
3.2.1-22	PWR Only				
3.2.1-23	Steel Heat exchanger components, Containment isolation piping and components (Internal surfaces) exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. The Open-Cycle Cooling Water System (B.2.1.12) program will be used to manage loss of material and fouling that leads to corrosion of the carbon steel heat exchanger components exposed to raw water in the Residual Heat Removal System, in the Hydrogen Recombiner room and Standby Gas Treatment System room coolers.
3.2.1-24	PWR Only				

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-25	Stainless steel Heat exchanger components, Containment isolation piping and components (Internal surfaces) exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. The Open-Cycle Cooling Water System (B.2.1.12) program will be used to manage loss of material and fouling that leads to corrosion of the stainless steel piping, piping components, and heat exchanger components exposed to raw water in the Residual Heat Removal System, in the Hydrogen Recombiner room and Standby Gas Treatment System room coolers.
3.2.1-26	Stainless steel Heat exchanger tubes exposed to Raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. The Open-Cycle Cooling Water System (B.2.1.12) program will be used to manage reduction of heat transfer of the stainless steel heat exchanger tubes exposed to raw water in the Residual Heat Removal System.
3.2.1-27	Stainless steel, Steel Heat exchanger tubes exposed to Raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. Stainless steel heat exchanger tubes exposed to raw water in ESF systems are addressed by Item Number 3.2.1-26. There are no steel heat exchanger tubes exposed to raw water in ESF systems.
3.2.1-28	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F) in ESF systems.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-29	Steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no steel piping, piping components, and piping elements exposed to closed-cycle cooling water in ESF systems.
3.2.1-30	Steel Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801 with exceptions. The Closed Treated Water Systems (B.2.1.13) program will be used to manage loss of material of the carbon steel heat exchanger components exposed to closed cycle cooling water in the Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water Systems (B.2.1.13) program implementation.
3.2.1-31	Stainless steel Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801 with exceptions. The Closed Treated Water Systems (B.2.1.13) program will be used to manage loss of material of the stainless steel heat exchanger components exposed to closed cycle cooling water in the Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water Systems (B.2.1.13) program implementation.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-32	Copper alloy Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801 with exceptions. The Closed Treated Water Systems (B.2.1.13) program will be used to manage loss of material of the copper alloy with 15% zinc or less heat exchanger components exposed to closed cycle cooling water in the Reactor Coolant Pressure Boundary System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water Systems (B.2.1.13) program implementation.
3.2.1-33	Copper alloy, Stainless steel Heat exchanger tubes exposed to Closed-cycle cooling water	Reduction of heat transfer due to fouling	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no copper alloy or stainless steel heat exchanger tubes with a heat transfer function exposed to closed-cycle cooling water in ESF systems
3.2.1-34	Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements, Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	Not Applicable. There are no copper alloy (>15% Zn or >8% Al) piping, piping components, and piping elements or heat exchanger components exposed to closed-cycle cooling water in ESF systems.
3.2.1-35	PWR Only				
3.2.1-36	PWR Only				

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-37	Gray cast iron Piping, piping components, and piping elements exposed to Soil	Loss of material due to selective leaching	Chapter XI.M33, "Selective Leaching"	No	Not Applicable. There are no gray cast iron piping, piping components, and piping elements exposed to soil in ESF systems.
3.2.1-38	Elastomers Elastomer seals and components exposed to Air – indoor, uncontrolled (External)	Hardening and loss of strength due to elastomer degradation	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage hardening and loss of strength of the elastomer ducting and component door seals and flexible connections exposed to air - indoor, uncontrolled in the Standby Gas Treatment System.
3.2.1-39	Steel Containment isolation piping and components (External surfaces) exposed to Condensation (External)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. Steel piping components exposed to condensation in the Engineered Safety Features systems are addressed by item 3.2.1-69.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-40	Steel Ducting, piping, and components (External surfaces), Ducting, closure bolting, Containment isolation piping and components (External surfaces) exposed to Air – indoor, uncontrolled (External)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage loss of material for carbon or low alloy steel with stainless steel cladding, carbon steel, carbon steel (with internal coatings), ductile cast iron, and gray cast iron ducting and components, heat exchanger components, piping, piping components, and piping elements, reactor vessel external attachments, and tanks exposed to air – indoor, uncontrolled in the High Pressure Core Spray System, Low Pressure Core Spray System, Reactor Core Isolation Cooling System, Residual Heat Removal System, Standby Gas Treatment System, Reactor Coolant Pressure Boundary System, and Reactor Vessel. Components associated with the Reactor Vessel that are not subject to wetting have no aging effects that need to be managed.
3.2.1-41	Steel External surfaces exposed to Air – outdoor (External)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not Applicable. There are no steel external surfaces exposed to air - outdoor in ESF systems.
3.2.1-42	Aluminum Piping, piping components, and piping elements exposed to Air - outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not Applicable. There are no aluminum piping, piping components, and piping elements exposed to air - outdoor in ESF systems.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-43	Elastomers Elastomer seals and components exposed to Air – indoor, uncontrolled (Internal)	Hardening and loss of strength due to elastomer degradation	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage hardening and loss of strength of elastomer ducting and component seals and flexible connections in the Standby Gas Treatment System.
3.2.1-44	Steel Piping and components (Internal surfaces), Ducting and components (Internal surfaces) exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to general corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material for carbon steel ducting and components in the Standby Gas Treatment System.
3.2.1-45	PWR Only				
3.2.1-46	Steel Piping and components (Internal surfaces) exposed to Condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of the carbon steel, galvanized steel, and gray cast iron ducting and components, piping, piping components, and piping elements exposed to condensation in the Standby Gas Treatment System and Main Steam System.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-47	PWR Only				
3.2.1-48	Stainless steel Piping, piping components, and piping elements (Internal surfaces); tanks exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of the stainless steel piping, piping components, and piping elements, and tanks exposed to condensation in the Standby Liquid Control System, Reactor Core Isolation Cooling System, Residual Heat Removal System, and Standby Gas Treatment System.
3.2.1-49	Steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. The Lubricating Oil Analysis (B.2.1.26) and One-Time Inspection (B.2.1.21) program will be used to manage loss of material of the carbon steel, ductile cast iron, and gray cast iron heat exchanger components, piping, piping components, and tanks exposed to lubricating oil in the High Pressure Core Spray System, Reactor Core Isolation Cooling System, and Reactor Coolant Pressure Boundary System.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-50	Copper alloy, Stainless steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. The Lubricating Oil Analysis (B.2.1.26) and One-Time Inspection (B.2.1.21) program will be used to manage loss of material of the copper alloy with 15% zinc or less heat exchanger components exposed to lubricating oil in the Reactor Coolant Pressure Boundary System.
3.2.1-51	Steel, Copper alloy, Stainless steel Heat exchanger tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. The Lubricating Oil Analysis (B.2.1.26) and One-Time Inspection (B.2.1.21) program will be used to manage reduction of heat transfer of the copper alloy with 15% zinc or less and stainless steel heat exchanger components exposed to lubricating oil in the Diesel Generator and Auxiliaries System, Open Cycle Cooling Water System, and Reactor Core Isolation Cooling System.
3.2.1-52	Steel (with coating or wrapping) Piping, piping components, and piping elements exposed to Soil or Concrete	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There are no steel (with coating or wrapping) piping, piping components, and piping elements exposed to soil or concrete in ESF systems.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-53	Stainless steel, nickel alloy piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There are no stainless steel or nickel alloy piping, piping components, and piping elements exposed to soil or concrete in ESF systems.
3.2.1-53a	Steel, stainless steel, nickel alloy underground piping, piping components, and piping elements exposed to air-indoor uncontrolled or condensation (external)	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There are no steel, stainless steel, or nickel alloy underground piping, piping components, and piping elements exposed to air - indoor uncontrolled or condensation (external) in ESF systems.
3.2.1-54	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	Chapter XI.M7, "BWR Stress Corrosion Cracking," and Chapter XI.M2, "Water Chemistry"	No	Not Applicable. Cracking of stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F) is addressed by Item Number 3.4.1-11.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-55	Steel Piping, piping components, and piping elements exposed to Concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Not Applicable. There are no steel piping, piping components, and piping elements exposed to concrete in ESF systems.
3.2.1-56	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.
3.2.1-57	Copper alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.2.1-58	PWR Only				

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-59	Galvanized steel Ducting, piping, and components exposed to Air – indoor, controlled (External)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.2.1-60	Glass Piping elements exposed to Air – indoor, uncontrolled (External), Lubricating oil, Raw water, Treated water, Treated water (borated), Air with borated water leakage, Condensation (Internal/External), Gas, Closed-cycle cooling water, Air – outdoor	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.2.1-61	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.
3.2.1-62	Nickel alloy Piping, piping components, and piping elements exposed to Air with borated water leakage	None	None	NA - No AEM or AMP	Not Applicable. There are no nickel alloy piping, piping components, and piping elements exposed to air with borated water leakage in ESF systems.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-63	Stainless steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Air with borated water leakage, Concrete, Gas, Air – indoor, uncontrolled (Internal)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.2.1-64	Steel Piping, piping components, and piping elements exposed to Air – indoor, controlled (External), Gas	None	None	NA - No AEM or AMP	Not Applicable. There are no steel piping, piping components, and piping elements exposed to air - indoor, controlled or gas in ESF systems.
3.2.1-65	Any material, piping, piping components, and piping elements exposed to treated water, treated water (borated)	Wall thinning due to erosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with NUREG-1801 with exceptions. The Flow-Accelerated Corrosion (B.2.1.10) program will be used to manage wall thinning of the carbon steel piping and piping components, exposed to treated water in the Low Pressure Core Spray System and Residual Heat Removal System. An exception applies to the NUREG-1801 recommendations for Flow-Accelerated Corrosion (B.2.1.10) program implementation.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-66	Metallic piping, piping components, and tanks exposed to raw water or waste water	Loss of material due to recurring internal corrosion	A plant-specific aging management program is to be evaluated to address recurring internal corrosion	Yes, plant-specific	Not Applicable. See Subsection 3.2.2.2.9.
3.2.1-67	Stainless steel or aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Cracking due to stress corrosion cracking	Chapter XI.M29, “Aboveground Metallic Tanks”	No	Not Applicable. The aluminum Reactor Core Isolation Cooling Storage Tank is not susceptible to cracking. See Table 3.2.2-3.
3.2.1-68	Steel, stainless steel, or aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	Consistent with NUREG-1801. The Aboveground Metallic Tanks (B.2.1.18) program will be used to manage loss of material of the aluminum Reactor Core Isolation Cooling Storage Tank exposed to air - outdoor, air - indoor uncontrolled, concrete, condensation, and soil in the Reactor Core Isolation Cooling System.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-69	Insulated steel, stainless steel, copper alloy, or aluminum, piping, piping components, and tanks exposed to condensation, air-outdoor	Loss of material due to general (steel, and copper alloy only), pitting, and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, "Aboveground Metallic Tanks," (for tanks only)	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage loss of material of insulated carbon steel piping and piping components exposed to condensation in the Reactor Core Isolation Cooling System.
3.2.1-70	Steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water, treated borated water	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Consistent with NUREG-1801. The Aboveground Metallic Tanks (B.2.1.18) program will be used to manage loss of material of the aluminum Reactor Core Isolation Cooling Storage Tank exposed to treated water in the Reactor Core Isolation Cooling System.
3.2.1-71	Insulated stainless steel, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, "Aboveground Metallic Tanks," (for tanks only)	No	Not Applicable. There are no insulated stainless steel, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation or air - outdoor in ESF systems.

Table 3.2.1 Summary of Aging Management Evaluations for the ESF

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-72	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Not Applicable. There are no metallic components with internal linings/coatings exposed to closed cycle cooling water, raw water, treated water, treated borated water, or lubricating oil in ESF systems.
3.2.1-73	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Not Applicable. There are no metallic components with internal linings/coatings exposed to closed cycle cooling water, raw water, treated water, treated borated water, or lubricating oil in ESF systems.
3.2.1-74	Gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Not applicable. There are no gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water in ESF systems.

Table 3.2.2-1
High Pressure Core Spray System
Summary of Aging Management Evaluation

Table 3.2.2-1 High Pressure Core Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-69	3.2.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-69	3.2.1-15	A
Flow Device	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Throttle	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Gearbox (HPCS Water Leg Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	C
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	C
		Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	C
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	C
Piping elements	Pressure Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-15	3.2.1-60	A
			Lubricating Oil (Internal)	None	None	V.F.EP-16	3.2.1-60	A

Table 3.2.2-1 High Pressure Core Spray System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.D2.E-26	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.D2.E-26	3.2.1-40	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Pump Casing (HPCS Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.D2.E-26	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
Pump Casing (HPCS Water Leg Pump)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.D2.E-26	3.2.1-40	A

Table 3.2.2-1 High Pressure Core Spray System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.D2.E-26	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B

Table 3.2.2-1 High Pressure Core Spray System (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.

Table 3.2.2-2
Low Pressure Core Spray System
Summary of Aging Management Evaluation

Table 3.2.2-2 Low Pressure Core Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-69	3.2.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-69	3.2.1-15	A
Flow Device	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Throttle	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-2 Low Pressure Core Spray System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	V.D2.E-408	3.2.1-65	D
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Pump Casing (LPCS Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
Pump Casing (LPCS/RHR A WTR Leg Pump)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A

Table 3.2.2-2 Low Pressure Core Spray System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Pump Casing (LPCS/RHR A WTR Leg Pump)	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B

Table 3.2.2-2 Low Pressure Core Spray System (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.

Table 3.2.2-3
Reactor Core Isolation Cooling System
Summary of Aging Management Evaluation

Table 3.2.2-3 Reactor Core Isolation Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-69	3.2.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-69	3.2.1-15	A
			Air - Outdoor (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-64	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-118	3.2.1-15	A
Flow Device	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.E4.AP-138	3.3.1-100	A
					One-Time Inspection (B.2.1.21)	VII.E4.AP-138	3.3.1-100	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.C.SP-88	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-88	3.4.1-11	B
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Throttle	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-3 Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Flow Device	Throttle	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.E4.AP-138	3.3.1-100	A
					One-Time Inspection (B.2.1.21)	VII.E4.AP-138	3.3.1-100	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.C.SP-88	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-88	3.4.1-11	B
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Gearbox (RCIC Water Leg Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	C
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	C
		Ductile Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	C
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	C
Heat Exchanger (Lube Oil Cooler) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	C

Table 3.2.2-3 Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Lube Oil Cooler) Shell Side Components	Pressure Boundary	Carbon Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	C
Heat Exchanger (Lube Oil Cooler) Tube Sheet	Pressure Boundary	Stainless Steel	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.C1.AP-138	3.3.1-100	C
					One-Time Inspection (B.2.1.21)	VII.C1.AP-138	3.3.1-100	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	C
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	D
Heat Exchanger (Lube Oil Cooler) Tube Side Components	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	C
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	D
Heat Exchanger (Lube Oil Cooler) Tubes	Heat Transfer	Stainless Steel	Lubricating Oil (External)	Reduction of Heat Transfer	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-79	3.2.1-51	A
					One-Time Inspection (B.2.1.21)	V.D2.EP-79	3.2.1-51	A
			Treated Water (Internal)	Reduction of Heat Transfer	One-Time Inspection (B.2.1.21)	V.D2.EP-74	3.2.1-19	A
					Water Chemistry (B.2.1.2)	V.D2.EP-74	3.2.1-19	B
	Pressure Boundary	Stainless Steel	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.C1.AP-138	3.3.1-100	C
					One-Time Inspection (B.2.1.21)	VII.C1.AP-138	3.3.1-100	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-111	3.3.1-25	A

Table 3.2.2-3 Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Lube Oil Cooler) Tubes	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	VII.A4.AP-111	3.3.1-25	B
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-15	3.2.1-60	A
			Lubricating Oil (Internal)	None	None	V.F.EP-16	3.2.1-60	A
			Treated Water (Internal)	None	None	V.F.EP-29	3.2.1-60	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	A
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B

Table 3.2.2-3 Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	V.D2.E-09	3.2.1-11	D
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.C.SP-88	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-88	3.4.1-11	B
				Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Structural Integrity (Attached)	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.EP-61	3.2.1-48	A
Piping, piping components: Insulated	Pressure Boundary	Carbon Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.D2.E-403	3.2.1-69	A
			Steam (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-160	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-160	3.4.1-14	B
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 1

Table 3.2.2-3 Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components: Insulated	Pressure Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	V.D2.E-09	3.2.1-11	D
Pump Casing (Main Oil Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	A
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	A
Pump Casing (RCIC Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
Pump Casing (Water Leg Pump)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Rupture Disks	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-17	3.2.1-61	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)			G, 2
					Water Chemistry (B.2.1.2)			G, 2
Tanks (RCIC Oil Governor Reservoir)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A

Table 3.2.2-3 Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (RCIC Oil Governor Reservoir)	Pressure Boundary	Carbon Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	A
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	A
Tanks (RCIC Storage Tank)-Aboveground Metallic	Pressure Boundary	Aluminum	Air - Indoor, Uncontrolled (External)	None	None	V.D2.E-405	3.2.1-67	I, 3
			Air - Outdoor (External)	Loss of Material	Aboveground Metallic Tanks (B.2.1.18)	V.D2.E-402	3.2.1-68	A
			Concrete	Loss of Material	Aboveground Metallic Tanks (B.2.1.18)	V.D2.E-402	3.2.1-68	A
			Condensation (Internal)	Loss of Material	Aboveground Metallic Tanks (B.2.1.18)	V.D2.E-402	3.2.1-68	A
			Soil (External)	Loss of Material	Aboveground Metallic Tanks (B.2.1.18)	V.D2.E-402	3.2.1-68	A
			Treated Water (Internal)	Loss of Material	Aboveground Metallic Tanks (B.2.1.18)	V.D2.E-404	3.2.1-70	A
Turbine Casings (RCIC Turbine)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-3 Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-77	3.2.1-49	A
					One-Time Inspection (B.2.1.21)	V.D2.EP-77	3.2.1-49	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.C.SP-88	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-88	3.4.1-11	B
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Valve Body: Insulated	Pressure Boundary	Carbon Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.D2.E-403	3.2.1-69	A
			Steam (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-160	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-160	3.4.1-14	B
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 1

Table 3.2.2-3 Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body: Insulated	Pressure Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B

Table 3.2.2-3 Reactor Core Isolation Cooling System (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Programs column indicates that cumulative fatigue damage due to fatigue for this component is evaluated in Section 4.3.
2. Nickel alloy and treated water environment does not appear in NUREG-1801 Rev. 2. Per use of operating experience, NUREG-2191 recommends that the Water Chemistry (B.2.1.2) program and the One-Time Inspection (B.2.1.21) program be used.
3. The RCIC storage tank is constructed of alloy 5454 plates and alloy 5454 and 6061 structural members and piping. The aging effect of cracking due to stress corrosion cracking does not apply to these alloys of aluminum (ref. NUREG-2192 Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants, paragraph 3.2.2.2.8).

Table 3.2.2-4
Residual Heat Removal System
Summary of Aging Management Evaluation

Table 3.2.2-4 Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-69	3.2.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-69	3.2.1-15	A
			Treated Water (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.D2.EP-73	3.2.1-17	E, 1
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-122	3.2.1-15	A
Flexible Connection	Pressure Boundary	Stainless Steel	Treated Water (External)	Cumulative Fatigue Damage	TLAA	II.B1.1.C-21	3.5.1-9	C, 3
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Flow Device	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A

Table 3.2.2-4 Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Flow Device	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Throttle	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Heat Exchanger (RHR Heat Exchanger) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	C
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	D
Heat Exchanger (RHR Heat Exchanger) Tube Sheet	Pressure Boundary	Carbon Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.EP-90	3.2.1-23	A
			Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.E.SP-77	3.4.1-15	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-77	3.4.1-15	B
Heat Exchanger (RHR Heat Exchanger) Tube Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.EP-90	3.2.1-23	A

Table 3.2.2-4 Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (RHR Heat Exchanger) Tubes	Heat Transfer	Stainless Steel	Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.E-21	3.2.1-26	A
			Treated Water (External)	Reduction of Heat Transfer	One-Time Inspection (B.2.1.21)	V.D2.EP-74	3.2.1-19	A
					Water Chemistry (B.2.1.2)	V.D2.EP-74	3.2.1-19	B
	Pressure Boundary	Stainless Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.EP-91	3.2.1-25	A
			Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	C
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	D
Heat Exchanger (Seal Cooler) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.EP-90	3.2.1-23	A
Heat Exchanger (Seal Cooler) Tubes	Heat Transfer	Stainless Steel	Raw Water (External)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.E-21	3.2.1-26	A
			Treated Water (Internal)	Reduction of Heat Transfer	One-Time Inspection (B.2.1.21)	V.D2.EP-74	3.2.1-19	A
					Water Chemistry (B.2.1.2)	V.D2.EP-74	3.2.1-19	B
	Pressure Boundary	Stainless Steel	Raw Water (External)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.EP-91	3.2.1-25	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	C
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	D
Hoses	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B

Table 3.2.2-4 Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	V.D2.E-408	3.2.1-65	D
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.C.SP-88	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-88	3.4.1-11	B

Table 3.2.2-4 Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Stainless Steel	Treated Water > 140°F (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Pump Casing (RHR Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
Pump Casing (Water Leg Pump)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Spray Nozzles	Spray	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Air - Indoor, Uncontrolled (Internal)	Flow Blockage	One-Time Inspection (B.2.1.21)	V.D2.EP-113	3.2.1-6	E, 4
Strainer (Element)	Filter	Stainless Steel	Treated Water (External)	Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 5
				Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A

Table 3.2.2-4 Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.E.E-44	3.2.1-40	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-60	3.2.1-16	A
					Water Chemistry (B.2.1.2)	V.D2.EP-60	3.2.1-16	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	V.D2.EP-73	3.2.1-17	A
					Water Chemistry (B.2.1.2)	V.D2.EP-73	3.2.1-17	B

Table 3.2.2-4 Residual Heat Removal System (Continued)

Notes	Definition of Note
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:

1. The Bolting Integrity (B.2.1.11) program is substituted to manage the loss of material in the submerged stainless steel closure bolting associated with the ECCS suction strainers.
2. The TLAA designation in the Aging Management Programs column indicates that cumulative fatigue damage due to fatigue for this component is evaluated in Section 4.3.
3. The TLAA designation in the Aging Management Programs column indicates that cumulative fatigue damage due to fatigue for this component is evaluated in Section 4.6.
4. The One-Time Inspection (B.2.1.21) will be used to manage flow blockage/fouling of the stainless steel spray nozzles.
5. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) will be used to manage flow blockage/fouling of the stainless steel ECCS suction strainers.

Table 3.2.2-5
Standby Gas Treatment System
Summary of Aging Management Evaluation

Table 3.2.2-5 Standby Gas Treatment System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	V.E.EP-70	3.2.1-13	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-69	3.2.1-15	A
Ducting and Components	Filter	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	VII.J.AP-13	3.3.1-116	A
		Glass	Condensation (External)	None	None	V.F.EP-66	3.2.1-60	C
	Pressure Boundary	Aluminum	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-3	3.2.1-56	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-142	3.3.1-92	C
		Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.B.E-26	3.2.1-40	A
			Air - Indoor, Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-29	3.2.1-44	A

Table 3.2.2-5 Standby Gas Treatment System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Ducting and Components	Pressure Boundary	Carbon Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	A
		Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.B.E-26	3.2.1-40	A
			Condensation (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 3
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 3
		Elastomers	Air - Indoor, Uncontrolled (External)	Hardening and Loss of Strength	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.B.EP-59	3.2.1-38	A
			Air - Indoor, Uncontrolled (Internal)	Hardening and Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.B.EP-58	3.2.1-43	A
		Glass	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-15	3.2.1-60	C
			Condensation (Internal)	None	None	V.F.EP-66	3.2.1-60	C
		Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.B.E-26	3.2.1-40	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	A

Table 3.2.2-5 Standby Gas Treatment System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Ducting and Components	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	C
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-99	3.3.1-94	A
Flexible Connection	Pressure Boundary	Elastomers	Air - Indoor, Uncontrolled (External)	Hardening and Loss of Strength	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.B.EP-59	3.2.1-38	A
			Air - Indoor, Uncontrolled (Internal)	Hardening and Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.B.EP-58	3.2.1-43	A
Flow Device	Pressure Boundary	Galvanized Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-14	3.2.1-59	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	C
	Throttle	Galvanized Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-14	3.2.1-59	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	C
Heat Exchanger (Hydrogen Recombiner Room and SGTS Room Coolers) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 4

Table 3.2.2-5 Standby Gas Treatment System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Hydrogen Recombiner Room and SGTS Room Coolers) Tube Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.B.E-26	3.2.1-40	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.EP-90	3.2.1-23	A
		Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 2
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
		Stainless Steel	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-99	3.3.1-94	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.EP-91	3.2.1-25	A
Heat Exchanger (Hydrogen Recombiner Room and SGTS Room Coolers) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 4
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-72	3.3.1-42	A
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 2
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A

Table 3.2.2-5 Standby Gas Treatment System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.B.E-26	3.2.1-40	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	A
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-10	3.2.1-57	A
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 2
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	A
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-10	3.2.1-57	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.AP-109	3.3.1-79	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	A
		Galvanized Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-14	3.2.1-59	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-99	3.3.1-94	C, 2

Table 3.2.2-5 Standby Gas Treatment System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Stainless Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.EP-61	3.2.1-48	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	V.D2.EP-91	3.2.1-25	C
Valve Body	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	V.B.E-26	3.2.1-40	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	A
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-10	3.2.1-57	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	A
		Galvanized Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-14	3.2.1-59	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	V.F.EP-18	3.2.1-63	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.EP-61	3.2.1-48	A

Table 3.2.2-5 Standby Gas Treatment System (Continued)

Notes	Definition of Note
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:

1. Not Used.
2. Components located inside HVAC housings, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.26) program is used to manage the aging effect(s) applicable to this component type, material, and environment combination.
3. The environment for this material is not identified in NUREG-1801. Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.44) is used to manage the aging effect(s) applicable to this component type, material, and environment combination.
4. This aging effect is not identified in NUREG-1801. Per use of operating experience, NUREG-2191 recommends that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.26) program be used.

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.3, Auxiliary Systems, as being subject to aging management review. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Closed Cycle Cooling Water System (2.3.3.1)
- Combustible Gas Control System (2.3.3.2)
- Compressed Air System (2.3.3.3)
- Control Rod Drive System (2.3.3.4)
- Control Room Ventilation System (2.3.3.5)
- Cranes, Hoists, and Refueling Equipment System (2.3.3.6)
- Demineralized Water Makeup System (2.3.3.7)
- Diesel Generator and Auxiliaries System (2.3.3.8)
- Fire Protection System (2.3.3.9)
- Fuel Pool Cooling and Storage System (2.3.3.10)
- Nonsafety-Related Ventilation System (2.3.3.11)
- Open Cycle Cooling Water System (2.3.3.12)
- Plant Drainage System (2.3.3.13)
- Primary Containment Ventilation System (2.3.3.14)
- Process Radiation Monitoring System (2.3.3.15)
- Process Sampling and Post Accident Monitoring System (2.3.3.16)
- Radwaste System (2.3.3.17)
- Reactor Water Cleanup System (2.3.3.18)
- Safety-Related Ventilation System (2.3.3.19)
- Standby Liquid Control System (2.3.3.20)
- Suppression Pool Cleanup System (2.3.3.21)

3.3.2 RESULTS

The following tables summarize the results of the aging management review for Auxiliary Systems.

Table 3.3.2-1 Closed Cycle Cooling Water System - Summary of Aging Management Evaluation

Table 3.3.2-2 Combustible Gas Control System - Summary of Aging Management Evaluation

Table 3.3.2-3 Compressed Air System - Summary of Aging Management Evaluation

Table 3.3.2-4 Control Rod Drive System - Summary of Aging Management Evaluation

Table 3.3.2-5 Control Room Ventilation System - Summary of Aging Management Evaluation

Table 3.3.2-6 Cranes, Hoists, and Refueling Equipment System - Summary of Aging Management Evaluation

Table 3.3.2-7 Demineralized Water Makeup System - Summary of Aging Management Evaluation

Table 3.3.2-8 Diesel Generator and Auxiliaries System - Summary of Aging Management Evaluation

Table 3.3.2-9 Fire Protection System - Summary of Aging Management Evaluation

Table 3.3.2-10 Fuel Pool Cooling and Storage System - Summary of Aging Management Evaluation

Table 3.3.2-11 Nonsafety-Related Ventilation System - Summary of Aging Management Evaluation

Table 3.3.2-12 Open Cycle Cooling Water System - Summary of Aging Management Evaluation

Table 3.3.2-13 Plant Drainage System - Summary of Aging Management Evaluation

Table 3.3.2-14 Primary Containment Ventilation System - Summary of Aging Management Evaluation

Table 3.3.2-15 Process Radiation Monitoring System - Summary of Aging Management Evaluation

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System - Summary of Aging Management Evaluation

Table 3.3.2-17 Radwaste System - Summary of Aging Management Evaluation

Table 3.3.2-18 Reactor Water Cleanup System - Summary of Aging Management Evaluation

Table 3.3.2-19 Safety-Related Ventilation System - Summary of Aging Management Evaluation

Table 3.3.2-20 Standby Liquid Control System - Summary of Aging Management Evaluation

Table 3.3.2-21 Suppression Pool Cleanup System - Summary of Aging Management Evaluation

3.3.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.3.2.1.1 Closed Cycle Cooling Water System

Materials

The materials of construction for the Closed Cycle Cooling Water System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel (with internal coatings)
- Copper Alloy with 15% Zinc or less
- Glass
- Gray Cast Iron
- Polymer
- Stainless Steel
- Stainless Steel (with internal coatings)
- Stainless Steel Bolting

Environments

The Closed Cycle Cooling Water System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air/Gas - Dry
- Closed Cycle Cooling Water
- Condensation
- Raw Water
- Treated Water

Aging Effect Requiring Management

The following aging effects associated with the Closed Cycle Cooling Water System components require management:

- Cracking
- Hardening and Loss of Strength

- Loss of Coating or Lining Integrity
- Loss of Material
- Loss of Preload
- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Closed Cycle Cooling Water System components:

- Bolting Integrity (B.2.1.11)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)
- One-Time Inspection (B.2.1.21)
- Open-Cycle Cooling Water System (B.2.1.12)
- Selective Leaching (B.2.1.22)
- Water Chemistry (B.2.1.2)

3.3.2.1.2 Combustible Gas Control System

Materials

The materials of construction for the Combustible Gas Control System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Stainless Steel

Environments

The Combustible Gas Control System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Condensation
- Treated Water
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Combustible Gas Control System components require management:

- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Combustible Gas Control System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- One-Time Inspection (B.2.1.21)
- Water Chemistry (B.2.1.2)

3.3.2.1.3 Compressed Air System

Materials

The materials of construction for the Compressed Air System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Copper Alloy with 15% Zinc or less
- Copper Alloy with greater than 15% Zinc
- Gray Cast Iron
- Stainless Steel

Environments

The Compressed Air System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Condensation
- Raw Water
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Compressed Air System components require management:

- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Compressed Air System components:

- Bolting Integrity (B.2.1.11)
- Compressed Air Monitoring (B.2.1.15)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Selective Leaching (B.2.1.22)

3.3.2.1.4 Control Rod Drive System

Materials

The materials of construction for the Control Rod Drive System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Glass
- Stainless Steel
- Stainless Steel Bolting

Environments

The Control Rod Drive System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air/Gas - Dry
- Condensation
- Treated Water
- Treated Water > 140°F

Aging Effect Requiring Management

The following aging effects associated with the Control Rod Drive System components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Control Rod Drive System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- One-Time Inspection (B.2.1.21)
- TLAA
- Water Chemistry (B.2.1.2)

3.3.2.1.5 Control Room Ventilation System

Materials

The materials of construction for the Control Room Ventilation System components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel (with internal coatings)
- Copper Alloy with 15% Zinc or less
- Ductile Cast Iron
- Elastomers
- Galvanized Bolting
- Galvanized Steel
- Glass
- Stainless Steel

Environments

The Control Room Ventilation System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air/Gas - Dry
- Closed Cycle Cooling Water
- Condensation
- Lubricating Oil
- Raw Water
- Treated Water
- Treated Water > 140°F
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Control Room Ventilation System components require management:

- Cracking
- Cumulative Fatigue Damage
- Hardening and Loss of Strength
- Loss of Coating or Lining Integrity
- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer

Aging Management Programs

The following aging management programs manage the aging effects for the Control Room Ventilation System components:

- Bolting Integrity (B.2.1.11)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)

- Lubricating Oil Analysis (B.2.1.26)
- One-Time Inspection (B.2.1.21)
- Open-Cycle Cooling Water System (B.2.1.12)
- Selective Leaching (B.2.1.22)
- TLAA
- Water Chemistry (B.2.1.2)

3.3.2.1.6 Cranes, Hoists, and Refueling Equipment System

Materials

The materials of construction for the Cranes, Hoists, and Refueling Equipment System components are:

- Aluminum Alloy
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Stainless Steel
- Stainless Steel Bolting

Environments

The Cranes, Hoists, and Refueling Equipment System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Treated Water

Aging Effect Requiring Management

The following aging effects associated with the Cranes, Hoists, and Refueling Equipment System components require management:

- Cumulative Fatigue Damage
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Cranes, Hoists, and Refueling Equipment System components:

- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14)
- TLAA

- Water Chemistry (B.2.1.2)

3.3.2.1.7 Demineralized Water Makeup System

Materials

The materials of construction for the Demineralized Water Makeup System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Copper Alloy with 15% Zinc or less
- Glass
- Gray Cast Iron
- Stainless Steel

Environments

The Demineralized Water Makeup System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Raw Water
- Treated Water
- Treated Water > 140°F

Aging Effect Requiring Management

The following aging effects associated with the Demineralized Water Makeup System components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Demineralized Water Makeup System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)

- One-Time Inspection (B.2.1.21)
- Selective Leaching (B.2.1.22)
- TLAA
- Water Chemistry (B.2.1.2)

3.3.2.1.8 Diesel Generator and Auxiliaries System

Materials

The materials of construction for the Diesel Generator and Auxiliaries System components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel (with internal coatings)
- Copper Alloy with 15% Zinc or less
- Copper Alloy with greater than 15% Zinc
- Glass
- Stainless Steel
- Stainless Steel Bolting

Environments

The Diesel Generator and Auxiliaries System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Closed Cycle Cooling Water
- Closed Cycle Cooling Water > 140°F
- Condensation
- Diesel Exhaust
- Fuel Oil
- Lubricating Oil
- Raw Water
- Soil

Aging Effect Requiring Management

The following aging effects associated with the Diesel Generator and Auxiliaries System components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Coating or Lining Integrity
- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer

Aging Management Programs

The following aging management programs manage the aging effects for the Diesel Generator and Auxiliaries System components:

- Bolting Integrity (B.2.1.11)
- Buried and Underground Piping and Tanks (B.2.1.28)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Fuel Oil Chemistry (B.2.1.19)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)
- Lubricating Oil Analysis (B.2.1.26)
- One-Time Inspection (B.2.1.21)
- Open-Cycle Cooling Water System (B.2.1.12)
- Selective Leaching (B.2.1.22)
- TLAA

3.3.2.1.9 Fire Protection System

Materials

The materials of construction for the Fire Protection System components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel (with internal coatings)

- Cementitious Fireproofing
- Concrete Block
- Copper Alloy with 15% Zinc or less
- Copper Alloy with greater than 15% Zinc
- Ductile Cast Iron
- Elastomers
- Galvanized Bolting
- Galvanized Steel
- Glass
- Gray Cast Iron
- Grout
- Gypsum
- Reinforced Concrete
- Aluminum Silicate
- Stainless Steel
- Subliming Compounds

Environments

The Fire Protection System components are exposed to the following environments:

- Air - Indoor, Controlled
- Air - Indoor, Uncontrolled
- Air - Outdoor
- Air/Gas - Dry
- Condensation
- Diesel Exhaust
- Fuel Oil
- Lubricating Oil
- Raw Water
- Soil

Aging Effect Requiring Management

The following aging effects associated with the Fire Protection System components require management:

- Change in Material Properties
- Concrete Cracking and Spalling
- Cracking
- Cracking and Delamination
- Cracking, Loss of Material
- Cumulative Fatigue Damage, Cracking
- Flow Blockage
- Hardening and Loss of Strength
- Increased Hardness, Shrinkage, Loss of Strength
- Loss of Coating or Lining Integrity
- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Preload
- Separation

Aging Management Programs

The following aging management programs manage the aging effects for the Fire Protection System components:

- Bolting Integrity (B.2.1.11)
- Buried and Underground Piping and Tanks (B.2.1.28)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Fire Protection (B.2.1.16)
- Fire Water System (B.2.1.17)
- Fuel Oil Chemistry (B.2.1.19)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)
- Lubricating Oil Analysis (B.2.1.26)
- Masonry Walls (B.2.1.33)

- One-Time Inspection (B.2.1.21)
- Selective Leaching (B.2.1.22)
- Structures Monitoring (B.2.1.34)
- TLAA

3.3.2.1.10 Fuel Pool Cooling and Storage System

Materials

The materials of construction for the Fuel Pool Cooling and Storage System components are:

- Aluminum
- Boral
- Carbon and Low Alloy Steel Bolting
- Carbon or Low Alloy Steel with Stainless Steel Cladding
- Carbon Steel
- Elastomers
- Glass
- Metamic
- Stainless Steel

Environments

The Fuel Pool Cooling and Storage System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Closed Cycle Cooling Water
- Condensation
- Treated Water

Aging Effect Requiring Management

The following aging effects associated with the Fuel Pool Cooling and Storage System components require management:

- Cumulative Fatigue Damage
- Hardening and Loss of Strength
- Loss of Material
- Loss of Preload

- Reduction of Heat Transfer
- Reduction of Neutron Absorbing Capacity; Change in Dimensions and Loss of Material

Aging Management Programs

The following aging management programs manage the aging effects for the Fuel Pool Cooling and Storage System components:

- Bolting Integrity (B.2.1.11)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Monitoring of Neutron-Absorbing Materials Other Than Boraflex (B.2.1.27)
- One-Time Inspection (B.2.1.21)
- TLAA
- Water Chemistry (B.2.1.2)

3.3.2.1.11 Nonsafety-Related Ventilation System

Materials

The materials of construction for the Nonsafety-Related Ventilation System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel (with internal coatings)
- Copper Alloy with 15% Zinc or less
- Galvanized Bolting
- Stainless Steel

Environments

The Nonsafety-Related Ventilation System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air/Gas - Dry
- Closed Cycle Cooling Water
- Condensation

- Raw Water
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Nonsafety-Related Ventilation System components require management:

- Loss of Coating or Lining Integrity
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Nonsafety-Related Ventilation System components:

- Bolting Integrity (B.2.1.11)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)
- Open-Cycle Cooling Water System (B.2.1.12)

3.3.2.1.12 Open Cycle Cooling Water System

Materials

The materials of construction for the Open Cycle Cooling Water System components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel (with internal coatings)
- Galvanized Steel
- Nickel Alloy
- PVC
- Stainless Steel
- Stainless Steel Bolting

Environments

The Open Cycle Cooling Water System components are exposed to the following environments:

- Air - Indoor, Controlled
- Air - Indoor, Uncontrolled
- Air - Outdoor
- Concrete
- Condensation
- Lubricating Oil
- Raw Water
- Soil

Aging Effect Requiring Management

The following aging effects associated with the Open Cycle Cooling Water System components require management:

- Cracking
- Flow Blockage
- Loss of Coatings or Lining Integrity
- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer
- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Open Cycle Cooling Water System components:

- Bolting Integrity (B.2.1.11)
- Buried and Underground Piping and Tanks (B.2.1.28)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)
- Lubricating Oil Analysis (B.2.1.26)

- One-Time Inspection (B.2.1.21)
- Open-Cycle Cooling Water System (B.2.1.12)

3.3.2.1.13 Plant Drainage System

Materials

The materials of construction for the Plant Drainage System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Copper Alloy with 15% Zinc or less
- Copper Alloy with greater than 15% Zinc
- Ductile Cast Iron
- Galvanized Steel
- Glass
- Gray Cast Iron
- PVC
- Stainless Steel
- Stainless Steel Bolting

Environments

The Plant Drainage System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Condensation
- Treated Water
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Plant Drainage System components require management:

- Hardening and Loss of Strength
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Plant Drainage System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- One-Time Inspection (B.2.1.21)
- Selective Leaching (B.2.1.22)
- Water Chemistry (B.2.1.2)

3.3.2.1.14 Primary Containment Ventilation System

Materials

The materials of construction for the Primary Containment Ventilation System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel (with internal coatings)
- Copper Alloy with 15% Zinc or less
- Galvanized Bolting
- Glass
- Gray Cast Iron
- Stainless Steel

Environments

The Primary Containment Ventilation System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air/Gas - Dry
- Closed Cycle Cooling Water
- Condensation
- Lubricating Oil
- Raw Water
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Primary Containment Ventilation System components require management:

- Cracking
- Loss of Coating or Lining Integrity
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Primary Containment Ventilation System components:

- Bolting Integrity (B.2.1.11)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)
- Lubricating Oil Analysis (B.2.1.26)
- One-Time Inspection (B.2.1.21)
- Open-Cycle Cooling Water System (B.2.1.12)
- Selective Leaching (B.2.1.22)

3.3.2.1.15 Process Radiation Monitoring System

Materials

The materials of construction for the Process Radiation Monitoring System components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Nickel Alloy
- Stainless Steel
- Stainless Steel Bolting

Environments

The Process Radiation Monitoring System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Closed Cycle Cooling Water
- Condensation
- Raw Water
- Treated Water

Aging Effect Requiring Management

The following aging effects associated with the Process Radiation Monitoring System components require management:

- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer

Aging Management Programs

The following aging management programs manage the aging effects for the Process Radiation Monitoring System components:

- Bolting Integrity (B.2.1.11)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- One-Time Inspection (B.2.1.21)
- Water Chemistry (B.2.1.2)

3.3.2.1.16 Process Sampling and Post Accident Monitoring System

Materials

The materials of construction for the Process Sampling and Post Accident Monitoring System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Stainless Steel

Environments

The Process Sampling and Post Accident Monitoring System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air/Gas - Dry
- Closed Cycle Cooling Water
- Condensation
- Raw Water
- Treated Water
- Treated Water > 140°F
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Process Sampling and Post Accident Monitoring System components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Process Sampling and Post Accident Monitoring System components:

- Bolting Integrity (B.2.1.11)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- One-Time Inspection (B.2.1.21)
- TLAA
- Water Chemistry (B.2.1.2)

3.3.2.1.17 Radwaste System

Materials

The materials of construction for the Radwaste System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Stainless Steel
- Stainless Steel Bolting

Environments

The Radwaste System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Treated Water
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Radwaste System components require management:

- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Radwaste System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- One-Time Inspection (B.2.1.21)
- Water Chemistry (B.2.1.2)

3.3.2.1.18 Reactor Water Cleanup System

Materials

The materials of construction for the Reactor Water Cleanup System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel

- Glass
- Polymer
- Stainless Steel

Environments

The Reactor Water Cleanup System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Closed Cycle Cooling Water
- Lubricating Oil
- Treated Water
- Treated Water > 140°F

Aging Effect Requiring Management

The following aging effects associated with the Reactor Water Cleanup System components require management:

- Cracking
- Cumulative Fatigue Damage
- Hardening or Loss of Strength
- Loss of Material
- Loss of Preload
- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Reactor Water Cleanup System components:

- Bolting Integrity (B.2.1.11)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Flow-Accelerated Corrosion (B.2.1.10)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Lubricating Oil Analysis (B.2.1.26)
- One-Time Inspection (B.2.1.21)
- TLAA

- Water Chemistry (B.2.1.2)

3.3.2.1.19 Safety-Related Ventilation System

Materials

The materials of construction for the Safety-Related Ventilation System components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel (with internal coatings)
- Copper Alloy with 15% Zinc or less
- Copper Alloy with greater than 15% Zinc
- Elastomers
- Galvanized Bolting
- Galvanized Steel
- Glass
- Nickel Alloy
- Stainless Steel

Environments

The Safety-Related Ventilation System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air/Gas - Dry
- Closed Cycle Cooling Water
- Condensation
- Raw Water
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Safety-Related Ventilation System components require management:

- Cracking
- Hardening and Loss of Strength
- Loss of Coating or Lining Integrity

- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer
- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Safety-Related Ventilation System components:

- Bolting Integrity (B.2.1.11)
- Closed Treated Water Systems (B.2.1.13)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)
- Open-Cycle Cooling Water System (B.2.1.12)

3.3.2.1.20 Standby Liquid Control System

Materials

The materials of construction for the Standby Liquid Control System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Glass
- Gray Cast Iron
- Stainless Steel
- Stainless Steel Bolting

Environments

The Standby Liquid Control System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Condensation
- Lubricating Oil
- Sodium Pentaborate Solution

- Treated Water
- Waste Water

Aging Effect Requiring Management

The following aging effects associated with the Standby Liquid Control System components require management:

- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Standby Liquid Control System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Lubricating Oil Analysis (B.2.1.26)
- One-Time Inspection (B.2.1.21)
- Water Chemistry (B.2.1.2)

3.3.2.1.21 Suppression Pool Cleanup System

Materials

The materials of construction for the Suppression Pool Cleanup System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Gray Cast Iron
- Stainless Steel

Environments

The Suppression Pool Cleanup System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Concrete
- Treated Water

Aging Effect Requiring Management

The following aging effects associated with the Suppression Pool Cleanup System components require management:

- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Suppression Pool Cleanup System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- One-Time Inspection (B.2.1.21)
- Selective Leaching (B.2.1.22)
- Water Chemistry (B.2.1.2)

3.3.2.2 AMR Results for Which Further Evaluation is Recommended by the GALL Report

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the license renewal application. For the Auxiliary Systems, those programs are addressed in the following subsections.

3.3.2.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of metal fatigue as a TLAA for the Process Sampling and Post Accident Monitoring System, Reactor Water Cleanup System, Feedwater System, and Main Steam System is discussed in Section 4.3. The evaluation of crane load cycles as a TLAA for the Cranes, Hoists, and Refueling Equipment System is discussed in Section 4.7.

3.3.2.2.2 Cracking due to Stress Corrosion Cracking and Cyclic Loading

Cracking due to SCC and cyclic loading could occur in stainless steel PWR non-regenerative heat exchanger components exposed to treated borated water greater than 60°C (>140°F) in the chemical and volume control system. The existing aging management program on monitoring and control of primary water chemistry in PWRs manages the aging effects of cracking due to SCC. However, control of water chemistry does not preclude cracking due to SCC and cyclic loading. Therefore, the effectiveness of the water chemistry control program should be verified to ensure that cracking is not occurring. The GALL Report recommends that a plant-specific aging management program be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are managed adequately. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.

Item Number 3.3.1-3 is applicable to PWRs only and is not used for Clinton Power Station.

3.3.2.2.3 Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air. The possibility of cracking also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Cracking is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.

GALL AMP XI.M36, “External Surfaces Monitoring,” is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external chloride stress corrosion cracking is not expected. The GALL Report recommends further evaluation to determine whether an adequate aging management program is used to manage this aging effect based on the environmental conditions applicable to the plant and ASME Code Section XI requirements applicable to the components.

Item Number 3.3.1-4 is not applicable to Clinton Power Station. Cracking due to stress corrosion cracking could occur for stainless steel components exposed to an aggressive air environment with the potential for the concentration of contaminants. Operating experience shows that the ambient air at Clinton Power Station is not aggressive such that cracking of stainless steel components exposed to air is not an applicable aging effect.

3.3.2.2.4 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 GALL Report references NRC Information Notice 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks,” and recommends further evaluation of a plant-specific aging management program to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Item Number 3.3.1-5 is applicable to PWRs only and is not used for Clinton Power Station.

3.3.2.2.5 Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The possibility of pitting and crevice corrosion also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Pitting and crevice corrosion is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.

GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external pitting or crevice corrosion is not expected. The GALL Report recommends further evaluation to determine whether an adequate aging management program is used to manage this aging effect based on the environmental conditions applicable to the plant and ASME Code Section XI requirements Quality Assurance for Aging Management of Nonsafety-Related Components.

Item Number 3.3.1-6 is not applicable to Clinton Power Station. Loss of material due to pitting and crevice corrosion could occur for stainless steel components exposed to an aggressive air environment with the potential for the concentration of contaminants. Operating experience shows that the ambient air at Clinton Power Station is not aggressive such that loss of material of stainless steel components exposed to air is not an applicable aging effect.

3.3.2.2.6 Quality Assurance for Aging Management of Nonsafety-Related Components

QA provisions applicable to License Renewal are discussed in Section B.1.3.

3.3.2.2.7 Ongoing Review of Operating Experience

Ongoing review of operating experience is addressed in Appendix A, Section A.1.6 and Appendix B, Section B.1.4.

3.3.2.2.8 Loss of Material due to Recurring Internal Corrosion

Recurring internal corrosion can result in the need to augment AMPs beyond the recommendations in the GALL Report. During the search of plant-specific OE conducted during the LRA development, recurring internal corrosion can be identified by the number of occurrences of aging effects and the extent of degradation at each localized corrosion site. This further evaluation item is applicable if the search of plant-specific OE reveals repetitive occurrences (e.g., one per refueling outage cycle that has occurred over: (a) three or more sequential or nonsequential cycles for a 10-year OE search, or (b) two or *more sequential or nonsequential cycles for a 5-year OE search) of aging effects with the same aging mechanism in which the aging effect resulted in the component either not meeting plant-specific acceptance criteria or experiencing a reduction in wall thickness greater than 50 percent (regardless of the minimum wall thickness.)*

The GALL Report recommends that a plant-specific AMP, or a new or existing AMP, be evaluated for inclusion of augmented requirements to ensure the adequate management of any recurring aging effect(s). Potential augmented requirements include: alternative examination methods (e.g., volumetric versus external visual), augmented inspections (e.g., a greater number of locations, additional locations based on risk insights based on susceptibility to aging effect and consequences of failure, a greater frequency of inspections), and additional trending parameters and decision points where increased inspections would be implemented. Acceptance criteria are described in Appendix A.1, "Aging Management Review – Generic (Branch Technical Position RSLB-1)."

The applicant states: (a) why the program's examination methods will be sufficient to detect the recurring aging effect before affecting the ability of a component to perform its intended function, (b) the basis for the adequacy of augmented or lack of augmented inspections, (c) what parameters will be trended as well as the decision points where increased inspections would be implemented (e.g., the extent of degradation at individual corrosion sites, the rate of degradation change), (d) how inspections of components that are not easily accessed (i.e., buried, underground) will be conducted, and (e) how leaks in any involved buried or underground components will be identified.

Each plant-specific operating experience example should be evaluated to determine if the chosen AMP should be augmented even if the thresholds for significance of aging effect or frequency of occurrence of aging effect have not been exceeded. For example, during a 10-year search of plant specific operating experience, two instances of 360 degree 30 percent wall loss occurred at copper alloy to steel joints. Neither the significance of the aging effect nor the frequency of occurrence of aging effect threshold has been exceeded. Nevertheless, the operating experience should be evaluated to determine if the AMP that is proposed to manage the aging effect is sufficient (e.g., method of inspection, frequency of inspection, number of inspections) to provide reasonable assurance that the CLB intended functions of the component will be met throughout the period of extended operation. Likewise, the GALL Report AMR items associated with the new FE items only cite raw water and waste water environments because OE indicates that these are the predominant environments associated with recurring internal corrosion; however, if the search of plant-specific OE reveals recurring internal corrosion in other water environments (e.g., treated water), the aging effect should be addressed in a similar manner.

LR-ISG-2012-02 has been issued which addresses instances of recurring internal corrosion identified during review of plant specific operating experience. The operating experience for Clinton Power Station has been reviewed and instances of internal corrosion in the Open Cycle Cooling Water System have been identified with a frequency that is consistent with the thresholds discussed in LR-ISG-2012-02.

Clinton Power Station implements the following inspections:

The Open-Cycle Cooling Water System (B.2.1.12) program is used to manage the loss of material due to recurring internal corrosion in carbon steel piping exposed to raw water.

The review of recent operating experience and inspection results indicates that the OCCWS is subject to recurring internal corrosion as defined in LR-ISR-2012-02. The Clinton Power Station OCCWS aging management program includes inspections to detect recurring internal corrosion. Over sixty Shutdown Service Water system locations are periodically inspected using volumetric examination techniques to monitor for recurring internal corrosion. These inspection locations and frequencies were established as part of GL 89-13 Program implementation and are adjusted as needed based on inspections results. In addition, these inspections are augmented by approximately ten additional inspection locations in other OCCWS that are selected annually. Wall thickness measurements using UT or other suitable techniques are performed at selected locations on above ground piping to identify loss of material due to recurring internal corrosion in carbon steel piping components exposed to raw water. The locations inspected are based on pipe configuration, flow conditions, operating history, and accessibility to provide a representative sample of inspections. The selected inspection locations are periodically reviewed to validate their relevance and usefulness and adjusted as appropriate. Evaluation of the inspection results include (1) a comparison to the nominal wall thickness or previous wall thickness measurements to determine rate of corrosion degradation, (2) a comparison to the design minimum allowable wall thickness to determine the acceptability of the component for continued use, and (3) a determination of reinspection interval to ensure the recurring aging effect is detected prior to loss of intended function.

For buried piping, guided wave inspections of selected buried piping segments are performed annually. In addition, a portion of the aboveground inspection locations will be selected with process conditions similar to those in the buried piping to use as an indicator of the condition of the buried piping. Visual inspections of the piping interior surfaces will be performed whenever the piping internal surface is made accessible due to maintenance and repair activities.

Deficiencies will be documented in accordance with the 10 CFR Part 50, Appendix B Corrective Action Program. The Open-Cycle Cooling Water System (B.2.1.12) program is described in Appendix B.

3.3.2.3 Time-Limited Aging Analysis

The time-limited aging analyses identified below are associated with the Auxiliary Systems components:

- Section 4.3, Metal Fatigue

- Section 4.7, Other Plant-Specific Time-Limited Aging Analysis

3.3.3 CONCLUSION

The Auxiliary Systems piping, fittings, and components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Auxiliary Systems components are identified in the summaries in Section 3.3.2.1 above.

A description of these 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 conclusions provided in Appendix B, the effects of aging associated with the Auxiliary Systems components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the current licensing basis during the period of extended operation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-1	Steel Cranes: structural girders exposed to Air – indoor, uncontrolled (External)	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation for structural girders of cranes that fall within the scope of 10 CFR 54 (Standard Review Plan, Section 4.7, “Other Plant-Specific Time-Limited Aging Analyses,” for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.3.2.2.1.
3.3.1-2	Stainless steel, Steel Heat exchanger components and tubes, Piping, piping components, and piping elements exposed to Treated borated water, Air - indoor, uncontrolled, Treated water	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.3.2.2.1.
3.3.1-3	PWR Only				

Table 3.3.1	Summary of Aging Management Evaluations for the Auxiliary Systems				
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-4	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Not applicable. There are no stainless steel piping, piping components, piping elements, or tanks exposed to air - outdoor in the Auxiliary Systems. See subsection 3.3.2.2.3.
3.3.1-5	PWR Only				
3.3.1-6	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Not applicable. There are no stainless steel piping, piping components, piping elements, or tanks exposed to air - outdoor in the Auxiliary Systems. See subsection 3.3.2.2.5.
3.3.1-7	PWR Only				
3.3.1-8	PWR Only				
3.3.1-9	PWR Only				
3.3.1-10	Steel, high-strength Closure bolting exposed to Air with steam or water leakage	Cracking due to stress corrosion cracking; cyclic loading	Chapter XI.M18, "Bolting Integrity"	No	Not Applicable. There is no steel, high-strength closure bolting exposed to air with steam or water leakage in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-11	Steel, high-strength High-pressure pump, closure bolting exposed to Air with steam or water leakage	Cracking due to stress corrosion cracking; cyclic loading	Chapter XI.M18, "Bolting Integrity"	No	Not Applicable. There is no steel, high-strength high-pressure pump, closure bolting exposed to air with steam or water leakage in the Auxiliary Systems.
3.3.1-12	Steel; stainless steel Closure bolting, Bolting exposed to Condensation, Air – indoor, uncontrolled (External), Air – outdoor (External)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage loss of material of carbon and low alloy steel bolting, galvanized bolting, and stainless steel bolting exposed to air - indoor uncontrolled and air - outdoor in the Closed Cycle Cooling Water System, Combustible Gas Control System, Compressed Air System, Control Rod Drive System, Control Room Ventilation System, Demineralized Water Makeup System, Diesel Generator and Auxiliaries System, Fire Protection System, Fuel Pool Cooling and Storage System, Nonsafety-Related Ventilation System, Open Cycle Cooling Water System, Plant Drainage System, Primary Containment Ventilation System, Process Radiation Monitoring System, Process Sampling and Post Accident Monitoring System, Radwaste System, Reactor Water Cleanup System, Safety-Related Ventilation System, Standby Liquid Control System, and Suppression Pool Cleanup System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-13	Steel Closure bolting exposed to Air with steam or water leakage	Loss of material due to general corrosion	Chapter XI.M18, "Bolting Integrity"	No	Not Applicable. There is no steel closure bolting exposed to air with steam or water leakage in the Auxiliary Systems.
3.3.1-14	Steel, Stainless Steel Bolting exposed to Soil	Loss of preload	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage loss of preload of the galvanized bolting and carbon and low alloy steel bolting exposed to soil in the Fire Protection System and Open Cycle Cooling Water System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-15	Steel; stainless steel, Copper alloy, Nickel alloy, Stainless steel Closure bolting, Bolting exposed to Air – indoor, uncontrolled (External), Any environment, Air – outdoor (External), Raw water, Treated borated water, Fuel oil, Treated water	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage loss of preload of carbon and low alloy steel bolting, galvanized bolting, and stainless steel bolting exposed to air - indoor uncontrolled, air - outdoor, and raw water in the Closed Cycle Cooling Water System, Combustible Gas Control System, Compressed Air System, Control Rod Drive System, Control Room Ventilation System, Demineralized Water Makeup System, Diesel Generator and Auxiliaries System, Fire Protection System, Fuel Pool Cooling and Storage System, Nonsafety-Related Ventilation System, Open Cycle Cooling Water System, Plant Drainage System, Primary Containment Ventilation System, Process Radiation Monitoring System, Process Sampling and Post Accident Monitoring System, Radwaste System, Reactor Water Cleanup System, Safety-Related Ventilation System, Standby Liquid Control System, and Suppression Pool Cleanup System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-16	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	Chapter XI.M2, "Water Chemistry," and Chapter XI.M25, “BWR Reactor Water Cleanup System”	No	Not Applicable. The main process piping in the Clinton Power Station Reactor Water Cleanup (RWCU) System is carbon steel. There are no stainless steel piping, piping components, and piping elements ≥ 4 inch NPS exposed to treated water >60°C (>140°F). Therefore, Clinton Power Station does not use the Chapter XI.M25, “BWR Reactor Water Cleanup System” program to manage cracking. Cracking in RWCU System stainless steel piping, piping components, and piping elements < 4 inch NPS exposed to treated water >60°C (>140°F) is addressed in Item Number 3.3.1-20.
3.3.1-17	Stainless steel Heat exchanger tubes exposed to Treated water, Treated borated water	Reduction of heat transfer due to fouling	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection"	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) programs will be used to manage reduction of heat transfer of stainless steel heat exchanger tubes exposed to treated water in the Fuel Pool Cooling and Storage System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-18	Stainless steel High-pressure pump, casing, Piping, piping components, and piping elements exposed to Treated borated water >60°C (>140°F), Sodium pentaborate solution >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. There are no stainless steel high-pressure pump, casing, piping, piping components, and piping elements exposed to treated borated water >60°C (>140°F) or sodium pentaborate solution >60°C (>140°F) in the Auxiliary Systems.
3.3.1-19	Stainless steel Regenerative heat exchanger components exposed to Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) programs will be used to manage cracking of stainless steel piping and piping components exposed to treated water >60°C (>140°F) in the Demineralized Water Makeup System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-20	Stainless steel, Stainless steel; steel with stainless steel cladding Heat exchanger components exposed to Treated borated water >60°C (>140°F), Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) programs will be used to manage cracking of stainless steel piping, piping components, and heat exchanger components exposed to treated water >60°C (>140°F) in the Control Rod Drive System, Control Room Ventilation System, Process Sampling and Post Accident Monitoring System, and Reactor Water Cleanup System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-21	Steel Piping, piping components, and piping elements exposed to Treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) programs will be used to manage loss of material of carbon steel, ductile cast iron, and gray cast iron piping, piping components, heat exchanger components, and tanks exposed to treated water in the Closed Cycle Cooling Water System, Control Rod Drive System, Control Room Ventilation System, Demineralized Water Makeup System, Fuel Pool Cooling and Storage System, Plant Drainage System, Process Sampling and Post Accident Monitoring System, Radwaste System, Reactor Water Cleanup System, Standby Liquid Control System, and Suppression Pool Cleanup System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.3.1-22	Copper alloy Piping, piping components, and piping elements exposed to Treated water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable There is no copper alloy with 15% zinc or less piping and piping components exposed to treated water in the Auxiliary Systems.
3.3.1-23	Aluminum Piping, piping components, and piping elements exposed to Treated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. The loss of material in aluminum piping, piping components, and piping elements exposed to treated water in the Auxiliary Systems is addressed in Item Number 3.3.1-25.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-24	Aluminum Piping, piping components, and piping elements exposed to Treated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. The loss of material in aluminum piping, piping components, and piping elements exposed to treated water in the Auxiliary Systems is addressed in Item Number 3.3.1-25.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-25	Stainless steel, Stainless steel; steel with stainless steel cladding, Aluminum Piping, piping components, and piping elements, Heat exchanger components exposed to Treated water, Sodium pentaborate solution	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) programs will be used to manage loss of material of aluminum, aluminum alloy, carbon or low alloy steel with stainless steel cladding, and stainless steel heat exchanger components, piping, piping components, and piping elements, expansion joints, fuel storage racks, electric heaters, and tanks exposed to sodium pentaborate solution, treated water, and treated water > 140°F in the Combustible Gas Control System, Control Rod Drive System, Control Room Ventilation System, Demineralized Water Makeup System, Fuel Pool Cooling and Storage System, Process Radiation Monitoring System, Process Sampling and Post Accident Monitoring System, Reactor Water Cleanup System, Standby Liquid Control System, Suppression Pool Cleanup System, and Reactor Core Isolation Cooling System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation. For the stainless steel and aluminum fuel prep machine, the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14) program has been substituted and will be used with the Water Chemistry (B.2.1.2) program to manage loss of material in the Cranes, Hoists, and Refueling Equipment System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-26	Steel, steel with stainless steel cladding Piping, piping components, and piping elements exposed to Treated water	Loss of material due to pitting and crevice corrosion (only after cladding degradation)	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. The loss of material in carbon or low alloy steel with stainless steel cladding, piping, piping components, and piping elements exposed to treated water in the Auxiliary Systems is addressed in Item Number 3.3.1-25.
3.3.1-27	Stainless steel Heat exchanger tubes exposed to Treated water	Reduction of heat transfer due to fouling	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. The reduction of heat transfer of stainless steel heat exchanger tubes exposed to treated water in the Auxiliary Systems is addressed in Item Number 3.3.1-17.
3.3.1-28	PWR Only				
3.3.1-29	PWR Only				
3.3.1-30	Concrete; cementitious material Piping, piping components, and piping elements exposed to Raw Water	Changes in material properties due to aggressive chemical attack	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no concrete; cementitious material piping, piping components, and piping elements exposed to raw water in the Auxiliary Systems.
3.3.1-30a	Fiberglass, HDPE Piping, piping components, and piping elements exposed to Raw water (internal)	Cracking, blistering, change in color due to water absorption	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no fiberglass, HDPE piping, piping components, and piping elements exposed to raw water in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-31	Concrete; cementitious material Piping, piping components, and piping elements exposed to Raw Water	Cracking due to settling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no concrete; cementitious material piping, piping components, and piping elements exposed to raw water in the Auxiliary Systems.
3.3.1-32	Reinforced concrete, asbestos cement Piping, piping components, and piping elements exposed to Raw water	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no reinforced concrete, asbestos cement piping, piping components, and piping elements exposed to raw water in the Auxiliary Systems.
3.3.1-32a	Elastomer seals and components exposed to raw water	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no elastomer seals and components exposed to raw water in the Auxiliary Systems.
3.3.1-33	Concrete; cementitious material Piping, piping components, and piping elements exposed to Raw Water	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no concrete; cementitious material piping, piping components, and piping elements exposed to raw water in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-34	Nickel alloy, Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. The Open-Cycle Cooling Water System (B.2.1.12) program will be used to manage loss of material of the nickel alloy piping components exposed to raw water in the Open Cycle Cooling Water System.
3.3.1-35	Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no copper alloy piping, piping components, or piping elements exposed to raw water in the Auxiliary Systems within the scope of the Open-Cycle Cooling Water System (B.2.1.12) program.
3.3.1-36	Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no copper alloy piping, piping components, or piping elements exposed to raw water in the Auxiliary Systems within the scope of the Open-Cycle Cooling Water System (B.2.1.12) program.
3.3.1-37	Steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. The Open-Cycle Cooling Water System (B.2.1.12) program will be used to manage loss of material and fouling that leads to corrosion of carbon steel and galvanized steel piping, piping components, and piping elements exposed to raw water in the Nonsafety-Related Ventilation System and Open Cycle Cooling Water System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-38	Copper alloy, Steel Heat exchanger components exposed to Raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-1801. The Open-Cycle Cooling Water System (B.2.1.12) program will be used to manage loss of material and fouling that leads to corrosion of carbon steel and copper alloy with 15% zinc or less heat exchanger components exposed to raw water in the Closed Cycle Cooling Water System, Control Room Ventilation System, Diesel Generator and Auxiliaries System, Nonsafety-Related Ventilation System, Primary Containment Ventilation System, Safety-Related Ventilation System, and Standby Gas Treatment System.
3.3.1-39	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. The loss of material in stainless steel piping, piping components, and piping elements exposed to raw water within the scope of the Open-Cycle Cooling Water System program is addressed in Item Numbers 3.3.1-40 and 3.2.1-25.
3.3.1-40	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-1801. The Open-Cycle Cooling Water System (B.2.1.12) program will be used to manage loss of material and fouling that leads to corrosion of stainless steel heat exchanger components, piping, piping components, and piping elements in the Open Cycle Cooling Water System, Process Radiation Monitoring System, and Process Sampling and Post Accident Monitoring System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-41	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Not Applicable. The loss of material in stainless steel piping, piping components, and piping elements exposed to raw water within the scope of the Open-Cycle Cooling Water System program is addressed in Item Numbers 3.3.1-40 and 3.2.1-25.
3.3.1-42	Copper alloy, Titanium, Stainless steel Heat exchanger tubes exposed to Raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. The Open-Cycle Cooling Water System (B.2.1.12) program will be used to manage reduction of heat transfer of the copper alloy with 15% zinc or less and stainless steel heat exchanger tubes exposed to raw water in the Control Room Ventilation System, Diesel Generator and Auxiliaries System, Open Cycle Cooling Water System, Standby Gas Treatment System, and Safety-Related Ventilation System.
3.3.1-43	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801 with exceptions. The Closed Treated Water Systems (B.2.1.13) program will be used to manage cracking of stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water >60°C (>140°F) in the Diesel Generator and Auxiliaries System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water Systems (B.2.1.13) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-44	Stainless steel; steel with stainless steel cladding Heat exchanger components exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no stainless steel or steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water > 140°F in the Auxiliary Systems.
3.3.1-45	Steel Piping, piping components, and piping elements; tanks exposed to Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801 with exceptions. The Closed Treated Water Systems (B.2.1.13) program will be used to manage loss of material of carbon steel and gray cast iron piping, piping components, piping elements and tanks exposed to closed cycle cooling water in the Closed Cycle Cooling Water System, Control Room Ventilation System, Diesel Generator and Auxiliaries System, Nonsafety-Related Ventilation System, Primary Containment Ventilation System, Process Radiation Monitoring System, and Reactor Water Cleanup System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water Systems (B.2.1.13) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-46	Steel, Copper alloy Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801 with exceptions. The Closed Treated Water Systems (B.2.1.13) program will be used to manage loss of material of carbon steel, copper alloy with 15% zinc or less, and copper alloy with greater than 15% zinc heat exchanger components exposed to closed cycle cooling water in the Closed Cycle Cooling Water System, Control Room Ventilation System, Diesel Generator and Auxiliaries System, Fuel Pool Cooling and Storage System, Nonsafety-Related Ventilation System, Primary Containment Ventilation System, Process Radiation Monitoring System, Process Sampling and Post Accident Monitoring System, Reactor Water Cleanup System, and Safety-Related Ventilation System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water Systems (B.2.1.13) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-47	Stainless steel; steel with stainless steel cladding Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to microbiologically-influenced corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801 with exceptions. The Closed Treated Water Systems (B.2.1.13) program will be used to manage loss of material of steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water in the Fuel Pool Cooling and Storage System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water Systems (B.2.1.13) program implementation.
3.3.1-48	Aluminum Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no aluminum piping, piping components, and piping elements exposed to closed-cycle cooling water in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-49	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801 with exceptions. The Closed Treated Water Systems (B.2.1.13) program will be used to manage loss of material of stainless steel heat exchanger components, tanks, piping, piping components, and piping elements exposed to closed cycle cooling water and closed cycle cooling water > 140°F in the Closed Cycle Cooling Water System, Control Room Ventilation System, Diesel Generator and Auxiliaries System, Fuel Pool Cooling and Storage System, Primary Containment Ventilation System, Process Radiation Monitoring System, and Process Sampling and Post Accident Monitoring System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water Systems (B.2.1.13) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-50	Stainless steel, Copper Alloy, Steel Heat exchanger tubes exposed to Closed-cycle cooling water	Reduction of heat transfer due to fouling	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801 with exceptions. The Closed Treated Water Systems (B.2.1.13) program will be used to manage reduction of heat transfer of copper alloy with 15% zinc or less and stainless steel heat exchanger tubes exposed to closed cycle cooling water in the Control Room Ventilation System, Diesel Generator and Auxiliaries System, and Fuel Pool Cooling and Storage System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water Systems (B.2.1.13) program implementation.
3.3.1-51	Boraflex Spent fuel storage racks: neutron-absorbing sheets (PWR), Spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to Treated borated water, Treated water	Reduction of neutron-absorbing capacity due to boraflex degradation	Chapter XI.M22, “Boraflex Monitoring”	No	Not applicable. Clinton Power Station does not use Boraflex for neutron absorption in the spent fuel storage racks. The Clinton Power Station spent fuel storage racks use boral and Metamic for neutron absorption. The reduction in neutron absorbing capacity for boral and Metamic is addressed in Item Number 3.3.1-102.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-52	Steel Cranes: rails and structural girders exposed to Air – indoor, uncontrolled (External)	Loss of material due to general corrosion	Chapter XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems”	No	Consistent with NUREG-1801. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14) program will be used to manage loss of material of carbon steel crane/hoist components exposed to air - indoor uncontrolled in the Cranes, Hoists, and Refueling Equipment System.
3.3.1-53	Steel Cranes - rails exposed to Air – indoor, uncontrolled (External)	Loss of material due to wear	Chapter XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems”	No	Consistent with NUREG-1801. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14) program will be used to manage loss of material of carbon steel crane/hoist components exposed to air - indoor uncontrolled in the Cranes, Hoists, and Refueling Equipment System.
3.3.1-54	Copper alloy Piping, piping components, and piping elements exposed to Condensation	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M24, “Compressed Air Monitoring"	No	Consistent with NUREG-1801 with exceptions. The Compressed Air Monitoring (B.2.1.15) program will be used to manage loss of material of the copper alloy with 15% zinc or less and copper alloy with greater than 15% zinc piping and piping components exposed to condensation in the Compressed Air System. An exception applies to the NUREG-1801 recommendations for Compressed Air Monitoring (B.2.1.15) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-55	Steel Piping, piping components, and piping elements: compressed air system exposed to Condensation (Internal)	Loss of material due to general and pitting corrosion	Chapter XI.M24, “Compressed Air Monitoring”	No	Consistent with NUREG-1801 with exceptions. The Compressed Air Monitoring (B.2.1.15) program will be used to manage loss of material of carbon steel piping and piping components exposed to condensation in the Compressed Air System. An exception applies to the NUREG-1801 recommendations for Compressed Air Monitoring (B.2.1.15) program implementation.
3.3.1-56	Stainless steel Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M24, “Compressed Air Monitoring”	No	Consistent with NUREG-1801 with exceptions. The Compressed Air Monitoring (B.2.1.15) program will be used to manage loss of material of stainless steel piping, piping components, and piping elements exposed to condensation in the Compressed Air System. An exception applies to the NUREG-1801 recommendations for Compressed Air Monitoring (B.2.1.15) program implementation.
3.3.1-57	Elastomers Fire barrier penetration seals exposed to Air - indoor, uncontrolled, Air – outdoor	Increased hardness; shrinkage; loss of strength due to weathering	Chapter XI.M26, "Fire Protection"	No	Consistent with NUREG-1801 with exceptions. The Fire Protection (B.2.1.16) program will be used to manage increased hardness, shrinkage, and loss of strength of elastomer fire barriers (penetration seals and fire stops) exposed to air - indoor uncontrolled in the Fire Protection System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-58	Steel Halon/carbon dioxide fire suppression system piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M26, "Fire Protection"	No	Consistent with NUREG-1801 with exceptions. The Fire Protection (B.2.1.16) program will be used to manage loss of material of carbon steel, ductile cast iron, and gray cast iron piping and piping components, exposed to air - indoor uncontrolled in the Fire Protection System.
3.3.1-59	Steel Fire rated doors exposed to Air - indoor, uncontrolled, Air – outdoor	Loss of material due to wear	Chapter XI.M26, "Fire Protection"	No	Consistent with NUREG-1801 with exceptions. The Fire Protection (B.2.1.16) program will be used to manage loss of material of carbon steel fire barriers (doors) exposed to air - indoor uncontrolled and air - outdoor in the Fire Protection System.
3.3.1-60	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	Chapter XI.M26, “Fire Protection,” and Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801 with exceptions. The Fire Protection (B.2.1.16) and Structures Monitoring (B.2.1.34) programs will be used to manage concrete cracking and spalling of grout and reinforced concrete fire barriers (penetration seals and fire stops, walls, ceilings, and floors, and curbs) exposed to air - indoor uncontrolled in the Fire Protection System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-61	Reinforced concrete Structural fire barriers: walls, ceilings and floors exposed to Air – outdoor	Cracking, loss of material due to freeze-thaw, aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, “Fire Protection,” and Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801 with exceptions. The Fire Protection (B.2.1.16) and Structures Monitoring (B.2.1.34) programs will be used to manage cracking and loss of material of reinforced concrete fire barriers (walls, ceilings, and floors) exposed to air - outdoor in the Fire Protection System.
3.3.1-62	Reinforced concrete Structural fire barriers: walls, ceilings and floors exposed to Air - indoor, uncontrolled, Air – outdoor	Loss of material due to corrosion of embedded steel	Chapter XI.M26, “Fire Protection,” and Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801 with exceptions. The Fire Protection (B.2.1.16) and Structures Monitoring (B.2.1.34) programs will be used to manage loss of material in reinforced concrete fire barriers (curbs and walls, ceilings, and floors) exposed to air - indoor uncontrolled and air - outdoor in the Fire Protection System.
3.3.1-63	Steel Fire Hydrants exposed to Air – outdoor	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801 with exceptions. The Fire Water System (B.2.1.17) program will be used to manage loss of material of ductile cast iron and gray cast iron fire hydrants exposed to air - outdoor in the Fire Protection System. An exception applies to the NUREG-1801 recommendations for Fire Water System (B.2.1.17) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-64	Steel, Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801 with exceptions. The Fire Water System (B.2.1.17) program will be used to manage loss of material, fouling that leads to corrosion, and flow blockage of carbon steel, copper alloy with 15% zinc or less, copper alloy with greater than 15% zinc, ductile cast iron, galvanized steel, and gray cast iron piping, piping components, and piping elements and tanks exposed to raw water in the Fire Protection System. An exception applies to the NUREG-1801 recommendations for Fire Water System (B.2.1.17) program implementation. The Bolting Integrity (B.2.1.11) program has been substituted and will be used to manage loss of material of carbon and low alloy steel bolting exposed to raw water in the Fire Protection System.
3.3.1-65	Aluminum Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	Not applicable. There are no aluminum piping, piping components, or piping elements exposed to raw water in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-66	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801 with exceptions. The Fire Water System (B.2.1.17) program will be used to manage loss of material, fouling that leads to corrosion, and flow blockage of stainless steel piping, piping components, and piping elements exposed to raw water in the Fire Protection System. An exception applies to the NUREG-1801 recommendations for Fire Water System (B.2.1.17) program implementation. The Open-Cycle Cooling Water System (B.2.1.12) program has been substituted and will be used to manage flow blockage of stainless steel piping components in the Open Cycle Cooling Water System.
3.3.1-67	Steel Tanks exposed to Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not Applicable. There are no steel tanks exposed to air - outdoor in the Auxiliary Systems within the scope of the Aboveground Metallic Tanks (B.2.1.18) program.
3.3.1-68	Steel Piping, piping components, and piping elements exposed to Fuel oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. The Fuel Oil Chemistry (B.2.1.19) and One-Time Inspection (B.2.1.21) programs will be used to manage loss of material of carbon steel, carbon steel (with internal coatings) and ductile cast iron piping, piping components, and piping elements and tanks exposed to fuel oil in the Fire Protection System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-69	Copper alloy Piping, piping components, and piping elements exposed to Fuel oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M30, "Fuel Oil Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. The Fuel Oil Chemistry (B.2.1.19) and One-Time Inspection (B.2.1.21) programs will be used to manage loss of material of copper alloy with greater than 15% zinc piping, piping components, and piping elements exposed to fuel oil in the Fire Protection System.
3.3.1-70	Steel Piping, piping components, and piping elements; tanks exposed to Fuel oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M30, "Fuel Oil Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. The Fuel Oil Chemistry (B.2.1.19) and One-Time Inspection (B.2.1.21) programs will be used to manage loss of material and fouling that leads to corrosion of carbon steel and carbon steel (with internal coatings) piping, piping components, and tanks exposed to fuel oil in the Diesel Generator and Auxiliaries System.
3.3.1-71	Stainless steel, Aluminum Piping, piping components, and piping elements exposed to Fuel oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M30, "Fuel Oil Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. The Fuel Oil Chemistry (B.2.1.19) and One-Time Inspection (B.2.1.21) programs will be used to manage loss of material of stainless steel and aluminum piping, piping components, and piping elements exposed to fuel oil in the Diesel Generator and Auxiliaries System and Fire Protection System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-72	Gray cast iron, Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements, Heat exchanger components exposed to Treated water, Closed-cycle cooling water, Soil, Raw water, Waste water	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	Consistent with NUREG-1801 with exceptions. The Selective Leaching (B.2.1.22) program will be used to manage loss of material of copper alloy with greater than 15% zinc, ductile cast iron, and gray cast iron heat exchanger components, piping, piping components, piping elements, and tanks exposed to closed cycle cooling water, raw water, soil, treated water, and waste water in the Closed Cycle Cooling Water System, Compressed Air System, Control Room Ventilation System, Demineralized Water Makeup System, Diesel Generator and Auxiliaries System, Fire Protection System, Plant Drainage System, Primary Containment Ventilation System, and Suppression Pool Cleanup System. An exception applies to the NUREG-1801 recommendations for Selective Leaching (B.2.1.22) program implementation.
3.3.1-73	Concrete; cementitious material Piping, piping components, and piping elements exposed to Air - outdoor	Changes in material properties due to aggressive chemical attack	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not Applicable. There are no concrete; cementitious material piping, piping components, and piping elements exposed to air - outdoor in the Auxiliary Systems.
3.3.1-74	Concrete; cementitious material Piping, piping components, and piping elements exposed to Air - outdoor	Cracking due to settling	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not Applicable. There are no concrete; cementitious material piping, piping components, and piping elements exposed to air - outdoor in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-75	Reinforced concrete, asbestos cement Piping, piping components, and piping elements exposed to Air – outdoor	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not Applicable. There are no reinforced concrete, asbestos cement piping, piping components, and piping elements exposed to air - outdoor in the Auxiliary Systems.
3.3.1-76	Elastomers Elastomer: seals and components exposed to Air – indoor, uncontrolled (Internal/External)	Hardening and loss of strength due to elastomer degradation	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801 with exceptions. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage hardening and loss of strength of elastomer seals and components exposed to air - indoor uncontrolled in the Control Room Ventilation System, Safety-Related Ventilation System, and Fuel Pool Cooling and Storage System. The Fire Protection (B.2.1.16) program has been substituted and will be used to manage hardening and loss of strength of elastomer hoses exposed to air - indoor uncontrolled in the Fire Protection System.
3.3.1-77	Concrete; cementitious material Piping, piping components, and piping elements exposed to Air - outdoor	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not Applicable. There are no concrete; cementitious material piping, piping components, and piping elements exposed to air - outdoor in the Auxiliary Systems.

3.3.1-78	Steel Piping and components (External surfaces), Ducting and components (External surfaces), Ducting; closure bolting exposed to Air – indoor, uncontrolled (External), Air – indoor, uncontrolled (External), Air – outdoor (External), Condensation (External)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801 with exceptions. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage loss of material carbon steel, carbon steel (with internal coating), ductile cast iron, gray cast iron, and gray cast iron (with internal coating) ducting and components, heat exchanger components, piping, piping components, and piping elements, and tanks exposed to air - indoor uncontrolled, air – outdoor, and condensation in the Closed Cycle Cooling Water System, Combustible Gas Control System, Compressed Air System, Control Rod Drive System, Control Room Ventilation System, Demineralized Water Makeup System, Diesel Generator and Auxiliaries System, Fire Protection System, Fuel Pool Cooling and Storage System, Nonsafety-Related Ventilation System, Open Cycle Cooling Water System, Plant Drainage System, Primary Containment Ventilation System, Process Radiation Monitoring System, Process Sampling and Post Accident Monitoring System, Radwaste System, Reactor Water Cleanup System, Safety-Related Ventilation System, Standby Liquid Control System, Suppression Pool Cleanup System, and Main Steam System. The Fire Protection (B.2.1.16) program has been substituted and will be used to manage loss of material of carbon steel fire barriers and tanks exposed to air - indoor uncontrolled and air - outdoor in the Fire Protection System. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program has been substituted and will be used to manage loss of material of carbon steel heat exchanger components and ducting components

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					exposed to condensation in the Nonsafety-Related Ventilation System, Primary Containment Ventilation System, and Safety-Related Ventilation System.
3.3.1-79	Copper alloy Piping, piping components, and piping elements exposed to Condensation (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage loss of material of copper alloy with greater than 15% zinc piping components exposed to condensation (external) in the Standby Gas Treatment System.
3.3.1-80	Steel Heat exchanger components, Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage loss of material of carbon steel heat exchanger components exposed to air - indoor uncontrolled in the Diesel Generator and Auxiliaries System and Primary Containment Ventilation System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-81	Copper alloy, Aluminum Piping, piping components, and piping elements exposed to Air – outdoor (External), Air - outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801 with exceptions. The Fire Water System (B.2.1.17) program has been substituted and will be used to manage loss of material of copper alloy with 15% zinc or less fire hydrants exposed to air - outdoor in the Fire Protection System. An exception applies to the NUREG-1801 recommendations for Fire Water System (B.2.1.17) program implementation. The Fire Protection (B.2.1.16) program has been substituted and will be used to manage loss of material of copper alloy with 15% zinc or less piping and piping components exposed to air - outdoor in the Fire Protection System.
3.3.1-82	Elastomers Elastomer: seals and components exposed to Air – indoor, uncontrolled (External)	Loss of material due to wear	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage loss of material of elastomer seals and components exposed to air - indoor uncontrolled in the Control Room Ventilation System, Fuel Pool Cooling and Storage System, and Safety-Related Ventilation System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-83	Stainless steel Diesel engine exhaust piping, piping components, and piping elements exposed to Diesel exhaust	Cracking due to stress corrosion cracking	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage cracking of the stainless steel diesel engine exhaust piping components exposed to diesel exhaust in the Fire Protection System.
3.3.1-84	There is no Item Number 3.3.1-84 listed in NUREG-1800 or subsequent issued ISGs.				
3.3.1-85	Elastomers Elastomer seals and components exposed to Closed-cycle cooling water	Hardening and loss of strength due to elastomer degradation	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not Applicable. There are no elastomer seals and components exposed to closed cycle cooling water in the Auxiliary Systems.
3.3.1-86	Elastomers Elastomers, linings, Elastomer: seals and components exposed to Treated borated water, Treated water, Raw water	Hardening and loss of strength due to elastomer degradation	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage hardening and loss of strength of elastomer seals and components exposed to treated water in the Fuel Pool Cooling and Storage System and Fuel Building.
3.3.1-87	There is no Item Number 3.3.1-87 listed in NUREG-1800 or subsequent issued ISGs.				

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-88	Steel; stainless steel Piping, piping components, and piping elements, Piping, piping components, and piping elements, diesel engine exhaust exposed to Raw water (potable), Diesel exhaust	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of carbon steel, galvanized steel, gray cast iron and stainless diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust and raw water (potable) in the Demineralized Water Makeup System, Diesel Generator and Auxiliaries System, and Fire Protection System.
3.3.1-89	Steel, Copper alloy Piping, piping components, and piping elements exposed to Moist air or condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	For fire water system components: Chapter XI.M27, "Fire Water System," or for other components: Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of carbon steel, carbon steel (with internal coatings), copper alloy with 15% zinc or less, copper alloy with greater than 15% zinc, and ductile cast iron heat exchanger components, piping, piping components, piping elements, and tanks exposed to condensation in the Compressed Air System, Control Rod Drive System, Control Room Ventilation System, Diesel Generator and Auxiliaries System, Fire Protection System, Open Cycle Cooling Water System, Primary Containment Ventilation System, Process Sampling and Post Accident Monitoring System, Safety-Related Ventilation System, and Standby Gas Treatment System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-90	Steel 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	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801 with exceptions. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of carbon steel and galvanized steel ducting and components, compressor housings, piping, piping components, and piping elements exposed to condensation in the Combustible Gas Control System, Control Room Ventilation System, Primary Containment Ventilation System, and Safety-Related Ventilation System. The Fire Protection (B.2.1.16) has been substituted and will be used to manage loss of material of galvanized steel fire damper assemblies exposed to condensation in the Fire Protection System.
3.3.1-91	Steel Piping, piping components, and piping elements; tanks exposed to Waste Water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of carbon steel, ductile cast iron, gray cast iron, and galvanized steel heat exchanger components, piping, piping components, and piping elements, and tanks exposed to waste water in the Combustible Gas Control System, Compressed Air System, Plant Drainage System, Primary Containment Ventilation System, and Radwaste System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-92	Aluminum Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of aluminum alloy ducting and components and piping components exposed to condensation in the Control Room Ventilation System, Process Radiation Monitoring System, and Standby Gas Treatment System.
3.3.1-93	Copper alloy Piping, piping components, and piping elements exposed to Raw water (potable)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) will be used to manage loss of material of copper alloy with 15% zinc or less and copper alloy greater than 15% zinc piping and piping components exposed to raw water in the Demineralized Water Makeup System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-94	Stainless steel Ducting and components exposed to Condensation	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801 with exceptions. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of stainless steel ducting and components, heat exchanger components, piping, piping components, piping elements, and tanks exposed to condensation in the Combustible Gas Control System, Control Room Ventilation System, Diesel Generator and Auxiliaries System, Nonsafety-Related Ventilation System, Primary Containment Ventilation System, Process Radiation Monitoring System, Process Sampling and Post Accident Monitoring System, Safety-Related Ventilation System, and Standby Gas Treatment System. The Fire Protection (B.2.1.16) program has been substituted and will be used to manage loss of material of stainless steel fire damper assemblies exposed to condensation in the Fire Protection System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-95	Copper alloy, Stainless steel, Nickel alloy, Steel Piping, piping components, and piping elements, Heat exchanger components, Piping, piping components, and piping elements; tanks exposed to Waste water, Condensation (Internal)	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of carbon steel, copper alloy with 15% zinc or less, copper alloy with greater than 15% zinc, nickel alloy, and stainless steel piping, piping components, and piping elements, heat exchanger components, sumps, and tanks exposed to condensation and waste water in the Closed Cycle Cooling Water System, Combustible Gas Control System, Compressed Air System, Control Room Ventilation System, Diesel Generator and Auxiliaries System, Fuel Pool Cooling and Storage System, Nonsafety-Related Ventilation System, Plant Drainage System, Primary Containment Ventilation System, Process Radiation Monitoring System, Process Sampling and Post Accident Monitoring System, Radwaste System, Safety-Related Ventilation System, Standby Liquid Control System, and sumps in the Primary Containment.
3.3.1-96	Elastomers Elastomer: seals and components exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to wear	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not Applicable. There are no elastomers, elastomer seals and components exposed to indoor air that are subject to loss of material due to wear.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-97	Steel Piping, piping components, and piping elements, Reactor coolant pump oil collection system: tanks, Reactor coolant pump oil collection system: piping, tubing, valve bodies exposed to Lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. The Lubricating Oil Analysis (B.2.1.26) and One-Time Inspection (B.2.1.21) programs will be used to manage loss of material of carbon steel and gray cast iron piping and piping components, exposed to lubricating oil in the Control Room Ventilation System, Diesel Generator and Auxiliaries System, Fire Protection System, Reactor Water Cleanup System, and Standby Liquid Control System.
3.3.1-98	Steel Heat exchanger components exposed to Lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. The Lubricating Oil Analysis (B.2.1.26) and One-Time Inspection (B.2.1.21) programs will be used to manage loss of material and fouling that leads to corrosion of carbon steel heat exchanger components exposed to lubricating oil in the Diesel Generator and Auxiliaries System and Primary Containment Ventilation System.
3.3.1-99	Copper alloy, Aluminum Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, “Lubricating Oil Analysis,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. The Lubricating Oil Analysis (B.2.1.26) and One-Time Inspection (B.2.1.21) programs will be used to manage loss of material of aluminum, copper alloy with 15% zinc or less, and copper alloy with greater than 15% zinc heat exchanger components, piping, and piping components exposed to lubricating oil in the Diesel Generator and Auxiliaries System, Open Cycle Cooling Water System, and Reactor Coolant Pressure Boundary System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-100	Stainless steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. The Lubricating Oil Analysis (B.2.1.26) and One-Time Inspection (B.2.1.21) programs will be used to manage loss of material of stainless steel heat exchanger components, piping, piping components, and piping elements, and tanks exposed to lubricating oil in the Open Cycle Cooling Water System, Reactor Core Isolation Cooling System, and Reactor Coolant Pressure Boundary System.
3.3.1-101	Aluminum Heat exchanger tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. The Lubricating Oil Analysis (B.2.1.26) and One-Time Inspection (B.2.1.21) programs will be used to manage reduction of heat transfer of aluminum heat exchanger components exposed to lubricating oil in the Open Cycle Cooling Water System.
3.3.1-102	Boral®; boron steel, and other materials (excluding Boraflex) Spent fuel storage racks: neutron-absorbing sheets (PWR), Spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to Treated borated water, Treated water	Reduction of neutron-absorbing capacity; change in dimensions and loss of material due to effects of SFP environment	Chapter XI.M40, "Monitoring of Neutron-Absorbing Materials other than Boraflex"	No	Consistent with NUREG-1801. The Monitoring of Neutron-Absorbing Materials Other Than Boraflex (B.2.1.27) program will be used to manage reduction of neutron absorbing capacity, change in dimensions and loss of material of the Boral and Metamic fuel storage racks exposed to treated water in the Fuel Pool Cooling and Storage System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-103	Reinforced concrete, asbestos cement Piping, piping components, and piping elements exposed to Soil or concrete	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M41, “Buried and Underground Piping and Tanks”	No	Not Applicable. There are no reinforced concrete, asbestos cement piping, piping components, and piping elements exposed to soil or concrete in the Auxiliary Systems.
3.3.1-104	HDPE, Fiberglass Piping, piping components, and piping elements exposed to Soil or concrete	Cracking, blistering, change in color due to water absorption	Chapter XI.M41, “Buried and Underground Piping and Tanks”	No	Not Applicable. There are no HDPE, fiberglass piping, piping components, and piping elements exposed to soil or concrete in the Auxiliary Systems.
3.3.1-105	Concrete cylinder piping, Asbestos cement pipe Piping, piping components, and piping elements exposed to Soil or concrete	Cracking, spalling, corrosion of rebar due to exposure of rebar	Chapter XI.M41, “Buried and Underground Piping and Tanks”	No	Not Applicable. There are no concrete cylinder piping, asbestos cement piping, piping components, and piping elements exposed to soil or concrete in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-106	Steel (with coating or wrapping) Piping, piping components, and piping elements exposed to Soil or concrete	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M41, “Buried and Underground Piping and Tanks”	No	Consistent with NUREG-1801 with exceptions. The Buried and Underground Piping and Tanks (B.2.1.28) program will be used to manage loss of material of carbon steel, ductile cast iron, and gray cast iron piping and piping components exposed to soil or concrete in the Diesel Generator and Auxiliaries System, Fire Protection System, and Open Cycle Cooling Water System. An exception applies to the NUREG-1801 recommendations for Buried and Underground Piping and Tanks (B.2.1.28) program implementation.
3.3.1-107	Stainless steel, nickel alloy piping, piping components, and piping elements exposed to Soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, “Buried and Underground Piping and Tanks”	No	Not Applicable. There are no stainless steel or nickel alloy piping, piping components, and piping elements in a soil or concrete environment in the Auxiliary Systems at Clinton Power Station.
3.3.1-108	Titanium, super austenitic, aluminum, copper alloy, stainless steel, nickel alloy piping, piping components, and piping elements, bolting exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, “Buried and Underground Piping and Tanks”	No	Not Applicable. There are no titanium, super austenitic, aluminum, copper alloy, and nickel alloy piping, piping components, piping elements, and bolting exposed to soil or concrete in the Auxiliary Systems. The stainless steel piping and piping components exposed to concrete in the Suppression Pool Cleanup System are addressed by line item 3.3.1-120.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-109	Steel Bolting exposed to Soil or concrete	Loss of material due to general, pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Consistent with NUREG-1801 with exceptions. The Buried and Underground Piping and Tanks (B.2.1.28) program will be used to manage loss of material of carbon and low alloy steel and galvanized bolting exposed to soil in the Fire Protection System and Open Cycle Cooling Water System. An exception applies to the NUREG-1801 recommendations for Buried and Underground Piping and Tanks (B.2.1.28) program implementation.
3.3.1-109x	Underground aluminum, copper alloy, stainless steel, nickel alloy steel piping, piping components, and piping elements	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There are no underground aluminum, copper alloy, stainless steel, nickel alloy steel piping, piping components, and piping elements in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-110	Stainless steel Piping, piping components, and piping elements exposed to Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking," and Chapter XI.M2, "Water Chemistry"	No	Not Applicable. The BWR Stress Corrosion Cracking (B.2.1.7) program manages cracking initiation and growth in Reactor Coolant Pressure Boundary System piping, piping components, and piping elements ≥ 4 inch NPS through the implementation of an augmented Inservice Inspection (ISI) program in accordance with ASME Code, Section XI. Cracking in stainless steel piping, piping components, and piping elements < 4 inch NPS exposed to treated water >140°F in the Auxiliary Systems is addressed in Item Numbers 3.3.1-19 and 3.3.1-20.
3.3.1-111	Steel Structural steel exposed to Air – indoor, uncontrolled (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S6, "Structures Monitoring"	No	Not Applicable. With the exception of the Cranes, Hoists and Refueling Equipment System, there is no structural steel exposed to air – indoor uncontrolled in the Auxiliary Systems. The loss of material in structural steel exposed to air – indoor uncontrolled in the Cranes, Hoists and Refueling Equipment System is addressed in Item Number 3.3.1-52.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-112	Steel Piping, piping components, and piping elements exposed to Concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Not Applicable. There is no steel piping, piping components, or piping elements exposed to concrete in the Auxiliary Systems.
3.3.1-113	Aluminum Piping, piping components, and piping elements exposed to Air – dry (Internal/External), Air – indoor, uncontrolled (Internal/External), Air – indoor, controlled (External), Gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.
3.3.1-114	Copper alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (Internal/External), Air – dry, Gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.
3.3.1-115	PWR Only				

Table 3.3.1	**Summary of Aging Management Evaluations for the Auxiliary Systems**				
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-116	Galvanized steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.
3.3.1-117	Glass Piping elements exposed to Air – indoor, uncontrolled (External), Lubricating oil, Closed-cycle cooling water, Air – outdoor, Fuel oil, Raw water, Treated water, Treated borated water, Air with borated water leakage, Condensation (Internal/External) Gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.
3.3.1-118	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.
3.3.1-119	Nickel alloy, PVC, Glass Piping, piping components, and piping elements exposed to Air with borated water leakage, Air – indoor, uncontrolled, Condensation (Internal), Waste Water	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-120	Stainless steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (Internal/External), Air – indoor, uncontrolled (External), Air with borated water leakage, Concrete, Air – dry, Gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.
3.3.1-121	Steel Piping, piping components, and piping elements exposed to Air – indoor, controlled (External), Air – dry, Gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.
3.3.1-122	Titanium Heat exchanger components, Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled or Air – outdoor	None	None	NA – No AEM or AMP	Not Applicable. There are no titanium heat exchanger components, piping, piping components, and piping elements exposed to air – indoor uncontrolled or air – outdoor in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-123	Titanium (ASTM Grades 1,2, 7, 11, or 12 that contains > 5% aluminum or more than 0.20% oxygen or any amount of tin) Heat exchanger components other than tubes, Piping, piping components, and piping elements exposed to Raw water	None	None	NA – No AEM or AMP	Not Applicable. There are no titanium (ASTM Grades 1,2, 7, 11, or 12 that contains > 5% aluminum or more than 0.20% oxygen or any amount of tin) heat exchanger components other than tubes, piping, piping components, and piping elements exposed to raw water in the Auxiliary Systems.
3.3.1-124	Stainless steel, Steel (with stainless steel or nickel-alloy cladding), Spent fuel storage racks (BWR), Spent fuel storage racks (PWR), Piping, piping components, and piping elements; exposed to Treated water >60°C (>140°F), Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. Cracking of stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F) is addressed by line items 3.3.1-19 and 3.3.1-20.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-125	Steel (with stainless steel cladding), stainless steel Spent fuel storage racks (BWR), Spent fuel storage racks (PWR), Piping, piping components, and piping elements; exposed to Treated water, Treated borated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) programs will be used to manage loss of material of stainless steel spent fuel storage racks exposed to treated water in the Fuel Pool Cooling and Storage System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.3.1-126	Any material, piping, piping components, and piping elements exposed to treated water, treated water (borated), raw water	Wall thinning due to erosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with NUREG-1801 with exceptions. The Open-Cycle Cooling Water System (B.2.1.12) program has been substituted and will be used to manage wall thinning due to erosion of carbon steel and copper alloy with 15% zinc or less heat exchanger components and piping and piping components exposed to raw water in the Closed Cooling Water System, Open Cycle Cooling Water System, and Safety-Related Ventilation System. The Closed Treated Water System (B.2.1.13) program has been substituted and will be used to manage wall thinning due to erosion of steel piping and piping components exposed to closed cycle cooling water in the Closed Cooling Water System. An exception applies to the NUREG-1801 recommendations for Closed Treated Water System (B.2.1.13) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-127	Metallic piping, piping components, and tanks exposed to raw water or waste water	Loss of material due to recurring internal corrosion	A plant-specific aging management program is to be evaluated to address recurring internal corrosion	Yes, plant-specific	Consistent with NUREG-1801. The Open-Cycle Cooling Water System (B.2.1.12) program will be used to manage the loss of material due to recurring internal corrosion in carbon steel piping and piping components exposed to raw water in the Open Cycle Cooling Water System. See Subsection 3.3.2.2.8.
3.3.1-128	Steel, stainless steel, or aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to general (steel only), pitting, or crevice corrosion; cracking due to stress corrosion cracking (stainless steel and aluminum only)	Chapter XI.M29, “Aboveground Metallic Tanks”	No	Not Applicable. There are no steel, stainless steel, or aluminum outdoor tanks constructed on soil or concrete, or, indoor large-volume tanks (100,000 gallons and greater) designed to internal pressures approximating atmospheric pressure and exposed internally to water (e.g., within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or the following external environments air - outdoor, air – indoor uncontrolled, moist air or condensation in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-129	Steel tanks exposed to soil or concrete; air-indoor uncontrolled, raw water, treated water, waste water, condensation	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not Applicable. There are no steel outdoor tanks constructed on soil or concrete, or indoor large-volume tanks (100,000 gallons and greater) designed to internal pressures approximating atmospheric pressure and exposed internally to water (e.g., within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete, air – indoor uncontrolled, raw water, treated water, waste water or condensation in the Auxiliary Systems.
3.3.1-130	Metallic sprinklers exposed to air-indoor controlled, air-indoor uncontrolled, air-outdoor, moist air, condensation, raw water, treated water	Loss of material due to general (where applicable), pitting, crevice, and microbiologically-influenced corrosion, fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801 with exceptions. The Fire Water System (B.2.1.17) program will be used to manage loss of material, fouling that leads to corrosion, and flow blockage of metallic sprinklers exposed to condensation and raw water in the Fire Protection System. An exception applies to the NUREG-1801 recommendations for Fire Water System (B.2.1.17) program implementation.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-131	Steel, stainless steel, copper alloy, or aluminum fire water system piping, piping components and piping elements exposed to air-indoor uncontrolled (internal), air-outdoor (internal), or condensation (internal)	Loss of material due to general (steel, and copper alloy only), pitting, crevice, and microbiologically-influenced corrosion, fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, “Fire Water System”	No	Consistent with NUREG-1801 with exceptions. The Fire Water System (B.2.1.17) program will be used to manage loss of material, fouling that leads to corrosion, and flow blockage of carbon steel, galvanized steel, copper alloy with 15% zinc or less, gray cast iron and stainless steel piping, piping components and piping elements exposed to condensation in the Fire Protection System. An exception applies to the NUREG-1801 recommendations for Fire Water System (B.2.1.17) program implementation.
3.3.1-132	Insulated steel, stainless steel, copper alloy, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor	Loss of material due to general (steel, and copper alloy only), pitting, and crevice corrosion; cracking due to stress corrosion cracking (aluminum, stainless steel and copper alloy (>15% Zn) only)	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, “Aboveground Metallic Tanks” (for tanks only)	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.25) program will be used to manage loss of material of insulated carbon steel, stainless steel, gray cast iron, copper alloy with greater than 15% zinc, and copper alloy with 15% zinc or less heat exchanger components, piping, piping components, and piping elements, and tanks along with cracking of insulated stainless steel and copper alloy with greater than 15% zinc piping and piping components exposed to condensation and air - outdoor in the Closed Cycle Cooling Water System, Control Room Ventilation System, Fire Protection System, Open Cycle Cooling Water System, Primary Containment Ventilation System, and Safety-Related Ventilation System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-133	Underground HDPE piping, piping components, and piping elements in an air-indoor uncontrolled or condensation (external) environment	Cracking, blistering, change in color due to water absorption	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There are no underground HDPE piping, piping components, and piping elements in an air - indoor uncontrolled or condensation (external) environment in the Auxiliary Systems.
3.3.1-134	Steel, stainless steel, or copper alloy piping, piping components, and piping elements, and heat exchanger components exposed to a raw water environment (for nonsafety-related components not covered by NRC GL 89-13)	Loss of material due to general (steel and copper alloy only), pitting, crevice, and microbiologically influenced corrosion, fouling that leads to corrosion	Chapter XI.MI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.26) program will be used to manage loss of material for the nonsafety-related stainless steel, gray cast iron, carbon steel, copper alloy with greater than 15% zinc, and copper alloy with 15% zinc or less piping, piping components, tanks, and heat exchanger components not covered by NRC GL 89-13 and exposed to a raw water environment in the Compressed Air System, Process Radiation Monitoring System, and Process Sampling and Post Accident Monitoring System.
3.3.1-135	Steel or stainless steel pump casings submerged in a waste water (internal and external) environment	Loss of material due to general (steel only), pitting, crevice, and microbiologically influenced corrosion	Chapter XI.MI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not Applicable. There are no steel or stainless steel pump casings submerged in a waste water (internal and external) environment in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-136	Steel, stainless steel or aluminum fire water storage tanks exposed to air-indoor uncontrolled, air-outdoor, condensation, moist air, raw water, treated water	Loss of material due to general (steel only), pitting, crevice, and microbiologically-influenced corrosion, fouling that leads to corrosion; cracking due to stress corrosion cracking (stainless steel and aluminum only)	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801 with exceptions. The Fire Water System (B.2.1.18) program will be used to manage loss of material and fouling that leads to corrosion of carbon steel and gray cast iron piping, piping components, and tanks exposed to air - indoor uncontrolled in the Fire Protection System. An exception applies to the NUREG-1801 recommendations for Fire Water System (B.2.1.17) program implementation.
3.3.1-137	Steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to treated water, treated borated water	Loss of material due to general (steel only) pitting and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	Not Applicable. There are no steel, stainless steel, or aluminum outdoor tanks constructed on soil or concrete, or, indoor large-volume tanks (100,000 gallons and greater) designed to internal pressures approximating atmospheric pressure and exposed internally to water (e.g., within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to treated water or treated borated water in the Auxiliary Systems.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-138	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, or fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings	Chapter XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Consistent with NUREG-1801. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.1.44) program will be used to manage loss of coating or lining integrity of stainless steel (with internal coatings) carbon steel (with internal coatings) and gray cast iron (with internal coatings tanks, blower housings, ducting, and ducting components exposed to closed cycle cooling water, fuel oil, raw water, and waste water in the Closed Cycle Cooling Water System, Diesel Generator and Auxiliaries System, Fire Protection System, Nonsafety-Related Ventilation System, Reactor Water Cleanup System, and Main Steam System.
3.3.1-139	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Consistent with NUREG-1801. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.1.44) program will be used to manage loss of material and fouling that leads to corrosion of stainless steel (with internal coatings) and carbon steel (with internal coatings) tanks, ducting, and ducting components exposed to closed cycle cooling water, raw water, and waste water in the Closed Cycle Cooling Water System, Control Room Ventilation System, Diesel Generator and Auxiliaries System, Nonsafety-Related Ventilation System, and Open Cycle Cooling Water System.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-140	Gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Chapter XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Not applicable. There are no gray cast iron (with internal coatings) piping or piping components exposed to closed cycle cooling water, raw water, or treated water in the Auxiliary Systems.

Table 3.3.2-1
Closed Cycle Cooling Water System
Summary of Aging Management Evaluation

Table 3.3.2-1 Closed Cycle Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Heat Exchanger (Component Cooling Water) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B
Heat Exchanger (Component Cooling Water) Tube Side Components	Leakage Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-416	3.3.1-138	A
Heat Exchanger (Containment Penetration Cooler) Tubes	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	C, 1
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	D, 1
Heat Exchanger (Drywell Penetration Cooler) Tubes	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	C, 1
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	D, 1

Table 3.3.2-1 Closed Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Plant Chilled Water System Chiller - Condenser) Tube Side Components	Leakage Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-416	3.3.1-138	A
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C2.A-414	3.3.1-139	A
				Wall Thinning	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-409	3.3.1-126	E, 5
Heat Exchanger (Plant Chilled Water System Chiller - Condenser) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (External)	None	None	VII.J.AP-9	3.3.1-114	C, 3
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A, 3
Heat Exchanger (Plant Chilled Water System Chiller - Evaporator) Tube Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B
Heat Exchanger (Plant Chilled Water System Chiller - Evaporator) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (External)	None	None	VII.J.AP-9	3.3.1-114	C, 3
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-199	3.3.1-46	D, 3

Table 3.3.2-1 Closed Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Hoses	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Closed Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1-117	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
				Wall Thinning	Closed Treated Water Systems (B.2.1.13)	VII.E3.A-408	3.3.1-126	E, 4
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Polymer	Air - Indoor, Uncontrolled (External)	Hardening and Loss of Strength	External Surfaces Monitoring of Mechanical Components (B.2.1.24)			F, 2
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)			F, 2
			Closed Cycle Cooling Water (Internal)	Hardening and Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			F, 2
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			F, 2
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-1 Closed Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
Piping, piping components: Insulated	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C2.A-405	3.3.1-132	A
		Stainless Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C2.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C2.A-405	3.3.1-132	A
	Pressure Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C2.A-405	3.3.1-132	A
Pump Casing (Component Cooling Water Pump)	Leakage Boundary	Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
					Selective Leaching (B.2.1.22)	VII.C2.A-50	3.3.1-72	B
				Wall Thinning	Closed Treated Water Systems (B.2.1.13)	VII.E3.A-408	3.3.1-126	E, 4
Pump Casing (Plant Chilled Water System Pump)	Leakage Boundary	Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-1 Closed Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Pump Casing (Plant Chilled Water System Pump)	Leakage Boundary	Gray Cast Iron	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
					Selective Leaching (B.2.1.22)	VII.C2.A-50	3.3.1-72	B
Tanks (Chemical Feeder Tank)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
Tanks (Component Cooling Water Demineralizer Tank) - internal coating/linings	Leakage Boundary	Stainless Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	C
			Closed Cycle Cooling Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C2.A-416	3.3.1-138	A
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C2.A-414	3.3.1-139	A
Tanks (Component Cooling Water Storage Tank)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	C
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
Tanks (Plant Chilled Water System Compression Tank)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B

Table 3.3.2-1 Closed Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (Plant Chilled Water System Compression Tank)	Leakage Boundary	Carbon Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-280	3.3.1-95	A
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
				Wall Thinning	Closed Treated Water Systems (B.2.1.13)	VII.E3.A-408	3.3.1-126	E, 4
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
Valve Body: Insulated	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C2.A-405	3.3.1-132	A
		Stainless Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C2.A-405	3.3.1-132	A

Table 3.3.2-1 Closed Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body: Insulated	Leakage Boundary	Stainless Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C2.A-405	3.3.1-132	A
	Pressure Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C2.A-405	3.3.1-132	A

Table 3.3.2-1 Closed Cycle Cooling Water System (Continued)

Notes	Definition of Note
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:

1. Drywell and Containment Penetration Coolers are plate coil style heat exchangers; therefore, there are no shell side components associated with these coolers.
2. Consistent with operating experience contained in NUREG-2191, Item Number VII.C2.A-797b, polymeric piping, piping components in Treated Water (Internal) and Air - Indoor, Uncontrolled (External) environments are susceptible to Hardening or Loss of Strength and Loss of Material. These aging effects will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components and External Surfaces Monitoring of Mechanical Components programs, respectively.
3. The shell side of the Plant Chilled Water System Chiller condenser and evaporator contains a refrigerant; therefore, the tubes, which contain raw water, are conservatively managed as the leakage boundary.
4. The Closed Treated Water Systems (B.2.1.13) program has been substituted and will be used to manage wall thinning for this component, material, and environment combination.
5. The Open-Cycle Cooling Water System (B.2.1.12) program has been substituted and will be used to manage wall thinning due to solid particle erosion for this component, material, and environment combination.

Table 3.3.2-2
Combustible Gas Control System
Summary of Aging Management Evaluation

Table 3.3.2-2 Combustible Gas Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Compressor Housing (Hydrogen Compressors)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.A-08	3.3.1-90	C
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-2 Combustible Gas Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.A-08	3.3.1-90	C
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-99	3.3.1-94	C
			Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.A-08	3.3.1-90	C
Recombiners	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-99	3.3.1-94	C
Strainer (Element)	Filter	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-2 Combustible Gas Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Carbon Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.A-08	3.3.1-90	C
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-99	3.3.1-94	C

Table 3.3.2-2 Combustible Gas Control System (Continued)

Notes	Definition of Note
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:

None.

Table 3.3.2-3
Compressed Air System
Summary of Aging Management Evaluation

Table 3.3.2-3 Compressed Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Accumulator (Automatic Depressurization System)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-81	3.3.1-56	D
Accumulator (Main Steam Isolation Valves)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-81	3.3.1-56	D
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Compressor Housing (Breathing Air Compressors)	Leakage Boundary	Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.D.A-80	3.3.1-78	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.C1.A-408	3.3.1-134	A
					Selective Leaching (B.2.1.22)	VII.C1.A-51	3.3.1-72	B
Flow Device	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-81	3.3.1-56	B

Table 3.3.2-3 Compressed Air System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Flow Device	Throttle	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-81	3.3.1-56	B
Heat Exchanger (Breathing Air Compressor Aftercooler) Tube Side Components	Leakage Boundary	Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	C
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.C1.A-408	3.3.1-134	A
Heat Exchanger (Breathing Air Compressor Aftercooler) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.C1.A-408	3.3.1-134	A
Hoses	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-81	3.3.1-56	B
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.D.A-80	3.3.1-78	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-3 Compressed Air System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Copper Alloy with 15% Zinc or less	Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.C1.A-408	3.3.1-134	A
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.C1.A-408	3.3.1-134	A
					Selective Leaching (B.2.1.22)	VII.C1.A-47	3.3.1-72	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.D.A-80	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.A-26	3.3.1-55	B
					Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-240	3.3.1-54	B
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-3 Compressed Air System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Copper Alloy with greater than 15% Zinc	Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-240	3.3.1-54	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-81	3.3.1-56	B
	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.D.A-80	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.A-26	3.3.1-55	B
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-240	3.3.1-54	B
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-240	3.3.1-54	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-81	3.3.1-56	B
Valve Body	Leakage Boundary	Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.C1.A-408	3.3.1-134	A
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-3 Compressed Air System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Copper Alloy with greater than 15% Zinc	Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.C1.A-408	3.3.1-134	A
					Selective Leaching (B.2.1.22)	VII.C1.A-47	3.3.1-72	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.D.A-80	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.A-26	3.3.1-55	B
					Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-240	3.3.1-54	B
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-240	3.3.1-54	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-81	3.3.1-56	B

Table 3.3.2-3 Compressed Air System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.D.A-80	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.A-26	3.3.1-55	B
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-240	3.3.1-54	B
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-240	3.3.1-54	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Compressed Air Monitoring (B.2.1.15)	VII.D.AP-81	3.3.1-56	B

Table 3.3.2-3 Compressed Air System (Continued)

Notes	Definition of Note
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:

1. Components are housed inside of air handling or filter package units (addressed under "Ducting and Components"); therefore, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage the aging effects related to this component type, material, and environment combination.

Table 3.3.2-4
Control Rod Drive System
Summary of Aging Management Evaluation

Table 3.3.2-4 Control Rod Drive System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Accumulator (HCU)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-22	3.3.1-120	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E4.A-62	3.3.1-2	C, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	D
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1-117	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-4 Control Rod Drive System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-22	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
Rupture Disks	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-22	3.3.1-120	A

Table 3.3.2-4 Control Rod Drive System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-22	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B

Table 3.3.2-4 Control Rod Drive System (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Programs column indicates that cumulative fatigue damage due to fatigue for this component is evaluated in Section 4.3.
2. The TLAA designation in the Aging Management Programs column indicates that cumulative fatigue damage due to fatigue for this component is evaluated in Section 4.7.

Table 3.3.2-5
Control Room Ventilation System
Summary of Aging Management Evaluation

Table 3.3.2-5 Control Room Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Bolting (Ducting Closure)	Mechanical Closure	Galvanized Bolting	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	C
Drip Pan	Leakage Boundary	Stainless Steel	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	A, 1
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	C
Ducting and Components	Direct Flow	Aluminum	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-142	3.3.1-92	C, 1, 3
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-10	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.A-08	3.3.1-90	A
		Galvanized Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	C

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Ducting and Components	Pressure Boundary	Galvanized Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.A-08	3.3.1-90	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	A
Flexible Connection	Pressure Boundary	Elastomers	Air - Indoor, Uncontrolled (External)	Hardening and Loss of Strength	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.AP-102	3.3.1-76	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.AP-113	3.3.1-82	A
			Condensation (Internal)	Hardening and Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			G, 2
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			G, 2
Gearbox (Control Room HVAC Chilled Water Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.F1.AP-127	3.3.1-97	C
					One-Time Inspection (B.2.1.21)	VII.F1.AP-127	3.3.1-97	C

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Control Room HVAC Air Handling Unit) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 4
Heat Exchanger (Control Room HVAC Air Handling Unit) Tube Side Components	Pressure Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-203	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Control Room HVAC Air Handling Unit) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-205	3.3.1-50	B
			Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 4
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-203	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Control Room HVAC Equipment Room Air Handling Unit) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 4

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Control Room HVAC Equipment Room Air Handling Unit) Tube Side Components	Pressure Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-203	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Control Room HVAC Equipment Room Air Handling Unit) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-205	3.3.1-50	B
			Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 4
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-203	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Control Room HVAC Water Chiller - Condenser) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	C

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Control Room HVAC Water Chiller - Condenser) Tube Sheet	Pressure Boundary	Carbon Steel	Air/Gas - Dry (External)	None	None	VII.J.AP-6	3.3.1-121	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-183	3.3.1-38	A
Heat Exchanger (Control Room HVAC Water Chiller - Condenser) Tube Side Components	Pressure Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-416	3.3.1-138	A
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-414	3.3.1-139	A
Heat Exchanger (Control Room HVAC Water Chiller - Condenser) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (External)	None	None	VII.J.AP-9	3.3.1-114	C
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-72	3.3.1-42	A
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (External)	None	None	VII.J.AP-9	3.3.1-114	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Control Room HVAC Water Chiller - Evaporator) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	C
Heat Exchanger (Control Room HVAC Water Chiller - Evaporator) Tube Sheet	Pressure Boundary	Carbon Steel	Air/Gas - Dry (External)	None	None	VII.J.AP-6	3.3.1-121	C
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-189	3.3.1-46	B
Heat Exchanger (Control Room HVAC Water Chiller - Evaporator) Tube Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-189	3.3.1-46	B
Heat Exchanger (Control Room HVAC Water Chiller - Evaporator) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (External)	None	None	VII.J.AP-9	3.3.1-114	C
			Closed Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-205	3.3.1-50	B
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (External)	None	None	VII.J.AP-9	3.3.1-114	C
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-203	3.3.1-46	B

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1-117	A
	Pressure Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-98	3.3.1-117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1-117	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E3.A-34	3.3.1-2	A, 5
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Ductile Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
					Selective Leaching (B.2.1.22)	VII.F1.AP-31	3.3.1-72	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Stainless Steel	Treated Water > 140°F (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C, 1
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	A
Piping, piping components: Insulated	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-405	3.3.1-132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
	Pressure Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-405	3.3.1-132	A
		Stainless Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-405	3.3.1-132	A
	Structural Integrity (Attached)	Carbon Steel	Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-405	3.3.1-132	A

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Pump Casing (Control Room HVAC Chilled Water Pump)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
Strainer (Element)	Filter	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
Tanks (Chemical Feeder Tank)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
Tanks (Control Room HVAC Compression Tank)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
Tanks (Control Room HVAC Humidification Steam Boiler)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	D
Tanks (Filtration Skid Filter Vessel)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C
Valve Body: Insulated	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-405	3.3.1-132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
	Pressure Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-405	3.3.1-132	A

Table 3.3.2-5 Control Room Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body: Insulated	Pressure Boundary	Stainless Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F1.A-405	3.3.1-132	A

Table 3.3.2-5 Control Room Ventilation System (Continued)

Notes	Definition of Note
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:

1. Components are housed inside of air handling or filter package units (addressed under "Ducting and Components"); therefore, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage the aging effects related to this component type, material, and environment combination.
2. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage the aging effect(s) applicable to this component type, material, and environment combination.
3. Makeup air filter packages include aluminum radiant heat baffles, which serve to evenly distribute heated air through the filter package. These baffles are addressed with "Ducting and Components".
4. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage the reduction of heat transfer aging effect applicable to this component type, material, and environment combination. The component is located within HVAC ducting and components, and the external surfaces of this component are subject to the internal HVAC environment of condensation during normal operation. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program performs visual inspections which are capable of identifying aging mechanisms which cause reduction of heat transfer.

Table 3.3.2-5 Control Room Ventilation System (Continued)

Plant Specific Notes: (continued)

5. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.

Table 3.3.2-6
Cranes, Hoists, and Refueling Equipment System
Summary of Aging Management Evaluation

Table 3.3.2-6 Cranes, Hoists, and Refueling Equipment System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14)	III.B5.TP-248	3.5.1-80	E, 1
				Loss of Preload	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14)	III.B5.TP-261	3.5.1-88	E, 1
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Preload	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14)	III.B5.TP-261	3.5.1-88	E, 1
			Treated Water (External)	Loss of Material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14)	III.B1.2.TP-232	3.5.1-85	E, 1
					Water Chemistry (B.2.1.2)	III.B1.2.TP-232	3.5.1-85	B
				Loss of Preload	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14)	III.B5.TP-261	3.5.1-88	E, 1
Crane/Hoist (Fuel Prep Machine)	Structural Support	Aluminum Alloy	Air - Indoor, Uncontrolled (External)	None	None	III.B5.TP-8	3.5.1-95	C

Table 3.3.2-6 Cranes, Hoists, and Refueling Equipment System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Crane/Hoist (Fuel Prep Machine)	Structural Support	Aluminum Alloy	Treated Water (External)	Loss of Material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14)	VII.A4.AP-130	3.3.1-25	E, 1
					Water Chemistry (B.2.1.2)	VII.A4.AP-130	3.3.1-25	D
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Treated Water (External)	Loss of Material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14)	VII.E4.AP-110	3.3.1-25	E, 1
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	D
Crane/Hoist: Rails, Bridges, Structural Members, Structural Components	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	VII.B.A-06	3.3.1-1	A, 2
				Loss of Material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.1.14)	VII.B.A-07	3.3.1-52	A
						VII.B.A-05	3.3.1-53	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C

Table 3.3.2-6 Cranes, Hoists, and Refueling Equipment System (Continued)

Notes	Definition of Note
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:

1. The Inspection of Overhead Heavy Load and Light Load (Related to Fuel Handling) Systems (B.2.1.14) program is substituted to manage the aging effect(s) applicable to this component type, material, and environment combination.
2. The TLAA designation in the Aging Management Program column indicates that Cumulative Fatigue Damage/Fatigue of this component is evaluated in Section 4.7.

Table 3.3.2-7
Demineralized Water Makeup System
Summary of Aging Management Evaluation

Table 3.3.2-7 Demineralized Water Makeup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1-117	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E3.A-34	3.3.1-2	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-271	3.3.1-93	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B

Table 3.3.2-7 Demineralized Water Makeup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Stainless Steel	Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-120	3.3.1-19	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-120	3.3.1-19	D
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
Pump Casing (Potable Water Booster Pumps)	Leakage Boundary	Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-271	3.3.1-93	A
		Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-270	3.3.1-88	A
					Selective Leaching (B.2.1.22)	VII.C1.A-51	3.3.1-72	B
Tanks (Hot Water Heater)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A, 1
		Glass	Raw Water (Internal)	None	None	VII.J.AP-50	3.3.1-117	C, 1

Table 3.3.2-7 Demineralized Water Makeup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (Laboratory Humidification Steam Boiler) - Insulated	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	D
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-271	3.3.1-93	A
		Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B

Table 3.3.2-7 Demineralized Water Makeup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Gray Cast Iron	Treated Water (Internal)	Loss of Material	Selective Leaching (B.2.1.22)	VII.E3.AP-31	3.3.1-72	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-120	3.3.1-19	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-120	3.3.1-19	D
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B

Table 3.3.2-7 Demineralized Water Makeup System (Continued)

Notes	Definition of Note
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:

1. Potable water heaters have a glass interior and carbon steel exterior. Therefore, the glass portion only has an internal environment and the carbon steel portion only has an exterior environment.
2. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.

Table 3.3.2-8
Diesel Generator and Auxiliaries System
Summary of Aging Management Evaluation

Table 3.3.2-8 Diesel Generator and Auxiliaries System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Expansion Joints	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A
			Diesel Exhaust (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.AP-104	3.3.1-88	A
Flame Arrestor	Pressure Boundary	Aluminum	Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.AP-256	3.3.1-81	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F4.AP-142	3.3.1-92	A
Flexible Connection	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Flexible Connection	Pressure Boundary	Carbon Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Closed Cycle Cooling Water > 140°F (Internal)	Cracking	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-186	3.3.1-43	B
				Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-136	3.3.1-71	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-136	3.3.1-71	A
Heat Exchanger (DG Lube Oil Cooler) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.H2.AP-41	3.3.1-80	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-131	3.3.1-98	A
					One-Time Inspection (B.2.1.21)	VII.H2.AP-131	3.3.1-98	A
Heat Exchanger (DG Lube Oil Cooler) Tube Sheet	Pressure Boundary	Copper Alloy with greater than 15% Zinc	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.H2.AP-199	3.3.1-46	D
					Selective Leaching (B.2.1.22)	VII.H1.AP-43	3.3.1-72	D
			Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-133	3.3.1-99	C
					One-Time Inspection (B.2.1.21)	VII.H2.AP-133	3.3.1-99	C

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (DG Lube Oil Cooler) Tube Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.H2.AP-41	3.3.1-80	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B
Heat Exchanger (DG Lube Oil Cooler) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-205	3.3.1-50	B
			Lubricating Oil (External)	Reduction of Heat Transfer	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-78	3.2.1-51	A
					One-Time Inspection (B.2.1.21)	V.D2.EP-78	3.2.1-51	A
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.H2.AP-199	3.3.1-46	D
			Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-133	3.3.1-99	C
					One-Time Inspection (B.2.1.21)	VII.H2.AP-133	3.3.1-99	C
Heat Exchanger (DGWS Aftercooler) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 1
Heat Exchanger (DGWS Aftercooler) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.H2.AP-41	3.3.1-80	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	C
Heat Exchanger (DGWS Aftercooler) Tube Sheet	Pressure Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (DGWS Aftercooler) Tube Sheet	Pressure Boundary	Carbon Steel	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	C, 3
Heat Exchanger (DGWS Aftercooler) Tube Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.H2.AP-41	3.3.1-80	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B
Heat Exchanger (DGWS Aftercooler) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-205	3.3.1-50	B
			Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 1
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.H2.AP-199	3.3.1-46	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 3
Heat Exchanger (DGWS Cooling Water Heat Exchanger) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.H2.AP-41	3.3.1-80	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B
Heat Exchanger (DGWS Cooling Water Heat Exchanger) Tube Sheet	Pressure Boundary	Carbon Steel	Closed Cycle Cooling Water (External)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (DGWS Cooling Water Heat Exchanger) Tube Sheet	Pressure Boundary	Carbon Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-183	3.3.1-38	A
Heat Exchanger (DGWS Cooling Water Heat Exchanger) Tube Side Components	Pressure Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.H2.AP-41	3.3.1-80	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-416	3.3.1-138	A
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-414	3.3.1-139	A
Heat Exchanger (DGWS Cooling Water Heat Exchanger) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (External)	Reduction of Heat Transfer	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-205	3.3.1-50	B
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-72	3.3.1-42	A
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (External)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.H2.AP-199	3.3.1-46	D
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
Piping elements	Pressure Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Closed Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1-117	A

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.H2.AP-202	3.3.1-45	B
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-105	3.3.1-70	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-105	3.3.1-70	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-127	3.3.1-97	A
					One-Time Inspection (B.2.1.21)	VII.H2.AP-127	3.3.1-97	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-136	3.3.1-71	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-136	3.3.1-71	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.H1.A-24	3.3.1-80	C
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.H2.AP-202	3.3.1-45	B
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A
			Diesel Exhaust (Internal)	Cumulative Fatigue Damage	TLAA			H, 4

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Diesel Exhaust (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.AP-104	3.3.1-88	A
			Fuel Oil (External)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-105	3.3.1-70	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-105	3.3.1-70	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-105	3.3.1-70	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-105	3.3.1-70	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-127	3.3.1-97	A
					One-Time Inspection (B.2.1.21)	VII.H2.AP-127	3.3.1-97	A
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B.2.1.28)	VII.H1.AP-198	3.3.1-106	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Closed Cycle Cooling Water > 140°F (Internal)	Cracking	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-186	3.3.1-43	B
				Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-136	3.3.1-71	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-136	3.3.1-71	A

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.H1.A-24	3.3.1-80	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A
			Diesel Exhaust (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.AP-104	3.3.1-88	A
Pump Casing (DG Fuel Oil Transfer Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-105	3.3.1-70	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-105	3.3.1-70	A
Silencer / Muffler (Exhaust Silencer)	Structural Integrity (Attached)	Carbon Steel	Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.H1.A-24	3.3.1-80	C
			Diesel Exhaust (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.AP-104	3.3.1-88	A
Strainer (Element)	Filter	Stainless Steel	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C, 3
Tanks (Air Receiver)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (Air Receiver)	Pressure Boundary	Carbon Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	C
Tanks (DG Fuel Oil Day Tank)	Pressure Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 2
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 2
			Fuel Oil (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.H1.A-416	3.3.1-138	A
				Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-105	3.3.1-70	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-105	3.3.1-70	A
Tanks (DG Fuel Oil Storage Tank)	Pressure Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 2

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (DG Fuel Oil Storage Tank)	Pressure Boundary	Carbon Steel (with internal coatings)	Condensation (Internal)	Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 2
			Fuel Oil (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.H1.A-416	3.3.1-138	A
				Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-105	3.3.1-70	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-105	3.3.1-70	A
Tanks (DGWS Expansion Tank)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.H2.AP-202	3.3.1-45	B
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-280	3.3.1-95	A
Tanks (DGWS Immersion Heater)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.H2.AP-202	3.3.1-45	B
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.H2.AP-202	3.3.1-45	B
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-105	3.3.1-70	A

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Carbon Steel	Fuel Oil (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.H1.AP-105	3.3.1-70	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A
			Diesel Exhaust (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.AP-104	3.3.1-88	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-105	3.3.1-70	A
					One-Time Inspection (B.2.1.21)	VII.H1.AP-105	3.3.1-70	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-127	3.3.1-97	A
					One-Time Inspection (B.2.1.21)	VII.H2.AP-127	3.3.1-97	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Closed Cycle Cooling Water > 140°F (Internal)	Cracking	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-186	3.3.1-43	B
				Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.H1.AP-136	3.3.1-71	A

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Stainless Steel	Fuel Oil (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.H1.AP-136	3.3.1-71	A
	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	A

Table 3.3.2-8 Diesel Generator and Auxiliaries System (Continued)

Notes	Definition of Note
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:

1. Reduction of heat transfer due to fouling is not a NUREG-1801 R2 aging effect listed for heat exchanger tubes or fins exposed to condensation. Subsequent License Renewal Operating Experience (VII.H2.A-565 and VII.C1.A-419) has indicated that heat exchanger tubes/fins exposed to condensation can experience a reduction of heat transfer due to fouling, and that the XI.M38 program can manage these aging effects.
2. Loss of coating or lining integrity and loss of material for internally coated carbon steel tanks with an environment of condensation are not found in NURGE-1801, Revision 2 as supplemented by LR-ISG-2013-01. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP is utilized to manage the aging effects for this component, material, and environment combination.
3. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will be used to manage the aging effects of this component. Condensation is external to the component but internal to the heat exchanger.
4. This component is associated with carbon steel EDG engine exhaust piping in a diesel exhaust environment. TLAA is used to manage the aging effect(s) applicable to this component type, material and environment combination. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3

Table 3.3.2-9
Fire Protection System
Summary of Aging Management Evaluation

Table 3.3.2-9 Fire Protection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
			Air - Outdoor (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-126	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-263	3.3.1-15	A
			Raw Water (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.G.A-33	3.3.1-64	E, 1
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-264	3.3.1-15	A
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B.2.1.28)	VII.I.AP-241	3.3.1-109	B
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-242	3.3.1-14	A
		Galvanized Bolting	Air - Outdoor (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-126	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-263	3.3.1-15	A
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B.2.1.28)	VII.I.AP-241	3.3.1-109	B
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-242	3.3.1-14	A
Fire Barriers	Fire Barrier	Subliming Compounds	Air - Indoor, Uncontrolled (External)	Change in Material Properties	Fire Protection (B.2.1.16)			F, 8
				Cracking and Delamination	Fire Protection (B.2.1.16)			F, 8
				Loss of Material	Fire Protection (B.2.1.16)			F, 8
				Separation	Fire Protection (B.2.1.16)			F, 8

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Fire Barriers (Concrete Curbs)	Fire Barrier	Reinforced Concrete	Air - Indoor, Uncontrolled (External)	Concrete Cracking and Spalling	Fire Protection (B.2.1.16)	VII.G.A-90	3.3.1-60	A
					Structures Monitoring (B.2.1.34)	VII.G.A-90	3.3.1-60	A
				Loss of Material	Fire Protection (B.2.1.16)	VII.G.A-91	3.3.1-62	A
					Structures Monitoring (B.2.1.34)	VII.G.A-91	3.3.1-62	A
Fire Barriers (Concrete Walls, Ceilings, Floors)	Fire Barrier	Reinforced Concrete	Air - Indoor, Uncontrolled (External)	Concrete Cracking and Spalling	Fire Protection (B.2.1.16)	VII.G.A-90	3.3.1-60	A
					Structures Monitoring (B.2.1.34)	VII.G.A-90	3.3.1-60	A
				Loss of Material	Fire Protection (B.2.1.16)	VII.G.A-91	3.3.1-62	A
					Structures Monitoring (B.2.1.34)	VII.G.A-91	3.3.1-62	A
			Air - Outdoor (External)	Cracking, Loss of Material	Fire Protection (B.2.1.16)	VII.G.A-92	3.3.1-61	A
					Structures Monitoring (B.2.1.34)	VII.G.A-92	3.3.1-61	A
				Loss of Material	Fire Protection (B.2.1.16)	VII.G.A-93	3.3.1-62	A
					Structures Monitoring (B.2.1.34)	VII.G.A-93	3.3.1-62	A
Fire Barriers (Damper Assembly)	Fire Barrier	Galvanized Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	C
			Condensation (Internal)	Loss of Material	Fire Protection (B.2.1.16)	VII.F1.A-08	3.3.1-90	E, 2
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Fire Protection (B.2.1.16)	VII.F1.AP-99	3.3.1-94	E, 2
Fire Barriers (Doors)	Fire Barrier	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	Fire Protection (B.2.1.16)	VII.I.A-77	3.3.1-78	E, 13
						VII.G.A-21	3.3.1-59	A
			Air - Outdoor (External)	Loss of Material	Fire Protection (B.2.1.16)	VII.I.A-78	3.3.1-78	E, 13

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Fire Barriers (Doors)	Fire Barrier	Carbon Steel	Air - Outdoor (External)	Loss of Material	Fire Protection (B.2.1.16)	VII.G.A-22	3.3.1-59	A
Fire Barriers (For Steel Components)	Fire Barrier	Cementitious Fireproofing	Air - Indoor, Uncontrolled (External)	Change in Material Properties	Fire Protection (B.2.1.16)			H, 9
				Cracking and Delamination	Fire Protection (B.2.1.16)			H, 9
				Loss of Material	Fire Protection (B.2.1.16)			H, 9
				Separation	Fire Protection (B.2.1.16)			H, 9
		Gypsum	Air - Indoor, Uncontrolled (External)	Cracking	Fire Protection (B.2.1.16)			F, 10
Fire Barriers (Masonry Walls)	Fire Barrier	Concrete Block	Air - Indoor, Uncontrolled (External)	Cracking	Fire Protection (B.2.1.16)	III.A3.T-12	3.5.1-70	E, 11
					Masonry Walls (B.2.1.33)	III.A3.T-12	3.5.1-70	A
				Loss of Material	Fire Protection (B.2.1.16)			H, 11
					Masonry Walls (B.2.1.33)			H, 11
			Air - Outdoor (External)	Cracking	Fire Protection (B.2.1.16)	III.A3.T-12	3.5.1-70	E, 11
					Masonry Walls (B.2.1.33)	III.A3.T-12	3.5.1-70	A
				Loss of Material (Spalling, Scaling) and Cracking	Fire Protection (B.2.1.16)	III.A5.TP-34	3.5.1-71	E, 11
					Masonry Walls (B.2.1.33)	III.A5.TP-34	3.5.1-71	A
Fire Barriers (Penetration Seals and Fire Stops)	Fire Barrier	Elastomers	Air - Indoor, Uncontrolled (External)	Increased Hardness, Shrinkage, Loss of Strength	Fire Protection (B.2.1.16)	VII.G.A-19	3.3.1-57	A
		Grout	Air - Indoor, Uncontrolled (External)	Concrete Cracking and Spalling	Fire Protection (B.2.1.16)	VII.G.A-90	3.3.1-60	A, 15
					Structures Monitoring (B.2.1.34)	VII.G.A-90	3.3.1-60	A, 15
		Aluminum Silicate	Air - Indoor, Uncontrolled (External)	Change in Material Properties	Fire Protection (B.2.1.16)			F, 12
				Cracking and Delamination	Fire Protection (B.2.1.16)			F, 12

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Fire Barriers (Penetration Seals and Fire Stops)	Fire Barrier	Aluminum Silicate	Air - Indoor, Uncontrolled (External)	Loss of Material	Fire Protection (B.2.1.16)			F, 12
				Separation	Fire Protection (B.2.1.16)			F, 12
Fire Hydrant	Pressure Boundary	Copper Alloy with 15% Zinc or less	Air - Outdoor (External)	Loss of Material	Fire Water System (B.2.1.17)	VII.I.AP-159	3.3.1-81	E, 14
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.AP-197	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.AP-197	3.3.1-64	B
		Ductile Cast Iron	Air - Outdoor (External)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.AP-149	3.3.1-63	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
					Selective Leaching (B.2.1.22)	VII.G.A-51	3.3.1-72	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B.2.1.28)	VII.G.AP-198	3.3.1-106	B
					Selective Leaching (B.2.1.22)	VII.G.A-02	3.3.1-72	B
		Gray Cast Iron	Air - Outdoor (External)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.AP-149	3.3.1-63	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
					Selective Leaching (B.2.1.22)	VII.G.A-51	3.3.1-72	B

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Fire Hydrant	Pressure Boundary	Gray Cast Iron	Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B.2.1.28)	VII.G.AP-198	3.3.1-106	B
					Selective Leaching (B.2.1.22)	VII.G.A-02	3.3.1-72	B
Flame Arrestor	Pressure Boundary	Carbon Steel	Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-78	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
Flexible Connection	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Diesel Exhaust (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.AP-128	3.3.1-83	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.AP-104	3.3.1-88	A
Flow Device	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Flow Device	Pressure Boundary	Stainless Steel	Raw Water (Internal)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
	Throttle	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
Gearbox (Diesel Fire Water Pump)	Pressure Boundary	Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.G.AP-127	3.3.1-97	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-127	3.3.1-97	A
Gearbox (Jockey Pump)	Pressure Boundary	Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.G.AP-127	3.3.1-97	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-127	3.3.1-97	A
Hose Stations	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Hoses	Pressure Boundary	Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-132	3.3.1-69	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-132	3.3.1-69	A
		Elastomers	Air - Indoor, Uncontrolled (External)	Hardening and Loss of Strength	Fire Protection (B.2.1.16)	VII.F1.AP-102	3.3.1-76	E, 3, 4
			Air - Indoor, Uncontrolled (Internal)	Hardening and Loss of Strength	Fire Protection (B.2.1.16)	VII.F1.AP-102	3.3.1-76	E, 3, 4
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
Odorizer	Pressure Boundary	Aluminum	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-36	3.3.1-113	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-37	3.3.1-113	A
		Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	Fire Protection (B.2.1.16)	VII.G.AP-150	3.3.1-58	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	A
Piping elements	Pressure Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Condensation (Internal)	None	None	VII.J.AP-97	3.3.1-117	A
			Fuel Oil (Internal)	None	None	VII.J.AP-49	3.3.1-117	A
Piping, piping components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
					Fire Protection (B.2.1.16)	VII.G.AP-150	3.3.1-58	A

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-412	3.3.1-136	D
			Air - Indoor, Uncontrolled (Internal)	Loss of Material	Fire Protection (B.2.1.16)	VII.G.AP-150	3.3.1-58	A, 4
			Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-78	3.3.1-78	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	A
			Condensation (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
					Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
			Diesel Exhaust (Internal)	Cumulative Fatigue Damage	TLAA			H, 6
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.AP-104	3.3.1-88	A
			Fuel Oil (External)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-234	3.3.1-68	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-234	3.3.1-68	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-234	3.3.1-68	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-234	3.3.1-68	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Raw Water (Internal)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B.2.1.28)	VII.G.AP-198	3.3.1-106	B
		Copper Alloy with 15% Zinc or less	Air - Outdoor (External)	Loss of Material	Fire Protection (B.2.1.16)	VII.I.AP-159	3.3.1-81	E, 5
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	A
			Fuel Oil (External)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-132	3.3.1-69	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-132	3.3.1-69	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-132	3.3.1-69	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-132	3.3.1-69	A
		Ductile Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
					Fire Protection (B.2.1.16)	VII.G.AP-150	3.3.1-58	A
			Air - Indoor, Uncontrolled (Internal)	Loss of Material	Fire Protection (B.2.1.16)	VII.G.AP-150	3.3.1-58	A, 4
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Ductile Cast Iron	Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-234	3.3.1-68	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-234	3.3.1-68	A
		Galvanized Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	A
			Condensation (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-136	3.3.1-71	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-136	3.3.1-71	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
Piping, piping components: Insulated	Pressure Boundary	Carbon Steel	Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.G.A-405	3.3.1-132	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	A

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components: Insulated	Pressure Boundary	Carbon Steel	Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
Pump Casing (Diesel Fire Water Pump)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (External)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
		Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (External)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
					Selective Leaching (B.2.1.22)	VII.G.A-51	3.3.1-72	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
					Selective Leaching (B.2.1.22)	VII.G.A-51	3.3.1-72	B
Pump Casing (Jockey Pump)	Pressure Boundary	Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Pump Casing (Jockey Pump)	Pressure Boundary	Gray Cast Iron	Raw Water (Internal)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
					Selective Leaching (B.2.1.22)	VII.G.A-51	3.3.1-72	B
Silencer / Muffler (Exhaust Silencer)	Pressure Boundary	Galvanized Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	A
			Diesel Exhaust (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.AP-104	3.3.1-88	A
Spray Nozzles	Spray	Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Air - Indoor, Uncontrolled (Internal)	None	None	VII.J.AP-144	3.3.1-114	A, 4
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-22	3.3.1-120	A
			Condensation (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
Sprinkler Heads	Pressure Boundary	Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-403	3.3.1-130	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-403	3.3.1-130	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-403	3.3.1-130	B

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Sprinkler Heads	Pressure Boundary	Copper Alloy with greater than 15% Zinc	Raw Water (Internal)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-403	3.3.1-130	B
				Loss of Material	Selective Leaching (B.2.1.22)	VII.G.A-47	3.3.1-72	B
	Spray	Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Condensation (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-403	3.3.1-130	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-403	3.3.1-130	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-403	3.3.1-130	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-403	3.3.1-130	B
					Selective Leaching (B.2.1.22)	VII.G.A-47	3.3.1-72	B
Strainer (Element)	Filter	Carbon Steel	Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-234	3.3.1-68	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-234	3.3.1-68	A
		Copper Alloy with 15% Zinc or less	Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.AP-197	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.AP-197	3.3.1-64	B
Tanks (Diesel Fire Pump Day Tank) - internal coating/linings	Pressure Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 16

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (Diesel Fire Pump Day Tank) - internal coating/linings	Pressure Boundary	Carbon Steel (with internal coatings)	Condensation (Internal)	Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 16
			Fuel Oil (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.G.A-416	3.3.1-138	A
				Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-234	3.3.1-68	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-234	3.3.1-68	A
Tanks (Diesel Generator CO2 Storage Tank)	Pressure Boundary	Carbon Steel	Air - Outdoor (External)	Loss of Material	Fire Protection (B.2.1.16)	VII.I.A-78	3.3.1-78	E, 7
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	A
Tanks (Retard Chamber)	Pressure Boundary	Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-412	3.3.1-136	D
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
					Selective Leaching (B.2.1.22)	VII.G.A-51	3.3.1-72	B
Valve Body	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
					Fire Water System (B.2.1.17)	VII.G.A-412	3.3.1-136	D
			Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-78	3.3.1-78	A

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Carbon Steel	Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-234	3.3.1-68	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-234	3.3.1-68	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Air - Outdoor (External)	Loss of Material	Fire Protection (B.2.1.16)	VII.I.AP-159	3.3.1-81	E, 5
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A
			Condensation (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.AP-197	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.AP-197	3.3.1-64	B
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B.2.1.19)	VII.G.AP-132	3.3.1-69	A
					One-Time Inspection (B.2.1.21)	VII.G.AP-132	3.3.1-69	A

Table 3.3.2-9 Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Copper Alloy with greater than 15% Zinc	Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.AP-197	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.AP-197	3.3.1-64	B
					Selective Leaching (B.2.1.22)	VII.G.A-47	3.3.1-72	B
		Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-404	3.3.1-131	B
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-33	3.3.1-64	B
					Selective Leaching (B.2.1.22)	VII.G.A-51	3.3.1-72	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B.2.1.28)	VII.G.AP-198	3.3.1-106	B
					Selective Leaching (B.2.1.22)	VII.G.A-02	3.3.1-72	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B
				Loss of Material	Fire Water System (B.2.1.17)	VII.G.A-55	3.3.1-66	B

Table 3.3.2-9 Fire Protection System (Continued)

Notes	Definition of Note
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:

1. The Bolting Integrity AMP is used to manage loss of material for submerged carbon steel bolting in a raw water environment.
2. The Fire Protection AMP is added to supplement the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP in managing the aging effect(s) applicable to this component type, material, and environment combination. The damper housings for dampers with a fire barrier intended function are evaluated with the Fire Protection System and are inspected in accordance with Fire Protection AMP requirements. Fire barrier damper housings located within the in scope boundary of the various ventilation systems also have a pressure boundary intended function and are inspected in accordance with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. The pressure boundary intended function is evaluated with the various ventilation systems.
3. The Fire Protection AMP is used to replace the External Surfaces Monitoring of Mechanical Components AMP in managing the aging effect(s) applicable to this component type, material, and environment combination. The flexible hoses in the Halon system with a pressure boundary intended function are evaluated with the Fire Protection System and are inspected in accordance with Fire Protection AMP requirements.
4. Halon gas is contained in bottles until actuation; therefore, an Air - indoor (uncontrolled) internal environment is conservatively applied to Halon piping downstream of the bottles.

Table 3.3.2-9 Fire Protection System (Continued)

Plant Specific Notes: (continued)

5. The Fire Protection AMP is used to replace the External Surfaces Monitoring of Mechanical Components AMP in managing the aging effect(s) applicable to this component type, material, and environment combination. Copper tubing and bronze valve bodies in the CO2 system with a pressure boundary intended function are evaluated with the Fire Protection System and are inspected in accordance with Fire Protection AMP requirements.
6. This component is associated with carbon steel diesel-driven fire pump engine exhaust piping in a diesel exhaust environment. TLAA is used to manage cumulative fatigue damage for this component type, material, and environment combination. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.
7. The Fire Protection AMP is used to replace the External Surfaces Monitoring of Mechanical Components AMP in managing the aging effect(s) applicable to this component type, material, and environment combination. CO2 Storage Tanks with a pressure boundary intended function are evaluated with the Fire Protection System and are inspected in accordance with Fire Protection AMP requirements.
8. Consistent with operating experience contained in SLR-ISG-2021-02-MECHANICAL (Item VII.G.A-805), Subliming Compound Fire Barrier components in any air environment are susceptible to loss of material, cracking/delamination, change in material properties, and separation. The aging effects for this component, material, and environment combination are managed under the Fire Protection AMP.
9. Consistent with operating experience contained in SLR-ISG-2021-02-MECHANICAL (Item VII.G.A-806), Cementitious Fireproofing components in any air environment are susceptible to loss of material, cracking/delamination, change in material properties, and separation. The aging effects for this component, material, and environment combination are managed under the Fire Protection AMP.
10. The Fire Protection AMP will be used to manage the aging effect(s) applicable to this component type, material, and environment combination.
11. Consistent with operating experience contained in NUREG-2191 (Item VII.G.A-626), Masonry Wall Fire Barrier components in any air environment are susceptible to loss of material and cracking. The aging effects for this component, material, and environment combination are managed under the Fire Protection AMP and Masonry Walls AMP.
12. Consistent with operating experience contained in SLR-ISG-2021-02-MECHANICAL (Item VII.G.A-807), Silicate Fire Barrier components in any air environment are susceptible to loss of material, cracking/delamination, change in material properties, and separation. The aging effects for this component, material, and environment combination are managed under the Fire Protection AMP.
13. The Fire Protection AMP is used to replace the External Surfaces Monitoring of Mechanical Components AMP in managing the aging effect(s) applicable to this component type, material, and environment combination. Those doors which serve as fire barriers are evaluated with the Fire Protection System and are inspected in accordance with Fire Protection AMP requirements.
14. The Fire Water System AMP is used to replace the External Surfaces Monitoring of Mechanical Components AMP in managing the aging effect(s) applicable to this component type, material, and environment combination. External portions of fire hydrants are evaluated with the Fire Protection System and are inspected in accordance with Fire Water System AMP requirements.

Table 3.3.2-9 Fire Protection System (Continued)

Plant Specific Notes: (continued)

15. NUREG-1801 does not include grout fire barriers; however, grout is similar to concrete in terms of characteristics and is considered to be susceptible to the same aging effects and mechanisms as reinforced concrete. These aging effects and mechanisms are managed by the Fire Protection and Structures Monitoring AMPs.

16. Loss of coating or lining integrity and loss of material for internally coated carbon steel tanks with an environment of condensation are not found in NURGE-1801, Revision 2, as supplemented by LR-ISG-2013-01. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP is utilized to manage the aging effects for this component, material, and environment combination.

Table 3.3.2-10
Fuel Pool Cooling and Storage System
Summary of Aging Management Evaluation

Table 3.3.2-10 Fuel Pool Cooling and Storage System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Expansion Joints	Pressure Boundary	Elastomers	Air - Indoor, Uncontrolled (External)	Hardening and Loss of Strength	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.AP-102	3.3.1-76	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.AP-113	3.3.1-82	A
			Treated Water (Internal)	Hardening and Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.A4.AP-101	3.3.1-86	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 1
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
Fuel Storage Racks (New Fuel)	Structural Support	Aluminum	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-36	3.3.1-113	C

Table 3.3.2-10 Fuel Pool Cooling and Storage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Fuel Storage Racks (Spent Fuel Storage Pool)	Absorb Neutrons	Boral	Treated Water (External)	Reduction of Neutron Absorbing Capacity; Change in Dimensions and Loss of Material	Monitoring of Neutron-Absorbing Materials Other Than Boraflex (B.2.1.27)	VII.A2.AP-236	3.3.1-102	A
		Metamic	Treated Water (External)	Reduction of Neutron Absorbing Capacity; Change in Dimensions and Loss of Material	Monitoring of Neutron-Absorbing Materials Other Than Boraflex (B.2.1.27)	VII.A2.AP-236	3.3.1-102	A
	Structural Support	Stainless Steel	Treated Water (External)	Cumulative Fatigue Damage	TLAA	VII.A2.A-98	3.3.1-125	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.A2.A-98	3.3.1-125	A
					Water Chemistry (B.2.1.2)	VII.A2.A-98	3.3.1-125	B
Fuel Storage Racks (Upper Containment Pool)	Structural Support	Aluminum	Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-130	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.A4.AP-130	3.3.1-25	D
Heat Exchanger (Fuel Pool) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.A3.AP-189	3.3.1-46	B
Heat Exchanger (Fuel Pool) Tube Sheet	Pressure Boundary	Carbon or Low Alloy Steel with Stainless Steel Cladding	Closed Cycle Cooling Water (External)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.E3.AP-191	3.3.1-47	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-111	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-111	3.3.1-25	B
Heat Exchanger (Fuel Pool) Tube Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	C

Table 3.3.2-10 Fuel Pool Cooling and Storage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Fuel Pool) Tube Side Components	Pressure Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	D
Heat Exchanger (Fuel Pool) Tubes	Heat Transfer	Stainless Steel	Closed Cycle Cooling Water (External)	Reduction of Heat Transfer	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-188	3.3.1-50	B
			Treated Water (Internal)	Reduction of Heat Transfer	One-Time Inspection (B.2.1.21)	VII.A4.AP-139	3.3.1-17	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-139	3.3.1-17	B
	Pressure Boundary	Stainless Steel	Closed Cycle Cooling Water (External)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	D
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-111	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-111	3.3.1-25	B
Hoses	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1-117	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B

Table 3.3.2-10 Fuel Pool Cooling and Storage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
Piping, piping components (Fuel Transfer Tube)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
Pump Casing (Fuel Pool Cooling Pumps)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B

Table 3.3.2-10 Fuel Pool Cooling and Storage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Strainer (Element)	Filter	Stainless Steel	Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
Tanks (Fuel Pool Skimmer Surge Tanks)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	D
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-10 Fuel Pool Cooling and Storage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E4.A-62	3.3.1-2	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B

Table 3.3.2-10 Fuel Pool Cooling and Storage System (Continued)

Notes	Definition of Note
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:

1. The inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage the aging effect(s) applicable to this component type, material, and environment combination.
2. The TLAA designation in the Aging Management Programs column indicates fatigue of this component is evaluated in Sections 4.7.

Table 3.3.2-11
Nonsafety-Related Ventilation System
Summary of Aging Management Evaluation

Table 3.3.2-11 Nonsafety-Related Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Bolting (Ducting Closure)	Mechanical Closure	Galvanized Bolting	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	C
Drip Pan	Leakage Boundary	Stainless Steel	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F2.AP-99	3.3.1-94	A, 1
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	C
Ducting and Components	Leakage Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.A-10	3.3.1-78	A
			Waste Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.E5.A-416	3.3.1-138	C
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.E5.A-414	3.3.1-139	C

Table 3.3.2-11 Nonsafety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Area Coolers) Tube Side Components	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-189	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F2.A-08	3.3.1-90	C, 1
		Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-199	3.3.1-46	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Area Coolers) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-199	3.3.1-46	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Aux Bld Supply, Count Room, Lab Coolers) Tube Side Components	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-189	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F2.A-08	3.3.1-90	C, 1
Heat Exchanger (Aux Bld Supply, Count Room, Lab Coolers) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-199	3.3.1-46	D

Table 3.3.2-11 Nonsafety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Aux Bld Supply, Count Room, Lab Coolers) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Counting Room Condensing Unit) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	C
Heat Exchanger (Counting Room Condensing Unit) Tube Side Components	Leakage Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-416	3.3.1-138	A
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-414	3.3.1-139	A
Heat Exchanger (PASS Room Cooling Coil) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-11 Nonsafety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.H2.AP-194	3.3.1-37	A
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F1.AP-202	3.3.1-45	B
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.H2.AP-194	3.3.1-37	A

Table 3.3.2-11 Nonsafety-Related Ventilation System (Continued)

Notes	Definition of Note
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:

1. Components are housed inside of cooling coil housings; therefore, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage the aging effects related to this component type, material, and environment combination.

Table 3.3.2-12
Open Cycle Cooling Water System
Summary of Aging Management Evaluation

Table 3.3.2-12 Open Cycle Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
			Air - Outdoor (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-126	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-263	3.3.1-15	A
			Raw Water (External)	Loss of Material	Bolting Integrity (B.2.1.11)			H, 2
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-264	3.3.1-15	A
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B.2.1.28)	VII.I.AP-241	3.3.1-109	B
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-242	3.3.1-14	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Fixed Screens	Filter	Galvanized Steel	Raw Water (External)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	C, 4
Flexible Connection	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-16	3.3.1-118	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-206	3.3.1-34	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Flow Device	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
	Throttle	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
Heat Exchanger (Shutdown Service Water Pump Thrust Bearing Cooling Coil) Fins	Heat Transfer	Aluminum	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-162	3.3.1-99	C
					One-Time Inspection (B.2.1.21)	VII.H2.AP-162	3.3.1-99	C
				Reduction of Heat Transfer	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-154	3.3.1-101	C
					One-Time Inspection (B.2.1.21)	VII.H2.AP-154	3.3.1-101	C
Heat Exchanger (Shutdown Service Water Pump Thrust Bearing Cooling Coil) Tubes	Heat Transfer	Stainless Steel	Lubricating Oil (External)	Reduction of Heat Transfer	Lubricating Oil Analysis (B.2.1.26)	V.D2.EP-79	3.2.1-51	A

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Shutdown Service Water Pump Thrust Bearing Cooling Coil) Tubes	Heat Transfer	Stainless Steel	Lubricating Oil (External)	Reduction of Heat Transfer	One-Time Inspection (B.2.1.21)	V.D2.EP-79	3.2.1-51	A
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-187	3.3.1-42	A
	Pressure Boundary	Stainless Steel	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.C1.AP-138	3.3.1-100	C
					One-Time Inspection (B.2.1.21)	VII.C1.AP-138	3.3.1-100	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
						VII.C1.A-400	3.3.1-127	E, 5
		PVC	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-268	3.3.1-119	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)			G, 1
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Concrete (External)	None	None	VII.C3.AP-198	3.3.1-106	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-400	3.3.1-127	E, 5
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B.2.1.28)	VII.C1.AP-198	3.3.1-106	B
		Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-416	3.3.1-138	A
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-414	3.3.1-139	A
					Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-400	3.3.1-127	E, 5
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
Piping, piping components: Insulated	Leakage Boundary	Carbon Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components: Insulated	Leakage Boundary	Carbon Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
						VII.C1.A-400	3.3.1-127	E, 5
		Stainless Steel	Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
	Pressure Boundary	Carbon Steel	Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
						VII.C1.A-400	3.3.1-127	E, 5
				Wall Thinning	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-409	3.3.1-126	E, 6
		Stainless Steel	Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components: Insulated	Pressure Boundary	Stainless Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
	Structural Integrity (Attached)	Carbon Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
Pump Casing (Shutdown Service Water Pump 1A/1B)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (External)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
Pump Casing (Shutdown Service Water Pump 1C)	Pressure Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (External)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-416	3.3.1-138	A
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-414	3.3.1-139	A
Spray Nozzles	Spray	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Spray Nozzles	Spray	Stainless Steel	Raw Water (Internal)	Flow Blockage	Open-Cycle Cooling Water System (B.2.1.12)	VII.G.A-55	3.3.1-66	E, 3
				Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
Strainer (Element)	Filter	Stainless Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
Traveling Water Screens	Filter	Galvanized Steel	Raw Water (External)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	C, 4
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body: Insulated	Leakage Boundary	Carbon Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
		Stainless Steel	Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
	Pressure Boundary	Carbon Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-194	3.3.1-37	A
		Stainless Steel	Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-54	3.3.1-40	A
	Structural Integrity (Attached)	Carbon Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.C1.A-405	3.3.1-132	A

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body: Insulated	Structural Integrity (Attached)	Carbon Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Notes	Definition of Note
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:

1. Consistent with operating experience contained in NUREG-2191 (Item VII.C1.A-787a), PVC piping components in a Raw Water environment are susceptible to Loss of Material. Components with this material and environment combination are managed by the Open-Cycle Cooling Water System AMP.
2. NUREG-1801 does not include the loss of material aging effect for submerged carbon steel bolting subjected to a raw water environment; however, operating experience contained in NUREG-2191 (Item VII.I.A-423) indicates that the Bolting Integrity AMP is used to manage loss of material for this component, material, and environment combination.
3. Flow blockage of manual deluge spray nozzles within the Open-Cycle Cooling Water System are managed by the Open-Cycle Cooling Water System AMP in place of the Fire Water System AMP.
4. The Fixed Screens and Traveling Water Screens are located in the screenhouse intake to provide a secondary filter for the fire pumps.
5. NUREG-1801, Rev. 2, as amended by LR-ISG-2012-02, specifies a plant-specific program. The Open-Cycle Cooling Water System AMP is used to manage the aging effect applicable to this component type, material, and environment combination.

Table 3.3.2-12 Open Cycle Cooling Water System (Continued)

Plant Specific Notes: (continued)

6. The Open-Cycle Cooling Water System (B.2.1.12) program has been substituted and will be used to manage wall thinning due to solid particle erosion for this component, material, and environment combination.

Table 3.3.2-13
Plant Drainage System
Summary of Aging Management Evaluation

Table 3.3.2-13 Plant Drainage System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air – Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
		Stainless Steel Bolting	Air – Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Drip Pan	Leakage Boundary	Carbon Steel	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Heat Exchanger (Drywell Equipment Drain Coolers) Shell Side Components	Leakage Boundary	Carbon Steel	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-13 Plant Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Drywell Equipment Drain Coolers) Shell Side Components	Leakage Boundary	Carbon Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	C
Heat Exchanger (Drywell Equipment Drain Coolers) Tube Side Components	Leakage Boundary	Carbon Steel	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-106	3.3.1-21	C
					Water Chemistry (B.2.1.2)	VII.E4.AP-106	3.3.1-21	D
Hoses	Leakage Boundary	Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Piping elements	Leakage Boundary	Glass	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Waste Water (Internal)	None	None	VII.J.AP-277	3.3.1-119	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Copper Alloy with 15% Zinc or less	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-272	3.3.1-95	A

Table 3.3.2-13 Plant Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Copper Alloy with greater than 15% Zinc	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-272	3.3.1-95	A
					Selective Leaching (B.2.1.22)	VII.E5.A-407	3.3.1-72	B
		Ductile Cast Iron	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
					Selective Leaching (B.2.1.22)	VII.E5.A-407	3.3.1-72	B
		Galvanized Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Gray Cast Iron	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-13 Plant Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Gray Cast Iron	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
					Selective Leaching (B.2.1.22)	VII.E5.A-407	3.3.1-72	B
		PVC	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-268	3.3.1-119	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			G, 1
		Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Pressure Boundary	Carbon Steel	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-13 Plant Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Structural Integrity (Attached)	Carbon Steel	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-280	3.3.1-95	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
Pump Casing (Auxiliary Building Drain Tank Pumps)	Leakage Boundary	Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	C
Pump Casing (Fuel Building Equipment Drain Pumps)	Leakage Boundary	Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	C
Pump Casing (Fuel Building Floor Drain Transfer Pumps)	Leakage Boundary	Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C

Table 3.3.2-13 Plant Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Pump Casing (Fuel Building Floor Drain Transfer Pumps)	Leakage Boundary	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	C
Pump Casing (Fuel Cask Washdown Area Drain Pump)	Pressure Boundary	Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	C
Tanks (Auxiliary Building Floor Drain Tank)	Leakage Boundary	Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Tanks (Fuel Building Equipment Drain Tank)	Leakage Boundary	Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-13 Plant Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (Fuel Building Floor Drain Tank)	Leakage Boundary	Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Valve Body	Leakage Boundary	Carbon Steel	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Copper Alloy with 15% Zinc or less	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-272	3.3.1-95	A
		Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Pressure Boundary	Carbon Steel	Air – Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-13 Plant Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Carbon Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Stainless Steel	Air – Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-13 Plant Drainage System (Continued)

Notes	Definition of Note
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:

1. Consistent with operating experience contained in NUREG-2191 (Item VII.E5.A-787d), PVC piping components in a Waste Water environment are susceptible to Loss of Material. Components with this material and environment combination are managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP.

Table 3.3.2-14
Primary Containment Ventilation System
Summary of Aging Management Evaluation

Table 3.3.2-14 Primary Containment Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Bolting (Ducting Closure)	Mechanical Closure	Galvanized Bolting	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	C
Drip Pan	Leakage Boundary	Stainless Steel	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-99	3.3.1-94	C, 2
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A, 2
Ducting and Components	Structural Integrity (Attached)	Carbon Steel (with internal coatings)	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-81	3.3.1-78	A
			Condensation (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 1
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 1
Heat Exchanger (CGCS Cubicle Coil Cabinet) Tube Side Components	Structural Integrity (Attached)	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-109	3.3.1-79	C, 2

Table 3.3.2-14 Primary Containment Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (CGCS Cubicle Coil Cabinet) Tube Side Components	Structural Integrity (Attached)	Copper Alloy with 15% Zinc or less	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C
Heat Exchanger (Containment Purge and Supply Cooling Coils) Tube Side Components	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-189	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.A-08	3.3.1-90	C, 2
		Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-203	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 2
		Stainless Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-99	3.3.1-94	C, 2
Heat Exchanger (Containment Purge and Supply Cooling Coils) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-203	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 2

Table 3.3.2-14 Primary Containment Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Drywell Chiller Lube Oil Cooler) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.H2.AP-131	3.3.1-98	A
					One-Time Inspection (B.2.1.21)	VII.H2.AP-131	3.3.1-98	A
Heat Exchanger (Drywell Chiller) Shell Side Components: Insulated	Leakage Boundary	Carbon Steel	Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	C
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	C
Heat Exchanger (Drywell Chiller) Tube Side Components: Insulated	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-189	3.3.1-46	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-183	3.3.1-38	A
Heat Exchanger (Drywell Cooling Coils) Tube Side Components	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-189	3.3.1-46	B

Table 3.3.2-14 Primary Containment Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Drywell Cooling Coils) Tube Side Components	Leakage Boundary	Carbon Steel	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.H2.A-23	3.3.1-89	C, 2
		Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-203	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 2
		Stainless Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-99	3.3.1-94	C, 2
Heat Exchanger (Drywell Cooling Coils) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-203	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 2
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Closed Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1-117	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-202	3.3.1-45	B

Table 3.3.2-14 Primary Containment Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Carbon Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
Piping, piping components: Insulated	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
		Gray Cast Iron	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-202	3.3.1-45	B
					Selective Leaching (B.2.1.22)	VII.F3.A-50	3.3.1-72	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
		Stainless Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B

Table 3.3.2-14 Primary Containment Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components: Insulated	Leakage Boundary	Stainless Steel	Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
	Pressure Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
	Structural Integrity (Attached)	Carbon Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
Pump Casing (Drywell Chilled Water Pump)	Leakage Boundary	Gray Cast Iron	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-202	3.3.1-45	B
					Selective Leaching (B.2.1.22)	VII.F3.A-50	3.3.1-72	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
Strainer (Element)	Filter	Carbon Steel	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.I.A-81	3.3.1-78	E, 2

Table 3.3.2-14 Primary Containment Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (Air Separator): Insulated	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
Tanks (Drywell Chilled Water Compression Tank, Chemical Feed Tank, Sidestream Filter Vessel): Insulated	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-123	3.3.1-120	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-22	3.3.1-120	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
Valve Body: Insulated	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-202	3.3.1-45	B

Table 3.3.2-14 Primary Containment Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body: Insulated	Leakage Boundary	Carbon Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
	Pressure Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F3.AP-202	3.3.1-45	B
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
		Stainless Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F3.A-405	3.3.1-132	A

Table 3.3.2-14 Primary Containment Ventilation System (Continued)

Notes	Definition of Note
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:

1. Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.44) is used to manage the aging effect(s) applicable to this component type, material, and environment combination.
2. Components located inside HVAC housings, ducting or piping components, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.26) program is used to manage the aging effect(s) applicable to this component type, material, and environment combination.

Table 3.3.2-15
Process Radiation Monitoring System
Summary of Aging Management Evaluation

Table 3.3.2-15 Process Radiation Monitoring System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
			Air - Outdoor (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-126	3.3.1-12	A
Heat Exchanger (Standby Gas Hi Range Rad Monitor Cooler) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B
Heat Exchanger (Standby Gas Hi Range Rad Monitor Cooler) Tube Side Components	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	A
Heat Exchanger (Standby Gas Hi Range Rad Monitor Cooler) Tubes	Heat Transfer	Nickel Alloy	Closed Cycle Cooling Water (External)	Reduction of Heat Transfer	Closed Treated Water Systems (B.2.1.13)			G, 1

Table 3.3.2-15 Process Radiation Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Standby Gas Hi Range Rad Monitor Cooler) Tubes	Heat Transfer	Nickel Alloy	Condensation (Internal)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			G, 1
	Pressure Boundary	Nickel Alloy	Closed Cycle Cooling Water (External)	Loss of Material	Closed Treated Water Systems (B.2.1.13)			G, 1
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-274	3.3.1-95	C, 1
Hoses	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.C1.A-408	3.3.1-134	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A

Table 3.3.2-15 Process Radiation Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
	Pressure Boundary	Nickel Alloy	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-16	3.3.1-118	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-274	3.3.1-95	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.AP-221	3.3.1-6	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	A
	Structural Integrity (Attached)	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	A
Piping, piping components: Insulated	Pressure Boundary	Stainless Steel	Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-405	3.3.1-132	A
Pump Casing (CCW Sample Panels Pumps)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
Pump Casing (Common Station HVAC Rad Monitor Pump)	Pressure Boundary	Aluminum	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-36	3.3.1-113	A

Table 3.3.2-15 Process Radiation Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Pump Casing (Common Station HVAC Rad Monitor Pump)	Pressure Boundary	Aluminum	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-142	3.3.1-92	A
Pump Casing (Fuel Pool Service Water Rad Monitor Pumps)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
Pump Casing (Shutdown Service Water Rad Monitors Pumps)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Pump Casing (Standby Gas Hi Range Rad Monitor Pump)	Pressure Boundary	Aluminum	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-36	3.3.1-113	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F3.AP-142	3.3.1-92	A
Tanks (CCW Sample Panels Sample Chambers)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	D
Tanks (Common Station HVAC Rad Monitor Sample Chambers)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C

Table 3.3.2-15 Process Radiation Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (Common Station HVAC Rad Monitor Sample Chambers)	Pressure Boundary	Stainless Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	C
Tanks (Fuel Pool Service Water Rad Monitors Sample Chambers)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	D
Tanks (Shutdown Service Water Rad Monitors Sample Chambers)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	C
Tanks (Standby Gas Hi Range Rad Monitors Sample Chambers)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	C
Valve Body	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-15 Process Radiation Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.AP-221	3.3.1-6	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	A
	Structural Integrity (Attached)	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-273	3.3.1-95	A
Valve Body: Insulated	Pressure Boundary	Stainless Steel	Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-405	3.3.1-132	A

Table 3.3.2-15 Process Radiation Monitoring System (Continued)

Notes	Definition of Note
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:

1. Loss of material and reduction of heat transfer of the standby gas treatment system sample coolers is managed by the Closed Treated Water Systems AMP on the external surfaces of the tubes and by the Inspection of Internal Surfaces in Miscellaneous Piping and Ductings Components AMP on the internal surfaces of the tubes.

Table 3.3.2-16
Process Sampling and Post Accident Monitoring System
Summary of Aging Management Evaluation

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Drip Pan	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Heat Exchanger (Auxiliary Building Process Sample Panel Coolers) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B
Heat Exchanger (Auxiliary Building Process Sample Panel Coolers) Tube Side Components	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	B

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Auxiliary Building Process Sample Panel Coolers) Tube Side Components	Leakage Boundary	Stainless Steel	Treated Water > 140°F (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	D
Heat Exchanger (Closed Loop Cooling Skid) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.C1.A-408	3.3.1-134	A
Heat Exchanger (Reactor Sample Station Cooler) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-189	3.3.1-46	B
Heat Exchanger (Reactor Sample Station Cooler) Tube Side Components	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	B
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	D
Hoses	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Hoses	Pressure Boundary	Stainless Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Cumulative Fatigue Damage	TLAA	VII.E3.A-62	3.3.1-2	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-22	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Cumulative Fatigue Damage	TLAA	VII.E3.A-62	3.3.1-2	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
	Structural Integrity (Attached)	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Pump Casing (Closed Loop Cooling Pump)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
Pump Casing (Containment Sample Pump)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C
Pump Casing (Drywell Sump Sample Pump)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Pump Casing (H2/O2 Atmosphere Monitoring System Pump)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C
Tanks (Surge Tank)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	D

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.A-52	3.3.1-49	B
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Cumulative Fatigue Damage	TLAA	VII.E3.A-62	3.3.1-2	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Carbon Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.A-23	3.3.1-89	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-22	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Cumulative Fatigue Damage	TLAA	VII.E3.A-62	3.3.1-2	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
	Structural Integrity (Attached)	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F1.AP-99	3.3.1-94	C

Table 3.3.2-16 Process Sampling and Post Accident Monitoring System (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.

Table 3.3.2-17
Radwaste System
Summary of Aging Management Evaluation

Table 3.3.2-17 Radwaste System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17 Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Pump Casing (RWCU F/D Backwash Tank Pumps)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Rupture Disks	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	C
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-281	3.3.1-91	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-17 Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-17 Radwaste System (Continued)

Notes	Definition of Note
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:

None.

Table 3.3.2-18
Reactor Water Cleanup System
Summary of Aging Management Evaluation

Table 3.3.2-18 Reactor Water Cleanup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Gearbox	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.C2.AP-127	3.3.1-97	C
					One-Time Inspection (B.2.1.21)	VII.C2.AP-127	3.3.1-97	C
Heat Exchanger (Bearing Cooler) Tube Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.E3.AP-189	3.3.1-46	B
Heat Exchanger (RWCU Non-Regenerative) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.E3.AP-189	3.3.1-46	B

Table 3.3.2-18 Reactor Water Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (RWCU Non-Regenerative) Tube Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	D
Heat Exchanger (RWCU Pedestal and Cover Cooler) Tube Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.E3.AP-189	3.3.1-46	B
Heat Exchanger (RWCU Regenerative) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	D
Heat Exchanger (RWCU Regenerative) Tube Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	D
Heat Exchanger (RWCU Seal Cooler) Shell Side Components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-18 Reactor Water Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (RWCU Seal Cooler) Shell Side Components	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.E3.AP-189	3.3.1-46	B
Heat Exchanger (RWCU Seal Cooler) Tube Side Components	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	B
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	D
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1-117	A
			Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1-117	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	V.D2.E-10	3.2.1-1	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	VIII.D2.S-16	3.4.1-5	D
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-18 Reactor Water Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Stainless Steel	Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E3.A-62	3.3.1-2	A, 2
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	VIII.D2.S-16	3.4.1-5	D
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
Pump Casing (RWCU Holding Pumps)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B

Table 3.3.2-18 Reactor Water Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Pump Casing (RWCU Precoat Pump)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
Pump Casing (RWCU Recirculating Pumps)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
Pump Casing (RWCU Resin Metering Pump)	Leakage Boundary	Polymer	Air - Indoor, Uncontrolled (External)	Hardening and Loss of Strength	External Surfaces Monitoring of Mechanical Components (B.2.1.24)			F, 1
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)			F, 1
			Treated Water (Internal)	Hardening and Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			F, 1
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			F, 1
Tanks (RWCU Filter Demineralizers)	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	D

Table 3.3.2-18 Reactor Water Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (RWCU Precoat Tank)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	D
Tanks (Resin Feed)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	D
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.C2.AP-202	3.3.1-45	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VII.E3.AP-112	3.3.1-20	C
					Water Chemistry (B.2.1.2)	VII.E3.AP-112	3.3.1-20	D
				Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A

Table 3.3.2-18 Reactor Water Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-110	3.3.1-25	B

Table 3.3.2-18 Reactor Water Cleanup System (Continued)

Notes	Definition of Note
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:

1. Aging effects have been established based on NUREG-2191 (GALL-SLR) items VII.I.A-797a and VII.I.A-797b.The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP will manage hardening or loss of strength and loss of material for the internal surfaces of the polymeric RWCU Metering Pump exposed to treated water while the External Surfaces Monitoring of Mechanical Components AMP will manage hardening or loss of strength and loss of material for the external surfaces of the polymeric RWCU Metering Pump exposed to indoor uncontrolled air.
2. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.

Table 3.3.2-19
Safety-Related Ventilation System
Summary of Aging Management Evaluation

Table 3.3.2-19 Safety-Related Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Bolting (Ducting Closure)	Mechanical Closure	Galvanized Bolting	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	C
Drip Pan	Leakage Boundary	Stainless Steel	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F2.AP-99	3.3.1-94	A, 1
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	C
Ducting and Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.A-10	3.3.1-78	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F2.A-08	3.3.1-90	A
		Galvanized Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1-116	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F2.A-08	3.3.1-90	A

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Flexible Connection	Pressure Boundary	Elastomers	Air - Indoor, Uncontrolled (External)	Hardening and Loss of Strength	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.AP-102	3.3.1-76	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.AP-113	3.3.1-82	A
			Condensation (Internal)	Hardening and Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			G, 2
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			G, 2
Heat Exchanger (Diesel Generator Make-Up Supply Unit) Tube Side Components	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-189	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F4.A-08	3.3.1-90	C, 1
Heat Exchanger (Diesel Generator Make-Up Supply Unit) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-199	3.3.1-46	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (ECCS Equipment Room Coil Cabinet) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (ECCS Equipment Room Coil Cabinet) Tube Side Components	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
				Wall Thinning	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-409	3.3.1-126	E, 5
Heat Exchanger (ECCS Equipment Room Coil Cabinet) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-72	3.3.1-42	A
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
				Wall Thinning	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-409	3.3.1-126	E, 5
Heat Exchanger (Fuel Building Area Cooler) Tube Side Components	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-189	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F2.A-08	3.3.1-90	C, 1
		Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-199	3.3.1-46	D

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Fuel Building Area Cooler) Tube Side Components	Leakage Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Fuel Building Area Cooler) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-199	3.3.1-46	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Fuel Building Ventilation Supply Air Coil Bank) Tube Side Components	Leakage Boundary	Carbon Steel	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-189	3.3.1-46	B
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.F2.A-08	3.3.1-90	C, 1
Heat Exchanger (Fuel Building Ventilation Supply Air Coil Bank) Tubes	Leakage Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-199	3.3.1-46	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Inverter Room Coil Cabinet) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Inverter Room Coil Cabinet) Tube Side Components	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
Heat Exchanger (Inverter Room Coil Cabinet) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-72	3.3.1-42	A
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
Heat Exchanger (MSIV Inboard Room Coil Cabinet) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3
Heat Exchanger (MSIV Inboard Room Coil Cabinet) Tube Side Components	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
Heat Exchanger (MSIV Inboard Room Coil Cabinet) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-72	3.3.1-42	A

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (MSIV Inboard Room Coil Cabinet) Tubes	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
Heat Exchanger (SSW Pump Room Coil Cabinet) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3
Heat Exchanger (SSW Pump Room Coil Cabinet) Tube Side Components	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
Heat Exchanger (SSW Pump Room Coil Cabinet) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-72	3.3.1-42	A
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
Heat Exchanger (Switchgear Heat Removal Coil Cabinet) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Switchgear Heat Removal Coil Cabinet) Tube Side Components	Leakage Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-199	3.3.1-46	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	C
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
Heat Exchanger (Switchgear Heat Removal Coil Cabinet) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	C
			Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)			H, 3
	Leakage Boundary	Copper Alloy with 15% Zinc or less	Closed Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water Systems (B.2.1.13)	VII.F2.AP-199	3.3.1-46	D
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	C
			Condensation (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	C, 1

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Switchgear Heat Removal Condensing Unit) Shell Side Components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	C
Heat Exchanger (Switchgear Heat Removal Condensing Unit) Tube Sheet	Pressure Boundary	Carbon Steel	Air/Gas - Dry (External)	None	None	VII.J.AP-6	3.3.1-121	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-183	3.3.1-38	A
Heat Exchanger (Switchgear Heat Removal Condensing Unit) Tube Side Components	Pressure Boundary	Carbon Steel (with internal coatings)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-416	3.3.1-138	A
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)	VII.C1.A-414	3.3.1-139	A
Heat Exchanger (Switchgear Heat Removal Condensing Unit) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (External)	None	None	VII.J.AP-9	3.3.1-114	C

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Heat Exchanger (Switchgear Heat Removal Condensing Unit) Tubes	Heat Transfer	Copper Alloy with 15% Zinc or less	Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.A-72	3.3.1-42	A
	Pressure Boundary	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (External)	None	None	VII.J.AP-9	3.3.1-114	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B.2.1.12)	VII.C1.AP-179	3.3.1-38	A
Piping elements	Pressure Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-98	3.3.1-117	A
Piping, piping components	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-6	3.3.1-121	A
		Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	A
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A
	Structural Integrity (Attached)	Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A
Piping, piping components: Insulated	Pressure Boundary	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components: Insulated	Pressure Boundary	Copper Alloy with 15% Zinc or less	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.A-405	3.3.1-132	A
Strainer (Element)	Filter	Nickel Alloy	Air/Gas - Dry (Internal)	None	None			G, 4
Valve Body	Pressure Boundary	Copper Alloy with 15% Zinc or less	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	A
		Copper Alloy with greater than 15% Zinc	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1-114	A
			Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.G.AP-143	3.3.1-89	A
Valve Body: Insulated	Pressure Boundary	Copper Alloy with 15% Zinc or less	Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.A-405	3.3.1-132	A
		Copper Alloy with greater than 15% Zinc	Air/Gas - Dry (Internal)	None	None	VII.J.AP-9	3.3.1-114	A
			Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.A-405	3.3.1-132	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.F2.A-405	3.3.1-132	A

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

Notes	Definition of Note
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:

1. Components are housed inside of cooling coil cabinets (addressed under "Ducting and Components"); therefore, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage the aging effects related to this component type, material, and environment combination.
2. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage the aging effect(s) applicable to this component type, material, and environment combination.
3. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage the reduction of heat transfer aging effect applicable to this component type, material, and environment combination. The component is located within HVAC ducting and components, and the external surfaces of this component are subject to the internal HVAC environment of condensation during normal operation. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program performs visual inspections which are capable of identifying aging mechanisms which cause reduction of heat transfer.
4. Nickel Alloy in a gas environment is not expected to produce any aging effects with reference to the EPRI Mechanical Tools.

Table 3.3.2-19 Safety-Related Ventilation System (Continued)

5. The Open-Cycle Cooling Water System (B.2.1.12) program has been substituted and will be used to manage wall thinning due to solid particle erosion for this component, material, and environment combination.

Table 3.3.2-20
Standby Liquid Control System
Summary of Aging Management Evaluation

Table 3.3.2-20 Standby Liquid Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
		Stainless Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Electric Heaters	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Sodium Pentaborate Solution (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E2.AP-141	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.E2.AP-141	3.3.1-25	D
Gearbox (Standby Liquid Control Pumps)	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.E4.AP-127	3.3.1-97	C
					One-Time Inspection (B.2.1.21)	VII.E4.AP-127	3.3.1-97	C
		Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.E4.AP-127	3.3.1-97	A
					One-Time Inspection (B.2.1.21)	VII.E4.AP-127	3.3.1-97	A

Table 3.3.2-20 Standby Liquid Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1-117	A
	Pressure Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-14	3.3.1-117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1-117	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Sodium Pentaborate Solution (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)			G, 1
					Water Chemistry (B.2.1.2)			G, 1
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Sodium Pentaborate Solution (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E2.AP-141	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E2.AP-141	3.3.1-25	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B.2.1.26)	VII.E4.AP-127	3.3.1-97	A

Table 3.3.2-20 Standby Liquid Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-127	3.3.1-97	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.EP-61	3.2.1-48	A
			Sodium Pentaborate Solution (External)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E2.AP-141	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E2.AP-141	3.3.1-25	B
			Sodium Pentaborate Solution (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E2.AP-141	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E2.AP-141	3.3.1-25	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
	Structural Integrity (Attached)	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.EP-61	3.2.1-48	A
Pump Casing (Standby Liquid Control Pumps)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Sodium Pentaborate Solution (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E2.AP-141	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E2.AP-141	3.3.1-25	B
Tanks (Standby Liquid Control Storage Tank)	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C

Table 3.3.2-20 Standby Liquid Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Tanks (Standby Liquid Control Storage Tank)	Pressure Boundary	Stainless Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.EP-61	3.2.1-48	C
			Sodium Pentaborate Solution (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E2.AP-141	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.E2.AP-141	3.3.1-25	D
Tanks (Standby Liquid Control Test Tank)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.EP-61	3.2.1-48	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	C
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	D
Tanks (Waste Drum)	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	C
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.EP-61	3.2.1-48	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
Valve Body	Leakage Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B

Table 3.3.2-20 Standby Liquid Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.E5.AP-278	3.3.1-95	A
	Pressure Boundary	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Sodium Pentaborate Solution (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E2.AP-141	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E2.AP-141	3.3.1-25	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.E4.AP-110	3.3.1-25	B
	Structural Integrity (Attached)	Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.EP-61	3.2.1-48	A

Table 3.3.2-20 Standby Liquid Control System (Continued)

Notes	Definition of Note
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:

1. The Water Chemistry (B.2.1.2) program manages the aging effects on carbon steel Standby Liquid Control (SLC) System components subject to the sodium pentaborate environment by monitoring and controlling SLC System storage tank treated water chemistry. Aging effects on carbon steel exposed to a sodium pentaborate environment are established using a treated water environment.

Table 3.3.2-21
Suppression Pool Cleanup System
Summary of Aging Management Evaluation

Table 3.3.2-21 Suppression Pool Cleanup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VII.I.AP-125	3.3.1-12	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VII.I.AP-124	3.3.1-15	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Concrete (External)	None	None	VII.J.AP-19	3.3.1-120	A
			Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A

Table 3.3.2-21 Suppression Pool Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Stainless Steel	Treated Water (External)	Loss of Material	Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
Pump Casing (Suppression Pool Clean-Up Pump)	Leakage Boundary	Gray Cast Iron	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
					Selective Leaching (B.2.1.22)	VII.A4.AP-31	3.3.1-72	B
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.E3.AP-106	3.3.1-21	A
					Water Chemistry (B.2.1.2)	VII.E3.AP-106	3.3.1-21	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-21 Suppression Pool Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VII.A4.AP-110	3.3.1-25	A
					Water Chemistry (B.2.1.2)	VII.A4.AP-110	3.3.1-25	B

Table 3.3.2-21 Suppression Pool Cleanup System (Continued)

Notes	Definition of Note
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:

None.

3.4 AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEM

3.4.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.4, Steam and Power Conversion System, as being subject to aging management review. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Condensate System (2.3.4.1)
- Feedwater System (2.3.4.2)
- Main Steam System (2.3.4.3)

3.4.2 RESULTS

The following tables summarize the results of the aging management review for Steam and Power Conversion System.

Table 3.4.2-1 Condensate System - Summary of Aging Management Evaluation

Table 3.4.2-2 Feedwater System - Summary of Aging Management Evaluation

Table 3.4.2-3 Main Steam System - Summary of Aging Management Evaluation

3.4.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.4.2.1.1 Condensate System

Materials

The materials of construction for the Condensate System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Glass
- Stainless Steel

Environments

The Condensate System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Treated Water

Aging Effect Requiring Management

The following aging effects associated with the Condensate System components require management:

- Loss of Material
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Condensate System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- One-Time Inspection (B.2.1.21)
- Water Chemistry (B.2.1.2)

3.4.2.1.2 Feedwater System

Materials

The materials of construction for the Feedwater System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Stainless Steel

Environments

The Feedwater System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Treated Water
- Treated Water > 140°F

Aging Effect Requiring Management

The following aging effects associated with the Feedwater System components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Material
- Loss of Preload
- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Feedwater System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Flow-Accelerated Corrosion (B.2.1.10)
- One-Time Inspection (B.2.1.21)
- TLAA
- Water Chemistry (B.2.1.2)

3.4.2.1.3 Main Steam System

Materials

The materials of construction for the Main Steam System components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Gray Cast Iron (with Internal Coating)
- Stainless Steel

Environments

The Main Steam System components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Condensation
- Steam
- Treated Water
- Treated Water > 140°F

Aging Effect Requiring Management

The following aging effects associated with the Main Steam System components require management:

- Cracking
- Cumulative Fatigue Damage
- Loss of Coating or Lining Integrity
- Loss of Material
- Loss of Preload

- Wall Thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Main Steam System components:

- Bolting Integrity (B.2.1.11)
- External Surfaces Monitoring of Mechanical Components (B.2.1.24)
- Flow-Accelerated Corrosion (B.2.1.10)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)
- One-Time Inspection (B.2.1.21)
- TLAA
- Water Chemistry (B.2.1.2)

3.4.2.2 AMR Results for Which Further Evaluation is Recommended by the GALL Report

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the license renewal application. For the Steam and Power Conversion System, those programs are addressed in the following subsections.

3.4.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of metal fatigue as a TLAA for the Feedwater System, Main Steam System, and Reactor Coolant Pressure Boundary is discussed in Section 4.3.

3.4.2.2.2 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The possibility of cracking also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Cracking is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from *other agricultural or industrial sources. This item is applicable for the environments described above.*

GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external chloride stress corrosion cracking is not expected. The GALL Report recommends further evaluation to determine whether an adequate aging management program is used to manage this aging effect based on the environmental conditions applicable to the plant and ASME Code Section XI requirements applicable to the components.

Item Number 3.4.1-2 is not applicable to CPS. Cracking due to stress corrosion cracking could occur for stainless steel components exposed to an aggressive air environment with the potential for the concentration of contaminants. Operating experience shows that the ambient air at CPS is not aggressive such that cracking of stainless steel components exposed to air is not an applicable aging effect..

3.4.2.2.3 Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The possibility of pitting and crevice corrosion also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Pitting and crevice corrosion is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.

GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external pitting or crevice corrosion is not expected. The GALL Report recommends further evaluation to determine whether an adequate aging management program is used to manage this aging effect based on the environmental conditions applicable to the plant and ASME Code Section XI requirements Quality Assurance for Aging Management of Nonsafety-Related Components.

Item Number 3.4.1-3 is not applicable to CPS. Loss of material due to pitting and crevice corrosion could occur for stainless steel components exposed to an aggressive air environment with the potential for the concentration of contaminants. Operating experience shows that the ambient air at CPS is not aggressive such that loss of material of stainless steel components exposed to air is not an applicable aging effect.

3.4.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

QA provisions applicable to License Renewal are discussed in Section B.1.3.

3.4.2.2.5 Ongoing Review of Operating Experience

Ongoing review of operating experience is addressed in Appendix A, Section A.1.6 and Appendix B, Section B.1.4.

3.4.2.2.6 Loss of Material due to Recurring Internal Corrosion

Recurring internal corrosion can result in the need to augment AMPs beyond the recommendations in the GALL Report. During the search of plant-specific OE conducted during the LRA development, recurring internal corrosion can be identified by the number of occurrences of aging effects and the extent of degradation at each localized corrosion site. This further evaluation item is applicable if the search of plant-specific OE reveals repetitive occurrences (e.g., one per refueling outage cycle that has occurred over: (a) three or more sequential or nonsequential cycles for a 10-year OE search, or (b) two or more sequential or nonsequential cycles for a 5-year OE search) of aging effects with the same aging mechanism in which the aging effect resulted in the component either not meeting plant-specific acceptance criteria or experiencing a reduction in wall thickness greater than 50 percent (regardless of the minimum wall thickness.)

The GALL Report recommends that a plant-specific AMP, or a new or existing AMP, be evaluated for inclusion of augmented requirements to ensure the adequate management of any recurring aging effect(s). Potential augmented requirements include: alternative examination methods (e.g., volumetric versus external visual), augmented inspections (e.g., a greater number of locations, additional locations based on risk insights based on susceptibility to aging effect and consequences of failure, a greater frequency of inspections), and additional trending parameters and decision points where increased inspections would be implemented. Acceptance criteria are described in Appendix A.1, "Aging Management Review – Generic (Branch Technical Position RSLB-1)."

The applicant states: (a) why the program's examination methods will be sufficient to detect the recurring aging effect before affecting the ability of a component to perform its intended function, (b) the basis for the adequacy of augmented or lack of augmented inspections, (c) what parameters will be trended as well as the decision points where increased inspections would be implemented (e.g., the extent of degradation at individual corrosion sites, the rate of degradation change), (d) how inspections of components that are not easily accessed (i.e., buried, underground) will be conducted, and (e) how leaks in any involved buried or underground components will be identified.

Each plant-specific operating experience example should be evaluated to determine if the chosen AMP should be augmented even if the thresholds for significance of aging effect or frequency of occurrence of aging effect have not been exceeded. For example, during a 10-year search of plant specific operating experience, two instances of 360 degree 30 percent wall loss occurred at copper alloy to steel joints. Neither the significance of the aging effect nor the frequency of occurrence of aging effect threshold has been exceeded. Nevertheless, the operating experience should be evaluated to determine if the AMP that is proposed to manage the aging effect is sufficient (e.g., method of inspection, frequency of inspection, number of inspections) to provide *reasonable assurance that the CLB intended functions of the component will be met throughout the period of extended operation. Likewise, the GALL Report AMR items associated with the new FE items only cite raw water and waste water environments because OE indicates that these are the predominant environments associated with recurring internal corrosion; however, if the search of plant-specific OE reveals recurring internal corrosion in other water environments (e.g., treated water), the aging effect should be addressed in a similar manner.*

LR-ISG-2012-02 has been issued which addresses instances of recurring internal corrosion identified during review of plant specific operating experience. The operating experience for CPS has been reviewed and instances of internal corrosion in the Steam and Power Conversion Systems have not been identified with a frequency that is consistent with the thresholds discussed in LR-ISG-2012-02.

3.4.2.3 Time-Limited Aging Analysis

The time-limited aging analyses identified below are associated with the Steam and Power Conversion System components:

Section 4.3, Metal Fatigue

- Feedwater System
- Main Steam System

3.4.3 CONCLUSION

The Steam and Power Conversion System piping, fittings, and components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Steam and Power Conversion System components are identified in the summaries in Section 3.4.2.1 above.

A description of these 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 conclusions provided in Appendix B, the effects of aging associated with the Steam and Power Conversion System components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-1	Steel Piping, piping components, and piping elements exposed to Steam or Treated water	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.4.2.2.1.
3.4.1-2	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Not Applicable. There are no stainless steel piping, piping components, piping elements, or tanks exposed to air - outdoor in the Steam and Power Conversion Systems. See Subsection 3.4.2.2.2.
3.4.1-3	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Not Applicable. There are no stainless steel piping, piping components, piping elements, or tanks exposed to air - outdoor in the Steam and Power Conversion Systems. See subsection 3.4.2.2.3.
3.4.1-4	PWR Only				

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-5	Steel Piping, piping components, and piping elements exposed to Steam, Treated water	Wall thinning due to flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with NUREG-1801 with exceptions. The Flow-Accelerated Corrosion (B.2.1.10) program will be used to manage wall thinning of the carbon steel piping and piping components exposed to steam and treated water in the Reactor Water Cleanup System, Feedwater System, and Main Steam System. An exception applies to the NUREG-1801 recommendations for Flow-Accelerated Corrosion (B.2.1.10) program implementation.
3.4.1-6	Steel, Stainless Steel Bolting exposed to Soil	Loss of preload	Chapter XI.M18, "Bolting Integrity "	No	Not Applicable. There are no steel or stainless steel bolting exposed to soil in the Steam and Power Conversion Systems.
3.4.1-7	High-strength steel Closure bolting exposed to Air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No	Not Applicable. There are no steel high strength closure bolting exposed to air with steam or water leakage in Steam and Power Conversion systems.
3.4.1-8	Steel; stainless steel Bolting, Closure bolting exposed to Air – outdoor (External), Air – indoor, uncontrolled (External)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage loss of material of the carbon and low alloy steel bolting exposed to air - indoor uncontrolled and air - outdoor in the Condensate System, Feedwater System, and Main Steam System.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-9	Steel Closure bolting exposed to Air with steam or water leakage	Loss of material due to general corrosion	Chapter XI.M18, "Bolting Integrity"	No	Not Used. Loss of material for steel closure bolting in the Steam and Power Conversion Systems are included in item 3.4.1-8.
3.4.1-10	Copper alloy, Nickel alloy, Steel; stainless steel, Steel; stainless steel Bolting, Closure bolting exposed to Any environment, Air – outdoor (External), Air – indoor, uncontrolled (External)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. The Bolting Integrity (B.2.1.11) program will be used to manage loss of preload of the carbon and low alloy steel bolting exposed to air - indoor uncontrolled and air - outdoor in the Condensate System, Feedwater System, and Main Steam System.
3.4.1-11	Stainless steel Piping, piping components, and piping elements, Tanks, Heat exchanger components exposed to Steam, Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) program will be used to manage cracking of the stainless steel piping, piping components, and piping elements exposed to reactor coolant, steam, and treated water > 140°F in the Reactor Core Isolation Cooling System, Residual Heat Removal System, Reactor Coolant Pressure Boundary System, Feedwater System, and Main Steam System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-12	Steel; stainless steel Tanks exposed to Treated water	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. There are no steel or stainless steel tanks exposed to treated water in the Steam and Power Conversion Systems.
3.4.1-13	PWR Only				
3.4.1-14	Steel Piping, piping components, and piping elements, PWR heat exchanger components exposed to Steam, Treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) program will be used to manage loss of material of the carbon steel piping and piping components, and piping elements exposed to steam and treated water in the Reactor Core Isolation Cooling System, Reactor Coolant Pressure Boundary System, Condensate System, Feedwater System, and Main Steam System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.4.1-15	Steel Heat exchanger components exposed to Treated water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) program will be used to manage loss of material of the carbon steel heat exchanger components exposed to treated water in the Residual Heat Removal System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.

Table 3.4.1	Summary of Aging Management Evaluations for the Steam and Power Conversion				
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-16	Copper alloy, Stainless steel, Nickel alloy, Aluminum Piping, piping components, and piping elements, Heat exchanger components and tubes, PWR heat exchanger components exposed to Treated water, Steam	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801 with exceptions. The One-Time Inspection (B.2.1.21) and Water Chemistry (B.2.1.2) program will be used to manage loss of material of the stainless steel heat exchanger components, piping, piping components, and piping elements exposed to steam, treated water, and treated water >140°F in the Reactor Coolant Pressure Boundary System, Condensate System, Feedwater System, and Main Steam System. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.4.1-17	PWR Only				
3.4.1-18	Copper alloy, Stainless steel Heat exchanger tubes exposed to Treated water	Reduction of heat transfer due to fouling	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Not Applicable. There are no stainless steel or copper alloy heat exchanger components exposed to treated water in the Steam and Power Conversion Systems.
3.4.1-19	Stainless steel, Steel Heat exchanger components exposed to Raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no stainless steel or steel heat exchanger components exposed to raw water in the Steam and Power Conversion Systems.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-20	Copper alloy, Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no copper alloy or stainless steel piping, piping components, and piping elements exposed to raw water in the Steam and Power Conversion Systems.
3.4.1-21	PWR Only				
3.4.1-22	Stainless steel, Copper alloy, Steel Heat exchanger tubes, Heat exchanger components exposed to Raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not Applicable. There are no stainless steel, copper alloy, or steel heat exchanger tubes and heat exchanger components exposed to raw water in the Steam and Power Conversion Systems.
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	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60ºC (>140ºF) in the Steam and Power Conversion Systems.
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	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no steel heat exchanger components exposed to closed-cycle cooling water in the Steam and Power Conversion Systems.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-25	Steel Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no steel heat exchanger components exposed to closed-cycle cooling water in the Steam and Power Conversion Systems.
3.4.1-26	Stainless steel Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no steel heat exchanger components exposed to closed-cycle cooling water in the Steam and Power Conversion Systems.
3.4.1-27	Copper alloy Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no copper alloy piping, piping components, and piping elements exposed to closed-cycle cooling water in the Steam and Power Conversion Systems.
3.4.1-28	Steel, Stainless steel, Copper alloy Heat exchanger components and tubes, Heat exchanger tubes exposed to Closed-cycle cooling water	Reduction of heat transfer due to fouling	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not Applicable. There are no steel, stainless steel or copper alloy heat exchanger components and tubes, heat exchanger tubes exposed to closed-cycle cooling water in the Steam and Power Conversion Systems.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-29	Steel Tanks exposed to Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not Applicable. There are no steel tanks exposed to air - outdoor (external) in the Steam and Power Conversion Systems.
3.4.1-30	Steel, Stainless Steel, Aluminum Tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to Soil or Concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to general, (steel only) pitting, and crevice corrosion; cracking due to stress corrosion cracking (stainless steel and aluminum only)	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not Applicable. There are no steel, stainless steel or aluminum tanks (within the scope of chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete, or the following external environments of air - outdoor, air - indoor uncontrolled, moist air, or condensation in the Steam and Power Conversion System.
3.4.1-31	Stainless steel, Aluminum Tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to Soil or Concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to pitting, and crevice corrosion; cracking due to stress corrosion cracking	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not Applicable. There are no stainless steel or aluminum tanks (within the scope of chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete, or the following external environments of air - outdoor, air - indoor uncontrolled, moist air, or condensation in the Steam and Power Conversion System.
3.4.1-32	Gray cast iron Piping, piping components, and piping elements exposed to Soil	Loss of material due to selective leaching	Chapter XI.M33, "Selective Leaching"	No	Not Applicable. There are no gray cast iron piping, piping components, or piping elements exposed to soil in the Steam and Power Conversion Systems.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-33	Gray cast iron, Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements exposed to Treated water, Raw water, Closed-cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	Not Applicable. There are no gray cast iron or copper alloy piping, piping components or piping elements exposed to treated water, raw water, or closed-cycle cooling water in the Steam and Power Conversion Systems.
3.4.1-34	Steel External surfaces exposed to Air – indoor, uncontrolled (External), Air – outdoor (External), Condensation (External)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage loss of material of the carbon steel piping and piping components exposed to air - indoor uncontrolled in the Condensate System, Feedwater System, and Main Steam System.
3.4.1-35	Aluminum Piping, piping components, and piping elements exposed to Air - outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not Applicable. There are no aluminum piping, piping components or piping elements exposed to air - outdoor in the Steam and Power Conversion Systems.
3.4.1-36	PWR Only				
3.4.1-37	PWR Only				
3.4.1-38	PWR Only				

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-39	Stainless steel Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) program will be used to manage loss of material of stainless steel piping, piping components, and valve bodies exposed to condensation (internal) in the Main Steam System.
3.4.1-40	Steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. There are no steel piping, piping components, and piping elements exposed to lubricating oil in Steam and Power Conversion Systems.
3.4.1-41	PWR Only				
3.4.1-42	PWR Only				
3.4.1-43	Copper alloy Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. There are no copper alloy piping, piping components, and piping elements exposed to lubricating oil in the Steam and Power Conversion Systems.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-44	Stainless steel Piping, piping components, and piping elements, Heat exchanger components exposed to Lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Not Applicable. There are no stainless steel piping, piping components, and piping elements or heat exchanger components exposed to lubricating oil in the Steam and Power Conversion Systems.
3.4.1-45	PWR Only				
3.4.1-46	PWR Only				
3.4.1-47	Steel (with coating or wrapping), stainless steel, nickel-alloy piping, piping components, and piping elements; tanks exposed to Soil or Concrete	Loss of material due to general (steel only), pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There are no steel, stainless steel or nickel alloy piping, piping components, piping elements, or tanks exposed to soil or concrete in the Steam and Power Conversion Systems.
3.4.1-48	Stainless steel, nickel alloy bolting exposed to soil	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There is no stainless steel or nickel alloy bolting exposed to soil in the Steam and Power Conversion Systems.
3.4.1-49	Stainless steel, nickel alloy piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There are no stainless steel or nickel alloy piping, piping components, or piping elements exposed to soil or concrete in the Steam and Power Conversion Systems.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-50	Steel Bolting exposed to Soil	Loss of material due to general, pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There is no steel bolting exposed to soil in the Steam and Power Conversion Systems.
3.4.1-50x	Underground stainless steel, nickel alloy, steel piping, piping components, and piping elements	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not Applicable. There are no underground stainless steel, nickel alloy, or steel piping, piping components, or piping elements in the Steam and Power Conversion Systems.
3.4.1-51	Steel Piping, piping components, and piping elements exposed to Concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Not applicable. There are no steel piping, piping components, or piping elements exposed to concrete in the Steam and Power Conversion Systems.
3.4.1-52	Aluminum Piping, piping components, and piping elements exposed to Gas, Air – indoor, uncontrolled (Internal/External)	None	None	NA - No AEM or AMP	Not Applicable. There are no aluminum piping, piping components, or piping elements exposed to gas or air - indoor, uncontrolled (internal/external) in the Steam and Power Conversion Systems.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-53	PWR Only				
3.4.1-54	Copper alloy Piping, piping components, and piping elements exposed to Gas, Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Not Applicable. There are no copper alloy piping, piping components, or piping elements exposed to gas or air - indoor, uncontrolled (external) in the Steam and Power Conversion Systems.
3.4.1-55	Glass Piping elements exposed to Lubricating oil, Air – outdoor, Condensation (Internal/External), Raw water, Treated water, Air with borated water leakage, Gas, Closed-cycle cooling water, Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1-56	Nickel alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Not Applicable. There are no nickel alloy piping, piping components, or piping elements exposed to air - indoor, uncontrolled (external) in the Steam and Power Conversion Systems.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-57	Nickel alloy, PVC Piping, piping components, and piping elements exposed to Air with borated water leakage, Air – indoor, uncontrolled, Condensation (Internal)	None	None	NA - No AEM or AMP	Not Applicable. There are no nickel alloy or PVC piping, piping components, or piping elements exposed to air - indoor, uncontrolled or condensation (internal) in the Steam and Power Conversion Systems.
3.4.1-58	Stainless steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Concrete, Gas, Air – indoor, uncontrolled (Internal)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1-59	Steel Piping, piping components, and piping elements exposed to Air – indoor controlled (External), Gas	None	None	NA - No AEM or AMP	Not Applicable. There are no steel piping, piping components, or piping elements exposed to air - indoor controlled (external) or gas in the Steam and Power Conversion Systems.
3.4.1-60	Any material, piping, piping components, and piping elements exposed to treated water	Wall thinning due to erosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No	Not Applicable. There are no piping, piping components, or piping elements that are susceptible to wall thinning due to erosion.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-61	Metallic piping, piping components, and tanks exposed to raw water or waste water	Loss of material due to recurring internal corrosion	A plant-specific aging management program is to be evaluated to address recurring internal corrosion	Yes, plant-specific	Not Applicable. See subsection 3.4.2.2.6.
3.4.1-62	Steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not Applicable. There are no steel, stainless steel or aluminum tanks (within the scope of chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water in the Steam and Power Conversion System.
3.4.1-63	Insulated steel, stainless steel, copper alloy, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor	Loss of material due to general (steel, and copper alloy), pitting, or crevice corrosion, and cracking due to stress corrosion cracking (aluminum, stainless steel and copper alloy (>15% Zn) only)	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, "Aboveground Metallic Tanks" (for tanks only)	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage loss of material of carbon steel piping and piping components exposed to air - outdoor in the Condensate System.
3.4.1-64	Jacketed calcium silicate or fiberglass insulation in an air-indoor uncontrolled or air-outdoor environment	Reduced thermal insulation resistance due to moisture intrusion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) program will be used to manage reduced thermal insulation resistance of the elastomer and fiberglass insulation exposed to air - indoor uncontrolled and air - outdoor in the Structural Commodity Group.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-65	Jacketed foamglas ® (glass dust) insulation in an air-indoor uncontrolled or air-outdoor environment	Reduced thermal insulation resistance due to moisture intrusion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not Applicable. There are no Jacketed foamglas ® (glass dust) insulation exposed to air - indoor uncontrolled or air - outdoor in the Steam and Power Conversion System.
3.4.1-066	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Not Applicable. There are no metallic components with internal linings/coatings exposed to closed cycle cooling water, raw water, treated water, treated borated water, or lubricating oil in the Steam and Power Conversion System.
3.4.1-067	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Not Applicable. There are no metallic components with internal linings/coatings exposed to closed cycle cooling water, raw water, treated water, treated borated water, or lubricating oil in the Steam and Power Conversion System.
3.4.1-068	Gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Not Applicable. There are no gray cast iron components with internal linings/coatings exposed to closed cycle cooling water, raw water, or treated water in the Steam and Power Conversion System.

Table 3.4.2-1
Condensate System
Summary of Aging Management Evaluation

Table 3.4.2-1 Condensate System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VIII.H.SP-84	3.4.1-8	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VIII.H.SP-83	3.4.1-10	A
			Air - Outdoor (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VIII.H.SP-82	3.4.1-8	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VIII.H.SP-151	3.4.1-10	A
Piping elements	Leakage Boundary	Glass	Air - Indoor, Uncontrolled (External)	None	None	VIII.I.SP-9	3.4.1-55	A
			Treated Water (Internal)	None	None	VIII.I.SP-35	3.4.1-55	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.E.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-73	3.4.1-14	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VIII.I.SP-12	3.4.1-58	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.E.SP-87	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-87	3.4.1-16	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.E.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-73	3.4.1-14	B
Piping, piping components: Insulated	Pressure Boundary	Carbon Steel	Air - Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.E.S-402	3.4.1-63	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.E.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-73	3.4.1-14	B
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-1 Condensate System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Leakage Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.E.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-73	3.4.1-14	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.E.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-73	3.4.1-14	B

Table 3.4.2-1 Condensate System (Continued)

Notes	Definition of Note
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:

None.

Table 3.4.2-2
Feedwater System
Summary of Aging Management Evaluation

Table 3.4.2-2 Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VIII.H.SP-84	3.4.1-8	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VIII.H.SP-83	3.4.1-10	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D2.S-11	3.4.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.D2.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.D2.SP-73	3.4.1-14	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	VIII.D2.S-16	3.4.1-5	D
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VIII.I.SP-12	3.4.1-58	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.D2.SP-87	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.D2.SP-87	3.4.1-16	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.E.SP-88	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-88	3.4.1-11	B
				Cumulative Fatigue Damage	TLAA	VII.E3.A-62	3.3.1-2	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.D2.SP-87	3.4.1-16	A

Table 3.4.2-2 Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Leakage Boundary	Stainless Steel	Treated Water > 140°F (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	VIII.D2.SP-87	3.4.1-16	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D2.S-11	3.4.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.D2.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.D2.SP-73	3.4.1-14	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	VIII.D2.S-16	3.4.1-5	D
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.D2.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.D2.SP-73	3.4.1-14	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VIII.I.SP-12	3.4.1-58	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.D2.SP-87	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.D2.SP-87	3.4.1-16	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.E.SP-88	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.E.SP-88	3.4.1-11	B
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.D2.SP-87	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.D2.SP-87	3.4.1-16	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-2 Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.D2.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.D2.SP-73	3.4.1-14	B

Table 3.4.2-2 Feedwater System (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Programs column indicates that cumulative fatigue damage for this component is evaluated in Section 4.3.

Table 3.4.2-3
Main Steam System
Summary of Aging Management Evaluation

Table 3.4.2-3 Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Blower Housing	Structural Integrity (Attached)	Gray Cast Iron (with Internal Coating)	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VII.I.A-77	3.3.1-78	A
			Condensation (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 2
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (B.2.1.42)			G, 2
Bolting (Closure)	Mechanical Closure	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled (External)	Loss of Material	Bolting Integrity (B.2.1.11)	VIII.H.SP-84	3.4.1-8	A
				Loss of Preload	Bolting Integrity (B.2.1.11)	VIII.H.SP-83	3.4.1-10	A
Flow Device	Throttle	Stainless Steel	Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.C.SP-88	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-88	3.4.1-11	B
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.C.SP-87	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-87	3.4.1-16	B
Hoses	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-73	3.4.1-14	A

Table 3.4.2-3 Main Steam System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Hoses	Pressure Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	VIII.B2.SP-73	3.4.1-14	B
	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	A
Piping, piping components	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Steam (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B2.S-08	3.4.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-160	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-160	3.4.1-14	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	VIII.B2.S-15	3.4.1-5	D
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-73	3.4.1-14	B
				Wall Thinning	Flow-Accelerated Corrosion (B.2.1.10)	VIII.D2.S-16	3.4.1-5	D
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Steam (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B2.S-08	3.4.1-1	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-160	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-160	3.4.1-14	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-73	3.4.1-14	A

Table 3.4.2-3 Main Steam System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Pressure Boundary	Carbon Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B.2.1.2)	VIII.B2.SP-73	3.4.1-14	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VIII.I.SP-12	3.4.1-58	A
			Steam (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.B2.SP-98	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-98	3.4.1-11	B
				Cumulative Fatigue Damage	TLAA	VII.E3.A-62	3.3.1-2	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-155	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-155	3.4.1-16	B
			Treated Water (External)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.C.SP-87	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-87	3.4.1-16	B
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E3.A-62	3.3.1-2	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.C.SP-87	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-87	3.4.1-16	B
			Treated Water > 140°F (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.C.SP-88	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-88	3.4.1-11	B
				Cumulative Fatigue Damage	TLAA	VII.E3.A-62	3.3.1-2	A, 1
				Loss of Material	One-Time Inspection (B.2.1.21)	VIII.C.SP-87	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-87	3.4.1-16	B
	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-3 Main Steam System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Piping, piping components	Structural Integrity (Attached)	Carbon Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VIII.B2.SP-110	3.4.1-39	A
Valve Body	Leakage Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Steam (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-160	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-160	3.4.1-14	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-73	3.4.1-14	B
	Pressure Boundary	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Steam (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-160	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-160	3.4.1-14	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-73	3.4.1-14	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-73	3.4.1-14	B
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VIII.I.SP-12	3.4.1-58	A
			Steam (Internal)	Cracking	One-Time Inspection (B.2.1.21)	VIII.B2.SP-98	3.4.1-11	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-98	3.4.1-11	B

Table 3.4.2-3 Main Steam System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Valve Body	Pressure Boundary	Stainless Steel	Steam (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.B2.SP-155	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.B2.SP-155	3.4.1-16	B
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B.2.1.21)	VIII.C.SP-87	3.4.1-16	A
					Water Chemistry (B.2.1.2)	VIII.C.SP-87	3.4.1-16	B
	Structural Integrity (Attached)	Carbon Steel	Air - Indoor, Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.H.S-29	3.4.1-34	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	V.D2.E-27	3.2.1-46	A
		Stainless Steel	Air - Indoor, Uncontrolled (External)	None	None	VII.J.AP-17	3.3.1-120	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VIII.B2.SP-110	3.4.1-39	A

Table 3.4.2-3 Main Steam System (Continued)

Notes	Definition of Note
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:

1. The TLAA designation in the Aging Management Program column indicates that fatigue of this component is evaluated in Section 4.3.
2. For the environment of Condensation (Internal) the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program will be used to manage the identified component, material, environment, and aging effect.

3.5 AGING MANAGEMENT OF STRUCTURES AND COMPONENT SUPPORTS

3.5.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.4, Structures and Component Supports, as being subject to aging management review. The structures and commodities which are addressed in this section are described in the indicated sections.

- Auxiliary Building (2.4.1)
- Component Supports Commodity Group (2.4.2)
- Control Building (2.4.3)
- Cooling Lake (2.4.4)
- Diesel Generator Building (2.4.5)
- Fuel Building (2.4.6)
- Insulation Commodities Group (2.4.7)
- Primary Containment (2.4.8)
- Radwaste Building (2.4.9)
- Screen House (2.4.10)
- Structural Commodity Group (2.4.11)
- Switchyard Structures (2.4.12)
- Tank Foundations and Dikes (2.4.13)
- Turbine Building (2.4.14)
- Yard Structures (2.4.15)

3.5.2 RESULTS

The following tables summarize the results of the aging management review for Structures and Component Supports.

Table 3.5.2-1 Auxiliary Building - Summary of Aging Management Evaluation

Table 3.5.2-2 Component Supports Commodity Group - Summary of Aging Management Evaluation

Table 3.5.2-3 Control Building - Summary of Aging Management Evaluation

Table 3.5.2-4 Cooling Lake - Summary of Aging Management Evaluation

Table 3.5.2-5 Diesel Generator Building - Summary of Aging Management Evaluation

Table 3.5.2-6 Fuel Building - Summary of Aging Management Evaluation

3.5.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.5.2.1.1 Auxiliary Building

Materials

The materials of construction for the Auxiliary Building components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Concrete Block
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete

Environments

The Auxiliary Building components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Auxiliary Building components require management:

- Cracking

- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Auxiliary Building components:

- Masonry Walls (B.2.1.33)
- Structures Monitoring (B.2.1.34)

3.5.2.1.2 Component Supports Commodity Group

Materials

The materials of construction for the Component Supports Commodity Group components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Elastomer
- Galvanized Bolting
- Galvanized Steel
- Grout
- Lubrite
- Reinforced concrete
- Stainless Steel

Environments

The Component Supports Commodity Group components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Treated Water
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Component Supports Commodity Group components require management:

- Loss of Material
- Loss of Mechanical Function
- Loss of Preload
- Reduction in Concrete Anchor Capacity
- Reduction or Loss of Isolation Function

Aging Management Programs

The following aging management programs manage the aging effects for the Component Supports Commodity Group components:

- ASME Section XI, Subsection IWF (B.2.1.31)
- Structures Monitoring (B.2.1.34)
- Water Chemistry (B.2.1.2)

3.5.2.1.3 Control Building

Materials

The materials of construction for the Control Building components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Concrete Block
- Galvanized Bolting
- Reinforced concrete

Environments

The Control Building components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Control Building components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Mechanical Function
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Control Building components:

- Masonry Walls (B.2.1.33)
- Structures Monitoring (B.2.1.34)

3.5.2.1.4 Cooling Lake

Materials

The materials of construction for the Cooling Lake components are:

- Reinforced concrete
- Soil, rip-rap, gravel, rock

Environments

The Cooling Lake components are exposed to the following environments:

- Groundwater/Soil
- Water - Flowing
- Water - Standing

Aging Effect Requiring Management

The following aging effects associated with the Cooling Lake components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Material
- Loss of Material; Loss of Form

Aging Management Programs

The following aging management programs manage the aging effects for the Cooling Lake components:

- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)
- Structures Monitoring (B.2.1.34)

3.5.2.1.5 Diesel Generator Building

Materials

The materials of construction for the Diesel Generator Building components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Concrete Block
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete

Environments

The Diesel Generator Building components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Diesel Generator Building components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Diesel Generator Building components:

- Masonry Walls (B.2.1.33)
- Structures Monitoring (B.2.1.34)

3.5.2.1.6 Fuel Building

Materials

The materials of construction for the Fuel Building components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Concrete Block
- Elastomer
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete
- Stainless Steel
- Stainless Steel Bolting

Environments

The Fuel Building components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Treated Water
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Fuel Building components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Hardening and Loss of Strength
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Fuel Building components:

- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)
- Masonry Walls (B.2.1.33)
- Structures Monitoring (B.2.1.34)
- Water Chemistry (B.2.1.2)

3.5.2.1.7 Insulation Commodities Group

Materials

The materials of construction for the Insulation Commodities Group components are:

- Aluminum
- Fiberglass
- Stainless Steel

Environments

The Insulation Commodities Group components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor

Aging Effect Requiring Management

The following aging effects associated with the Insulation Commodities Group components require management:

- Reduced Thermal Insulation Resistance

Aging Management Programs

The following aging management programs manage the aging effects for the Insulation Commodities Group components:

- External Surfaces Monitoring of Mechanical Components (B.2.1.24)

3.5.2.1.8 Primary Containment

Materials

The materials of construction for the Primary Containment components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Carbon Steel; dissimilar metal welds
- Coatings
- Concrete Block
- Elastomer
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete

- Stainless Steel
- Stainless Steel Bolting
- Stainless Steel; Dissimilar metal welds
- Steel with Stainless Steel Cladding

Environments

The Primary Containment components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Treated Water
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Primary Containment components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Cumulative Fatigue Damage
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Coating or Lining Integrity
- Loss of Leak tightness
- Loss of Material
- Loss of Mechanical Function
- Loss of Preload
- Loss of Sealing
- Various Aging Effects

Aging Management Programs

The following aging management programs manage the aging effects for the Primary Containment components:

- 10 CFR Part 50, Appendix J (B.2.1.32)
- ASME Section XI, Subsection IWE (B.2.1.29)

- ASME Section XI, Subsection IWF (B.2.1.31)
- ASME Section XI, Subsection IWL (B.2.1.30)
- Bolting Integrity (B.2.1.11)
- Masonry Walls (B.2.1.33)
- One-Time Inspection (B.2.1.21)
- Protective Coating Monitoring and Maintenance Program (B.2.1.36)
- Structures Monitoring (B.2.1.34)
- TLAA
- Water Chemistry (B.2.1.2)

3.5.2.1.9 Radwaste Building

Materials

The materials of construction for the Radwaste Building components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Concrete Block
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete

Environments

The Radwaste Building components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Radwaste Building components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength

- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Radwaste Building components:

- Masonry Walls (B.2.1.33)
- Structures Monitoring (B.2.1.34)

3.5.2.1.10 Screen House

Materials

The materials of construction for the Screen House components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Concrete Block
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete

Environments

The Screen House components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Screen House components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength

- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Screen House components:

- Masonry Walls (B.2.1.33)
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)
- Structures Monitoring (B.2.1.34)

3.5.2.1.11 Structural Commodity Group

Materials

The materials of construction for the Structural Commodity Group components are:

- Aluminum
- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Elastomer
- Galvanized Bolting
- Galvanized Steel
- Glass
- Stainless Steel

Environments

The Structural Commodity Group components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil

Aging Effect Requiring Management

The following aging effects associated with the Structural Commodity Group components require management:

- Loss of Material
- Loss of Preload
- Loss of Sealing

Aging Management Programs

The following aging management programs manage the aging effects for the Structural Commodity Group components:

- Structures Monitoring (B.2.1.34)

3.5.2.1.12 Switchyard Structures

Materials

The materials of construction for the Switchyard Structures components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Ductile Cast Iron
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete

Environments

The Switchyard Structures components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Switchyard Structures components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)

- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Switchyard Structures components:

- Structures Monitoring (B.2.1.34)

3.5.2.1.13 Tank Foundations and Dikes

Materials

The materials of construction for the Tank Foundations and Dikes components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete

Environments

The Tank Foundations and Dikes components are exposed to the following environments:

- Air - Outdoor
- Groundwater/Soil
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Tank Foundations and Dikes components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength

- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Tank Foundations and Dikes components:

- Structures Monitoring (B.2.1.34)

3.5.2.1.14 Turbine Building

Materials

The materials of construction for the Turbine Building components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Concrete Block
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete

Environments

The Turbine Building components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Turbine Building components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Material

- Loss of Material (Spalling, Scaling) and Cracking
- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Turbine Building components:

- Masonry Walls (B.2.1.33)
- Structures Monitoring (B.2.1.34)

3.5.2.1.15 Yard Structures

Materials

The materials of construction for the Yard Structures components are:

- Carbon and Low Alloy Steel Bolting
- Carbon Steel
- Galvanized Bolting
- Galvanized Steel
- Reinforced concrete

Environments

The Yard Structures components are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor
- Groundwater/Soil
- Water - Flowing

Aging Effect Requiring Management

The following aging effects associated with the Yard Structures components require management:

- Cracking
- Cracking and Distortion
- Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Material
- Loss of Material (Spalling, Scaling) and Cracking

- Loss of Preload

Aging Management Programs

The following aging management programs manage the aging effects for the Yard Structures components:

- Structures Monitoring (B.2.1.34)

3.5.2.2 AMR Results for Which Further Evaluation is Recommended by the GALL Report

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the license renewal application. For the Structures and Component Supports, those programs are addressed in the following subsections.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Cracking and Distortion due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, and Cracking due to Differential Settlement and Erosion of Porous Concrete Subfoundations

Cracking and distortion due to increased stress levels from settlement could occur in PWR and BWR concrete and steel containments. The existing program relies on ASME Section XI, Subsection IWL to manage these aging effects. Also, reduction of foundation strength and cracking, due to differential settlement and erosion of porous concrete subfoundations could occur in all types of PWR and BWR containments. The existing program relies on the structures monitoring program to manage these aging effects. However, some plants may rely on a de-watering system to lower the site ground water level. If the plant's current licensing basis (CLB) credits a de-watering system to control settlement, the GALL Report recommends further evaluation to verify the continued functionality of the de-watering system during the period of extended operation.

Table 3.5.1 Item Number 3.5.1-1: This item number is applicable to the Clinton Power Station Mark III concrete containment. The Clinton Power Station Primary Containment is constructed on a basemat foundation underlain by compacted fill resting on hard Illinoian till, therefore, cracking and distortion due to settlement is applicable. Cracking and distortion due to settlement has not been observed in Clinton Power Station concrete structures. Nevertheless, the ASME Section XI, Subsection IWL program (B.2.1.30) will inspect and monitor the concrete Primary Containment structure for cracking due to any aging mechanism. The condition of accessible and above grade concrete is used as an indicator for the condition of the inaccessible and below grade structural components and provides reasonable assurance that degradation of inaccessible structural components will be detected before a loss of an intended function. In the event that unacceptable conditions due to this mechanism are identified in the accessible areas of structures, procedures require that extent of condition be determined, and additional inspections or evaluations would address inaccessible and below grade portions of any affected structure. Clinton Power Station does not utilize porous concrete subfoundation material. Dewatering was used during original construction, as described in USAR section 2.5.4.5.1, but the plant's current licensing basis (CLB) does not credit a permanent de-watering system to control settlement, therefore a further evaluation of reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete foundations is not required.

3.5.2.2.1.2 Reduction of Strength and Modulus 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. The implementation of 10 CFR 50.55a and ASME Section XI, Subsection IWL would not be able to identify the reduction of strength and modulus of concrete due to elevated temperature. Subsection CC-3440 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The GALL Report recommends further evaluation of a plant-specific aging management program if any portion of the concrete containment components 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). Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Table 3.5 Item Number 3.5.1-3: This item number is not applicable for the Clinton Power Station Mark III concrete containment. The Clinton Power Station Primary Containment Structure is a Seismic Category I structure consisting of the concrete containment vessel, a steel enclosure, and containment internal structures.

The Technical Specifications limit the average air temperature inside Primary Containment during normal plant operation to 122 degrees Fahrenheit. The average air temperature is maintained within the Technical Specification limits by recirculating air through the Primary Containment Ventilation System. The normal containment operating temperature is described in USAR Table 3.8-1.1 as 104 degrees Fahrenheit in general areas, 122 degrees Fahrenheit in some closed compartments, and 95 degrees Fahrenheit in the suppression pool. Therefore, the Clinton Power Station concrete Primary Containment is not subject to general area temperatures greater than 150 degrees F.

The design of the higher temperature containment penetrations includes stainless steel metallic reflective insulation (RMI). Some high temperature penetrations, in addition to insulation, also include penetration cooling coils which are cooled with the component cooling water system. Both the insulation and the penetration cooling coils ensure that local concrete temperatures do not exceed a maximum temperature of 200˚F. Plant operating experience has not identified elevated general area and local area temperature as a concern for Primary Containment concrete.

3.5.2.2.1.3 Loss of Material due to General, Pitting and Crevice Corrosion

1. *Loss of material due to general, pitting, and crevice corrosion could occur in steel elements of inaccessible areas for all types of PWR and BWR containments. The existing program relies on ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, to manage this aging effect. The GALL Report recommends further evaluation of plant-specific programs to manage this aging effect if corrosion is indicated from the IWE examinations. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Table 3.5.1 Item Number 3.5.1-5: This item number is applicable to the Clinton Power Station Mark III reinforced concrete containment. The Clinton Power Station containment has a steel liner above the level of the suppression pool and a stainless steel liner in the suppression pool. The ASME Section XI, Subsection IWE (B.2.1.29) program and the 10 CFR Part 50, Appendix J (B.2.1.32) programs will be used to manage the loss of material of steel elements in both the accessible and the inaccessible areas of the containment liner, liner anchors, and integral attachments. The coated steel liner surfaces are inspected for coating defects such as blisters that could indicate a corrosion of the carbon steel liner. The Clinton Power Station Mark III reinforced concrete containment design does not have an air gap between the concrete and the steel liner. The steel containment liner within the Clinton Power Station drywell wall area is completely embedded in concrete below the floor and not exposed. The Clinton Power Station BWR containment is not subject to borated water spills. The concrete floor of the drywell is sloped to local floor drains to prevent ponding, and any water is diverted by the drain system piping to the drywell floor drain sump. The concrete floor is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner. Concrete meeting the requirements of ACI 318, Building Code Requirements for Reinforced Concrete, and the guidance of ACI 201.2R with respect to chlorine ion content, was used for the containment concrete in contact with the embedded containment liner. This ensures that the contact of containment concrete will not cause corrosion of the liner, liner anchors, or other steel elements embedded in the concrete.

While some light general corrosion has been identified by IWE examinations inside Primary Containment, there has been no loss of material. Areas of light corrosion noted inside containment have been recoated or identified for coating maintenance. The suppression pool walls and floor are lined with stainless steel and corrosion has not been identified from the IWE examinations of these surfaces. For Clinton Power Station, no additional plant-specific activities are warranted beyond those described above and those that are currently established as part of the ASME Section XI, Subsection IWE (B.2.1.29) program. The continued monitoring of the containment liner in accordance with the ASME Section XI, Subsection IWE (B.2.1.29) program, and the testing conducted in accordance with the 10 CFR Part 50, Appendix J (B.2.1.32) program provide reasonable assurance that the loss of material due to corrosion of steel elements of the containment will be detected prior to a loss of intended function. These activities and programs provide assurance that the containment liner will remain capable of performing its design function through the period of extended operation.

See section 4.6.9 for a Containment Liner Corrosion Assessment TLAA.

2. *Loss of material due to general, pitting, and crevice corrosion could occur in steel torus shell of Mark I containments. The existing program relies on ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, to manage this aging effect. The GALL Report recommends further evaluation of plant-specific programs to manage this aging effect if corrosion is significant. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Table 3.5.1 Item Number 3.5.1-6: This item number is not applicable to the Clinton Power Station Mark III reinforced concrete containment. The Clinton Power Station containment has a stainless steel liner in the suppression pool. This item number is applicable only to Mark I containments and the associated torus.

3. *Loss of material due to general, pitting, and crevice corrosion could occur in steel torus ring girders and downcomers of Mark I containments, downcomers of Mark II containments, and interior surface of suppression chamber shell of Mark III containments. The existing program relies on ASME Section XI, Subsection IWE to manage this aging effect. The GALL Report recommends further evaluation of plant-specific programs to manage this aging effect if corrosion is significant. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

   Table 3.5.1 Item Number 3.5.1-37 is applicable to Clinton Power Station. Clinton Power Station Primary Containment is a Mark III reinforced concrete containment. The suppression pool is lined with a stainless steel liner plate. The ASME Section XI, Subsection IWE (B.2.1.29) program and the 10 CFR Part 50, Appendix J (B.2.1.32) programs will be used to manage the loss of material of stainless steel elements in both the accessible and the inaccessible areas of the suppression pool liner. The stainless steel liner surfaces are visually inspected for corrosion by underwater divers. The most recent inspection performed in 2018 did not report any indications of loss of material of the liner. The continued monitoring of the suppression pool liner in accordance with the ASME Section XI, Subsection IWE (B.2.1.29) program, and the testing conducted in accordance with the 10 CFR Part 50, Appendix J (B.2.1.32) program provide reasonable assurance that the loss of material due to corrosion of the stainless steel liner will be detected prior to a loss of intended function. These activities and programs provide reasonable assurance that the suppression pool liner will remain capable of performing its design function through the period of extended operation.

   Table 3.5.1 Item Number 3.5.1-78 is applicable to the stainless steel liners associated with the containment pool and the suppression pool. The Water Chemistry (B.2.1.2) program will manage loss of material of the stainless steel liner plate below the water level. The effectiveness of the Water Chemistry program is confirmed by the ongoing inspections of identical stainless steel plates in the suppression pool in accordance with the ASME Section XI, Subsection IWE (B.2.1.29) program. Suppression pool level is monitored by redundant safety-related instrumentation, and there is a containment pool leak detection system.

3.5.2.2.1.4 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. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4.5, "Concrete Containment Tendon Prestress Analysis," of this SRP-LR.

Table 3.5.1 Item Number 3.5.1-8: This item number is applicable only to PWR and BWR prestressed concrete containments. This item number is not applicable to the Clinton Power Station Mark III reinforced concrete containment. Clinton Power Station does not use a prestressing system.

3.5.2.2.1.5 Cumulative Fatigue Damage

If included in the current licensing basis, fatigue analyses of suppression pool steel shells (including welded joints) and penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) for all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers 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 4.6, "Containment Liner Plates, Metal Containments, and Penetrations Fatigue Analysis," of this SRP-LR.

Table 3.5.1 Item Number 3.5.1-9: This item number is applicable to the Clinton Power Station Mark III containment and internal structures. Components of the Primary Containment that were analyzed for fatigue under the current licensing bases and evaluated as a TLAA include the containment mechanical penetrations (including the equipment hatch, personnel airlocks, and dissimilar metal welds), containment liner, suppression pool liner, drywell equipment hatch, drywell personnel airlock, drywell head, the inclined fuel transfer tube bellows, refueling bellows, drywell high energy guard pipe bellows, high temperature drywell penetrations with class PC-A head fittings, and containment electrical penetrations. The evaluation of these TLAA components is addressed separately in Section 4.6, "Primary Containment Fatigue Analysis."

The Clinton Power Station drywell mechanical penetrations (except for the high energy guard pipe bellows and high temperature drywell penetrations with class PC-A head fittings) and the drywell electrical penetrations were determined not to have an existing fatigue analysis and therefore have no fatigue TLAAs.

3.5.2.2.1.6 Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking of stainless steel penetration bellows and dissimilar metal welds could occur in all types of PWR and BWR containments. The existing program relies on ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J, to manage this aging effect. The GALL Report recommends further evaluation of additional appropriate examinations/evaluations implemented to detect these aging effects for stainless steel penetration bellows and dissimilar metal welds.

Table 3.5.1 Item 3.5.1-10: Stress corrosion cracking (including Transgranular Stress Corrosion Cracking) is a concern for stainless steel and dissimilar metal welds when exposed to high temperature, a wet environment, or an environment contaminated with chlorides, fluorides, or sulfates. Elimination or reduction of any of these factors will decrease the likelihood of SCC. The containment penetrations at Clinton Power Station that include stainless steel bellows and/or dissimilar metal welds include certain high temperature piping penetrations, stainless steel process line penetrations above elevation 735, and the fuel transfer tube penetration.

At Clinton Power Station, high temperature lines that penetrate Primary Containment are carbon steel. The associated penetration head fittings and sleeves are also carbon steel.

Therefore, the process pipe to head fitting weld and the head fitting to penetration sleeve weld associated with these containment penetrations are not dissimilar metal welds.

Penetrations for high temperature lines that are also high energy and pass through both the containment wall and drywell wall require a guard pipe. The guard pipe is carbon steel and is welded to the containment penetration sleeve. It then passes through the drywell penetration sleeve and is open to the drywell. In the event of a process line rupture, the blowdown flow is directed to the drywell and will pass through the suppression pool vent system, and the steam will be condensed. A stainless steel bellows assembly, anchored to the drywell and welded to the guard pipe, provides a seal for normal drywell environmental conditions. The bellows are designed for thermal guard pipe expansion and relative seismic motion of the guard pipe and drywell.

The drywell guard pipe bellows are classified as ANSI B31.1 and are safety-related. The bellows are not part of the Primary Containment boundary. SCC of dissimilar metal welds associated with the stainless steel bellows assemblies is not considered credible because stainless steel SCC requires a concentration of chloride or sulfate contaminants, which are not present in significant quantities, as well as high stress, and temperatures greater than 140 degrees F. Plant procedures strictly control the procurement and use of products that could contain contaminants such as chlorides, fluorides, and sulfates, ensuring that stainless steel piping and components are not subject to significant levels of these detrimental contaminants. Leakage of water in the containment, which might contact the bellows welds, is not the normal operating environment and is event-driven. Steel covers protect the bellows from overhead leakage contamination, and the flexible bellows minimizes the applied stresses. The normal containment temperature outside of the drywell, where the bellows are located, is below 140 degrees F.

The drywell guard pipe bellows are included in the 10 CFR 50 Appendix J drywell bypass leakage test. A review of Clinton Power Station operating experience has not identified cracking of these stainless steel bellows. In addition, the drywell guard pipe bellows are qualified by cycle testing for 10,000 cycles, which is significantly greater than the number of expected over 60 years or operation, as discussed in TLAA Section 4.6.8.

Containment piping penetrations that are not high temperature or high energy do not require bellows and do not have dissimilar metal welds unless the process line is stainless steel. Below the 735 foot elevation, the process pipe and the containment penetration sleeves are stainless steel and no dissimilar metal welds are necessary.

Stainless steel process and instrument line containment penetrations above the 735 foot elevation are constructed with stainless steel head fittings welded to the carbon steel penetration sleeves. SCC of dissimilar metal welds associated with these penetrations is not considered credible because stainless steel SCC requires a concentration of chloride or sulfate contaminants, which are not present in significant quantities, as well as high stress, and temperatures greater than 140 degrees F. Plant procedures strictly control the procurement and use of products that could contain contaminants such as chlorides, fluorides, and sulfates, ensuring that stainless steel piping and components are not subject to significant levels of these detrimental contaminants. Leakage of water in the containment, which might contact the penetrations, is not the normal operating environment and is event-driven. The normal containment temperature outside of the drywell, where the containment penetrations are located, is below 140F.

SCC of dissimilar metal welds of low temperature containment penetrations, including electrical penetrations, is not expected to occur as described above. A review of Clinton Power Station operating experience has not identified cracking of these dissimilar metal welds. SCC of dissimilar metal welds associated with mechanical and electrical containment penetrations will be managed by the 10 CFR 50 Appendix J (B.2.1.32) program and the ASME Section XI, Subsection IWE (B.2.1.29) program.

There are stainless steel bellows and dissimilar metal welds associated with the fuel transfer tube. Similar to other low temperature penetrations, SCC of the stainless steel bellows and dissimilar metal welds is not expected. The fuel transfer tube components are not exposed to significant contaminants and are normally not exposed to water leakage. The flexible bellows assemblies minimize the applied stress at the dissimilar metal welds. A review of Clinton Power Station operating experience has not identified cracking of these dissimilar metal welds. SCC of dissimilar metal welds associated with the fuel transfer tube penetration will be managed by the 10 CFR 50 Appendix J (B.2.1.32) program and the ASME Section XI, Subsection IWE (B.2.1.29) program.

3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking due to Freeze-Thaw

Loss of material (scaling, spalling) and cracking due to freeze-thaw could occur in inaccessible areas of PWR and BWR concrete containments. The GALL Report recommends further evaluation of this aging effect for plants located in moderate to severe weathering conditions.

Table 3.5.1 Item Number 3.5.1-11: This aging effect and mechanism, the loss of material (spalling, scaling) and cracking due to freeze-thaw, is not applicable to the Clinton Power Station concrete containment. Clinton Power Station is located in a region where weathering conditions are considered severe as shown in ASTM C33, "Standard Specification for Concrete Aggregates." The concrete mix design provides for low permeability, by incorporating fly ash and water reducing agents, and adequate air entrainment (3% plus or minus 1%) such that the concrete has good freeze-thaw resistance.

There are however, no above-ground accessible concrete portions of the containment that are susceptible to freeze-thaw cycles; as the containment concrete walls and dome are completely enclosed by the metal siding of the gas control boundary, the Auxiliary Building, and the Fuel Building. The concrete containment walls below grade are also enclosed by the Auxiliary Building and the Fuel Building and are not subject to a groundwater/soil environment. The containment foundation is a concrete basemat shared with the Auxiliary and Fuel Buildings. The basemat foundation is located at an elevation well below the frost line (more than twenty feet below grade) and is therefore not subject to freeze-thaw conditions.

3.5.2.2.1.8 Cracking due to Expansion from Reaction with Aggregates

Cracking due to expansion from reaction with aggregates could occur in inaccessible areas of concrete elements of PWR and BWR concrete and steel containments. The GALL Report recommends further evaluation to determine if a plant-specific aging *management program is required to manage this aging effect. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Table 3.5.1 Item Number 3.5.1-12: This aging effect and mechanism is applicable to Clinton Power Station Primary Containment concrete structures. Concrete fine and coarse aggregates conform to ASTM C33-74 or CA-7. Construction specifications required petrographic examinations of aggregates used in concrete in accordance with ASTM C295, “Petrographic Examination of Aggregates for Concrete,” ASTM C289, “Potential Reactivity of Aggregates,” and other ASTM standards tests to prevent use of reactive aggregates. In addition, concrete structures were constructed in accordance with ACI 318, “Building Code Requirements for Structural Concrete and Commentary.” However, NRC Information Notice 2011-20 indicates that the older ASTM standards used during construction may not always be effective in identifying reactive aggregates. Therefore, further evaluation for this aging effect and mechanism is required.

The inaccessible containment foundation basemat is exposed to a groundwater/soil environment. Above grade containment concrete is not normally exposed to a source of moisture. The concrete Primary Containment is sheltered and protected from precipitation and weather within the metal siding of the gas control boundary, the Auxiliary Building, and Fuel Building. The ASME Section XI, Subsection IWL examination program (B.2.1.30) will monitor the Primary Containment concrete for pattern cracking and gel typical of expansion from reaction with aggregates or from cracking due to any mechanism, therefore, a plant-specific AMP is not required. The ASME Section XI, Subsection IWL examination program nor the Structures Monitoring program concrete examinations have identified the pattern cracking or gel typical of expansion from reaction with aggregates, therefore no further evaluation is required for this aging effect for the inaccessible portions of Primary Containment concrete. Accessible areas of other concrete structures exposed to precipitation and other sources of moisture have not exhibited pattern cracking or gel which could indicate a potential for cracking due to expansion from reaction with aggregates. Clinton Power Station will also examine exposed portions of below-grade concrete associated with non-Primary Containment structures, when excavated for any reason, in accordance with the Structures Monitoring program (B.2.1.34). The Clinton Power Station structural concrete was constructed as recommended to preclude cracking due to this mechanism; cracking due this mechanism has not been identified in accessible portions of the Primary Containment or other concrete plant structures; therefore, no additional aging management or further evaluation of inaccessible below grade concrete for this mechanism is required.

3.5.2.2.1.9 Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide and Carbonation

Increase in porosity and permeability due to leaching of calcium hydroxide and carbonation could occur in inaccessible areas of concrete elements of PWR and BWR concrete and steel containments. The GALL Report recommends further evaluation if leaching is observed in accessible areas that impact intended functions. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Table 3.5.1 Item Number 3.5.1-13: This aging effect and mechanism is applicable to Clinton Power Station containment foundation. The concrete Primary Containment is sheltered and protected from precipitation and weather within the metal siding of the gas control boundary, the Auxiliary Building, and Fuel Building. The containment basemat foundation is continuous with the foundation basemats for the surrounding Auxiliary and Fuel Buildings. The Clinton Power Station containment foundation concrete is designed in accordance with ACI 318, "Building Code Requirements for Structural Concrete and Commentary," and constructed in accordance with ACI 301, "Specifications for Structural Concrete." The type and size of aggregate, slump, Type I and II cement and additives have been selected to produce durable concrete, resistant to leaching. However, leaching of calcium hydroxide is applicable for flowing water environment; therefore, the potential for leaching to occur due to groundwater intrusion through narrow cracks is considered to be applicable.

The same concrete specification was used for all structures at Clinton Power Station, including the Groups 1, 3, 5, and 6 structures, such that inspection results of these structures are representative of the expected effects of leaching and carbonation of all structures within the scope of license renewal. In 2009 white scaling and efflorescence was found on the walls of the Screenhouse shutdown service water tunnel, however, there was no indication of damage to the walls. During an inspection of the same areas of the tunnel in 2019, the condition identified in 2009 remained as-is. The white efflorescence was determined to be a result of seepage during construction. In 2019 efflorescence and light rust was observed on and near an embedded wall plate in the Fuel Building wall. Although some minor leaching has been observed in accessible areas, there has been no impact to the structural integrity or the loss of intended function of the Screenhouse tunnel or Fuel Building concrete.

Inaccessible below-grade reinforced concrete Clinton Power Station structures are not subject to an aggressive environment. Test results for well water samples taken from fall of 2022 to summer of 2023 showed pH limits are safely above the threshold limit pH > 5.5, sulfates are significantly lower than the threshold limit sulfates <1500 ppm, and chlorides are below the threshold limit chlorides < 500 ppm; which indicates a non-aggressive environment. In June of 2023, there was a single well where a sample showed that there were chlorides marginally greater than 500 ppm. This chloride value was significantly greater than all the previous tests of that well. After a re-sampling of that well, the chloride value significantly fell below the 500 ppm threshold. Therefore, from the previous tests and the re-sampling of that well, the environment is still considered to be non-aggressive.

The ASME Section XI, Subsection IWL (B.2.1.30) program will manage the increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation for the inaccessible containment foundation. In addition, the containment foundation is a concrete basemat shared with the Auxiliary and Fuel Buildings, therefore the Structures Monitoring (B.2.1.34) program will inspect below-grade portions of the common foundation basemat if made accessible by excavation for any reason. The condition of accessible concrete associated with non-Primary Containment structures inspected in accordance with the Structures Monitoring program (B.2.1.35) provides reasonable assurance that degradation of inaccessible structural components will be detected before a loss of an intended function. In the event that unacceptable conditions due to this mechanism are identified in the accessible areas of non-Primary Containment structures, procedures require that extent of condition be determined, and additional inspections or evaluations would address inaccessible and below grade portions of any affected structure, therefore a plant-specific AMP is not required.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging Management of Inaccessible Areas

1. *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. The GALL Report recommends further evaluation of this aging effect for inaccessible areas of these Groups of structures for plants located in moderate to severe weathering conditions.*

   Table 3.5.1 Item Number 3.5.1-42: This aging effect and mechanism, the loss of material (spalling, scaling) and cracking due to freeze-thaw, is applicable to Clinton Power Station reinforced concrete structures. Item 3.5.1-42 is used to address inaccessible above-grade concrete exposed to an air-outdoor environment. This item is also used to address inaccessible below-grade reinforced concrete walls and foundations exposed to a groundwater/soil environment and subject to freeze-thaw outdoor air temperature cycles above the frost line.

   Clinton Power Station is located in a region where weathering conditions are considered severe as shown in ASTM C33, “Standard Specification for Concrete Aggregates.” The original designs and construction of these structures conformed to ACI 318, “Building Code Requirements for Structural Concrete and Commentary,” and ACI 301, “Specifications for Structural Concrete,” as described in the USAR. The concrete mix design provides for low permeability, by incorporating fly ash and water reducing agents, and adequate air entrainment (3% plus or minus 1%) in the air-outdoor environment such that the concrete has good freeze-thaw resistance.

   Inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment are also subject to the freeze-thaw outdoor air temperature cycles above the frost line. The Structures Monitoring (B.2.1.34) program will be used to manage loss of material (spalling, scaling) and cracking in both accessible and inaccessible areas of reinforced concrete for the Groups 1, 3, and 5 structures. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are the missile barrier components evaluated with the Control Building (Group 1). There are significant portions of these structures that are accessible to provide indications of reinforced concrete conditions in the inaccessible areas.

   Structural reinforced concrete has not exhibited significant loss of material (spalling, scaling) and cracking due to freeze-thaw in accessible areas of in scope reinforced concrete structures. This operating experience provides objective evidence that the design and construction of external reinforced concrete has provided concrete with good freeze-thaw resistance. Although operating experience has not identified significant loss of material and cracking due to freeze-thaw, the Structures Monitoring (B.2.1.34) program includes inspection for these aging effects in the accessible areas.

In addition, Clinton Power Station examines exposed portions of the below-grade concrete, when excavated for any reason in accordance with the Structures Monitoring program.

The visual inspections of reinforced concrete identify concrete damage in accordance with the requirements of the Structures Monitoring (B.2.1.34) program. If unacceptable conditions due to freeze thaw are identified in the accessible areas of structures, the conditions are evaluated and depending upon the initial conditions and evaluation, corrective actions are developed that may include additional inspections to determine the extent of degraded conditions as part of the corrective action program for inaccessible concrete.

If freeze thaw damage were to occur, it would occur at the surface of concrete with significant moisture levels and sudden drops in temperature to below freezing. This includes areas near the ground surface that are generally accessible for inspection.

The condition of accessible and above grade concrete is used as an indicator for the condition of the inaccessible and below grade structural components and provides reasonable assurance that degradation of inaccessible structural components will be detected before a loss of an intended function.

As a result, the Structures Monitoring (B.2.1.34) program inspections provide reasonable assurance that loss of material (spalling, scaling) and cracking due to freeze-thaw that could occur above the frost line in below grade inaccessible areas of reinforced concrete structures will be adequately managed.

2. *Cracking due to expansion and reaction with aggregates could occur in below-grade inaccessible concrete areas for Groups 1-5 and 7-9 structures. The GALL Report recommends further evaluation of inaccessible areas of these Groups of structures if concrete was not constructed in accordance with the recommendations in the GALL Report.*

   Table 3.5.1 Item Number 3.5.1-43: This aging effect and mechanism, cracking due to expansion and reaction with aggregates, is considered applicable to Clinton Power Station reinforced concrete structures. The Structures Monitoring (B.2.1.34) program will be used to manage cracking due to expansion and reaction with aggregates in both accessible and inaccessible areas of reinforced concrete for the Groups 1, 3, 4, and 5 structures. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components evaluated with the Control Building (Group 1). None of these structures are completely inaccessible, and there are significant portions of the structures that are accessible that provide indications of reinforced concrete conditions in inaccessible areas.

   The Clinton Power Station structural concrete was constructed as recommended to preclude cracking due to this mechanism. The original designs and construction of these structures conformed to ACI 318, "Building Code Requirements for Structural Concrete and Commentary," and ACI 301, "Specifications for Structural Concrete," as described in the USAR. The concrete mix specification requirements minimized the potential for expansion and reaction with aggregates. The concrete mix designs provide for low permeability, by incorporating fly ash and water reducing agents.

Concrete fine and coarse aggregates conform to ASTM C33, “Standard Specification for Concrete Aggregates.” Petrographic examinations of aggregates used in concrete were performed in accordance with ASTM C295, “Petrographic Examination of Aggregates for Concrete,” and ASTM C289, “Potential Reactivity of Aggregates,” to demonstrate that the aggregates do not adversely react within the concrete. The Cement is Type I and II, Portland cement conforming to ASTM C-150.

Cracking associated with expansion due to reaction with aggregates has not been observed on Clinton Power Station concrete structures. Nevertheless, the Structures Monitoring (B.2.1.34) program continues to inspect and monitor reinforced concrete structures for cracking due to any mechanism. The condition of accessible and above grade concrete is used as an indicator for the condition of the inaccessible and below grade structural components and provides reasonable assurance that degradation of inaccessible structural components will be detected before a loss of an intended function. If cracking due to expansion and reaction with aggregates were significant, pattern cracking would be expected over most of the surfaces at grade level where the moisture level is higher.

Clinton Power Station examines exposed portions of the below-grade concrete, when excavated for any reason, in accordance with the Structures Monitoring (B.2.1.35) program.

As a result, the Structures Monitoring (B.2.1.34) program inspections provide reasonable assurance that cracking due to expansion and reaction with aggregates that could occur in inaccessible reinforced concrete structures will be adequately managed. Therefore, a plant-specific AMP is not required to manage this aging effect.

3. *Cracking and distortion due to increased stress levels from settlement could occur in below-grade inaccessible concrete areas of structures for all Groups, and reduction in foundation strength, and cracking due to differential settlement and erosion of porous concrete subfoundations could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 -9 structures. The existing program relies on structure monitoring programs to manage these aging effects. Some plants may rely on a de-watering system to lower the site ground water level. If the plant’s CLB credits a de-watering system, the GALL Report recommends verification of the continued functionality of the de-watering system during the period of extended operation. The GALL Report recommends no further evaluation if this activity is included in the scope of the applicant’s structures monitoring program.*

   Table 3.5.1 Item Number 3.5.1-44: The Structures Monitoring (B.2.1.34) program, will be used to manage cracking and distortion due to increased stress level from settlement for the Groups 1, 3, 5, and 6 structures. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components evaluated with the Control Building (Group 1). Cracking and distortion due to settlement has not been identified in Clinton Power Station concrete building structures. Nevertheless, the Structures Monitoring program continues to inspect and monitor concrete structures for cracking and distortion due to any mechanism.

Clinton Power Station is constructed on a basemat foundation underlain by compacted fill resting on hard Illinoian till, therefore, cracking and distortion due to settlement is applicable. The condition of the accessible and above grade concrete is used as an indicator for the condition of the inaccessible and below grade structural components and provides reasonable assurance that degradation of inaccessible structural components will be detected before a loss of an intended function.

The condition of accessible and above grade concrete is used as an indicator for the condition of the inaccessible and below grade structural components and provides reasonable assurance that degradation of inaccessible structural components will be detected before a loss of an intended function. Cracks extending into accessible areas, if any, will be managed by the Structures Monitoring (B.2.1.34) program. If unacceptable conditions due to this mechanism were identified in the accessible areas of structures, procedures require that extent of condition be determined, and additional inspections or evaluations would address inaccessible and below grade portions of any affected structure. In addition, Clinton Power Station examines exposed portions of the below-grade concrete, when excavated for any reason, in accordance with the Structures Monitoring (B.2.1.34) program.

Table 3.5.1 Item Numbers 3.5.1-45 and 3.5.1-46: These item numbers are not applicable. Clinton Power Station foundation design does not utilize porous concrete foundation or subfoundation material. Dewatering was used during original construction, as described in USAR section 2.5.4.5.1, but the plant's current licensing basis (CLB) does not credit a permanent dewatering system to control building settlement. Since the magnitude of the total settlements is insignificant, as described in USAR Section 2.5.4.5.1.3, the differential settlements are expected to be smaller, thus differential settlement distortion is insignificant for Clinton Power Station structures.

4. *Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation could occur in below-grade inaccessible concrete areas of Groups 1-5 and 7-9 structures. The GALL Report recommends further evaluation if leaching is observed in accessible areas that impact intended functions.*

Table 3.5.1 Item Number 3.5.1-47: This aging effect and mechanism, increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation, is considered applicable to Clinton Power Station reinforced concrete structures. The Structures Monitoring (B.2.1.34) program will be used to manage the increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in both accessible and inaccessible areas for the Groups 1, 3, and 5 structures. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components evaluated with the Control Building (Group 1). This Item Number does not apply to the Group 4 structures due to the Mark III containment design. None of these structures are completely inaccessible, and there are significant portions of the structures that are accessible that provide indications of reinforced concrete conditions in inaccessible areas.

The same concrete specification was used for all structures at Clinton Power Station, including the Groups 1, 3, and 5 structures, such inspection results are representative of the expected effects of leaching of calcium hydroxide and carbonation of all structures within the scope of license renewal. The Clinton Power Station structural concrete was constructed as recommended to minimize these potential effects of leaching of calcium hydroxide and carbonation. The original designs and construction of these structures conformed to ACI 318, "Building Code Requirements for Structural Concrete and Commentary," and ACI 301, "Specifications for Structural Concrete." The concrete mix designs provide for low permeability, by incorporating fly ash and water reducing agents. Concrete fine and coarse aggregates conform to ASTM C33, "Standard Specification for Concrete Aggregates." Petrographic examinations of aggregates used in concrete were performed in accordance with ASTM C295, "Petrographic Examination of Aggregates for Concrete." The Cement is Type I and II, Portland cement conforming to ASTM C-150.

Accessible areas can be used as an indicator of increase in porosity and permeability and loss of strength of reinforced concrete conditions in inaccessible areas for leaching of carbonation. The effects of carbonation are applicable to the water – flowing environment but has not been observed at Clinton Power Station reinforced concrete structures. The same concrete specification was used for all structures at Clinton Power Station, such that inspection results are representative of the expected effects of carbonation of all structures within the scope of license renewal. Therefore, the effects of carbonation from an increase in porosity and permeability, are not expected to occur at the Groups 1, 3, and 5 structures.

Increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide is applicable for a water flowing environment; therefore, the potential for leaching to occur due to the water flowing environment is considered. Groundwater considered aggressive due to low pH or high sulfates could potentially result in chemical attack or leaching of the concrete. Test results for well water samples taken from fall of 2022 to summer of 2023 showed pH limits are safely above the threshold limit pH > 5.5, sulfates are significantly lower than the threshold limit sulfates <1500 ppm, and chlorides are below the threshold limit chlorides < 500 ppm; which indicates a non-aggressive environment. In June of 2023, there was a single well where a sample showed that there were chlorides marginally greater than 500 ppm. This chloride value was significantly greater than all the previous tests of that well. After a re-sampling of that well, the chloride value significantly fell below the 500 ppm threshold. Therefore, from the previous tests and the re-sampling of that well, the environment is still considered to be non-aggressive. Chloride levels are higher in the winter when the roads are salted and lower when the roads are not being salted. Higher chloride levels could exist in localized areas across the site during short periods of time, after which the salts are flushed away by surface water. However, Clinton Power Station will continue periodic groundwater testing and will examine exposed portions of the below-grade concrete, when excavated for any reason in accordance with the Structures Monitoring program. The effects of calcium hydroxide from an increase in porosity and permeability are not expected to occur at the Groups 1, 3, and 5 structures.

Operating experience at Clinton Power Station, which inspects for concrete deterioration due to any aging effect and mechanism, has not identified an increase in porosity and permeability and loss of strength due to these mechanisms. Clinton

Power Station also examines exposed portions of the below grade concrete, when excavated for any reason in accordance with the Structures Monitoring (B.2.1.34) program. In 2009 white scaling and efflorescence was found on the walls of the Screenhouse shutdown service water tunnel, however, there was no indication of damage to the walls. During an inspection of the same areas of the tunnel in 2019, the condition identified in 2009 remained as-is. The white efflorescence was determined to be a result of seepage during construction. In 2019 efflorescence and light rust was observed on and near an embedded wall plate in the Fuel Building wall. Although some leaching has been observed in accessible areas it is not significant and did not impact the intended function at Clinton Power Station.

The Structures Monitoring (B.2.1.34) program will continue to manage the increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in both accessible and inaccessible areas of Groups 1, 3, and 5 structures. In addition, Clinton Power Station will continue will examine exposed portions of the below-grade concrete, when excavated for any reason. Therefore, no additional measures for managing the aging effect of increase in porosity and permeability; loss of strength for concrete are required for inaccessible areas of Groups 1, 3, and 5 structures. Therefore, a plant-specific AMP is not required to manage this aging effect.

3.5.2.2.2.2 Reduction of Strength and Modulus 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. For any concrete elements that exceed specified temperature limits, further evaluations are recommended. Appendix A of ACI 349-85 specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 66°C (150°F) except for local areas, which are allowed to have increased temperatures not to exceed 93°C (200°F). The GALL Report recommends further evaluation of a plant-specific program 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). Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. The acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Table 3.5.1 Item Number 3.5.1-48: This item number is not applicable to Clinton Power Station. General area, normal temperatures greater than 150 degrees Fahrenheit and local temperatures in excess of 200 degrees Fahrenheit are not present at Clinton Power Station. Plant operating experience has not identified elevated general and local temperature as a concern for concrete structural components.

Group 1, 3, 4, and 5 structures are not subject to a general area temperature greater than 150 degrees F and there are no Group 2 structures at Clinton Power Station. In addition, local temperatures in excess of 200 degrees F have not been reported at Clinton Power Station. The Technical Specification and USAR limit the bulk average temperature to 122 degrees F for Group 4 structures within the Primary Containment. The bulk average temperature for Group 4 structures is maintained within the Technical

Specification limits by recirculating air through the Primary Containment Ventilation System.

Group 1, 3, 4, and 5 concrete structural components are not subject to local temperature greater than 200 degrees F. Process piping operating at temperatures greater than 200 degrees F is insulated through penetrations. The insulation in combination with compartment air circulation reduces concrete local temperature to less than 200 degrees F. Plant operating experience has not identified elevated general or local area temperature as a concern for concrete structural components.

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

The GALL Report recommends further evaluation for inaccessible areas of certain Group 6 structure/aging effect combinations as identified below, whether or not they are covered by inspections in accordance with the GALL Report, Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," or FERC/US Army Corp of Engineers dam inspection and maintenance procedures.

1. *Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Group 6 structures. The GALL Report recommends further evaluation of this aging effect for inaccessible areas for plants located in moderate to severe weathering conditions.*

   Table 3.5.1 Item Number 3.5.1-49: This aging effect and mechanism, the loss of material (spalling, scaling) and cracking due to freeze-thaw, is applicable to reinforced concrete structures. This aging effect is applicable to both above and below grade reinforced concrete in air-outdoor and groundwater/soil environments. Clinton Power Station is located in a region where weathering conditions are considered severe as shown in ASTM C33, "Standard Specification for Concrete Aggregates." The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.36) program will be used to manage loss of material (spalling, scaling) and cracking in both accessible and inaccessible areas of Group 6 structures. The Group 6 structures consist of the Screen House and Cooling Lake. The Cooling Lake structure that is in scope is submerged eight feet below the normal lake level and is not subject to freezing conditions. There are significant portions of the Screen House structure that are accessible to provide indications of reinforced concrete conditions in the inaccessible areas.

   The original designs and construction of these structures conformed to ACI 318, "Building Code Requirements for Structural Concrete and Commentary," and ACI 301, "Specifications for Structural Concrete." The concrete mix design provides for low permeability, by incorporating fly ash and water reducing agents, and adequate air entrainment (3% plus or minus 1%) in the air-outdoor environment such that the concrete has good freeze-thaw resistance.

   Structural reinforced concrete has not exhibited significant loss of material (spalling, scaling) and cracking due to freeze-thaw in accessible areas of in scope reinforced concrete structures. This operating experience provides objective evidence that the design and construction of external reinforced concrete at Clinton Power Station has provided concrete with good freeze-thaw resistance. Although operating experience has not identified significant loss of material and cracking due to freeze-thaw, the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.36) program includes inspection for these aging effects in the accessible areas.

In addition, Clinton Power Station examines exposed portions of the below-grade concrete, when excavated for any reason, in accordance with the Structures Monitoring (B.2.1.34) program.

The visual inspections of reinforced concrete identify concrete damage in accordance with the requirements of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.36) program. If unacceptable conditions due to freeze thaw are identified in the accessible areas of structures, the conditions are evaluated and depending upon the initial conditions and evaluation, corrective actions are developed that may include additional inspections to determine the extent of degraded conditions as part of the corrective action program.

If freeze thaw damage were to occur, it would occur at the surface of concrete with significant moisture levels and sudden drops in temperature to below freezing. In general, these areas are exposed at the ground surface and are accessible for inspection.

The condition of accessible and above grade concrete is used as an indicator for the condition of the inaccessible and below grade structural components and provides reasonable assurance that degradation of inaccessible structural components will be detected before a loss of an intended function.

As a result, the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.36) program is expected to adequately manage the loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below grade inaccessible concrete areas of Group 6 structures. Therefore, a plant-specific AMP is not required to manage this aging effect.

2. *Cracking due to expansion and reaction with aggregates could occur in below-grade inaccessible reinforced concrete areas of Group 6 structures. The GALL Report recommends further evaluation to determine if a plant-specific aging management program is required to manage this aging effect. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

   Table 3.5.1 Item Number 3.5.1-50: This aging effect and mechanism, cracking due to expansion and reaction with aggregates, is considered applicable to the reinforced concrete structures. The Structures Monitoring (B.2.1.34) program will be used to manage cracking due to expansion and reaction with aggregates in both accessible and inaccessible areas of Group 6 structures. The structures in the scope of this program consist of the Screen House and Cooling Lake. The Cooling Lake structure is submerged beneath the surface of the lake and not readily accessible for visual inspection. There are significant portions of the Screen House structure that are accessible for inspection to provide indications of reinforced concrete conditions in the inaccessible areas.

The Clinton Power Station structural concrete was constructed as recommended to preclude cracking due to this mechanism. The original designs and construction of these structures conformed to ACI 318, “Building Code Requirements for Structural Concrete and Commentary,” and ACI 301, “Specifications for Structural Concrete.” The concrete mix specification requirements minimized the potential for expansion and reaction with aggregates. The concrete mix designs provide for low permeability, by incorporating fly ash and water reducing agents. Concrete fine and coarse aggregates conform to ASTM C33, “Standard Specification for Concrete Aggregates.” Construction specifications require petrographic examinations of aggregates used in concrete to be performed in accordance with ASTM C295, “Petrographic Examination of Aggregates for Concrete,” and ASTM C289, “Potential Reactivity of Aggregates,” to demonstrate that the aggregates do not adversely react within the concrete. The Cement is Type I and II, Portland cement conforming to ASTM C-150.

Cracking associated with expansion due to reaction with aggregates has not been observed on Clinton Power Station Group 6 concrete structures, as described in the Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35) program operating experience. Nevertheless, the Structures Monitoring (B.2.1.34) program continues to inspect and monitor Group 6 concrete structures for cracking due to any mechanism. The condition of accessible and above grade concrete is used as an indicator for the condition of the inaccessible and below grade structural components and provides reasonable assurance that degradation of inaccessible structural components will be detected before a loss of an intended function. If cracking due to expansion and reaction with aggregates were significant, pattern cracking would be expected over most of the surfaces of the Group 6 structures continuously exposed to water.

In addition, significant concrete deformations due to concrete expansion has not been detected at the Screen House and Cooling Lake, which have comparatively high exposure to water compared to other reinforced concrete structures at Clinton Power Station. The Group 6 structures may be used as leading structures to indicate the presence of expansion and reaction with aggregates for the other reinforced concrete structures that are in scope. No significant concrete deformations due to differences in concrete expansion have been detected at the Screen House or Cooling Lake. This provides objective evidence that cracking associated with expansion due to reaction with aggregates has not yet occurred. Considering the age of Clinton Power Station, the possibility of occurrence becomes unlikely. Nevertheless, Clinton Power Station will continue to look for indications of cracking associated with expansion due to reaction with aggregates.

Clinton Power Station also examines exposed portions of the below grade concrete, when excavated for any reason in accordance with the Structures Monitoring (B.2.1.34) program.

The Structures Monitoring (B.2.1.34) program is expected to adequately manage the cracking due to expansion and reaction with aggregates that could occur in inaccessible reinforced concrete areas of Group 6 structures. Therefore, a plant-specific AMP is not required to manage this aging effect.

3. *Increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation could occur in inaccessible areas of concrete elements of Group 6 structures. The GALL Report recommends further evaluation if leaching is observed in accessible areas that impact intended functions. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

   Table 3.5.1 Item Number 3.5.1-51: This aging effect and mechanism, increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation, is considered applicable to Group 6 reinforced concrete structures. The Structures Monitoring (B.2.1.34) program will be used to manage the increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in both accessible and inaccessible areas of Group 6 structures. The structures in the scope of the program consist of the Screen House and Cooling Lake, however, the only Group 6 structure that is applicable to this aging effect and mechanism is the Screen House. There are significant portions of the Screen House that are accessible that provide indications of reinforced concrete conditions in inaccessible areas.

   The same concrete specification was used for all structures at Clinton Power Station, including the Group 6 structures, such that inspection results are representative of the expected effects of leaching and carbonation of all structures within the scope of license renewal. The original designs and construction of these structures conformed to ACI 318, “Building Code Requirements for Structural Concrete and Commentary,” and ACI 301, “Specifications for Structural Concrete.” The concrete mix designs provide for low permeability, by incorporating fly ash and water reducing agents. Concrete fine and coarse aggregates conform to ASTM C33, “Standard Specification for Concrete Aggregates.” Construction specifications require petrographic examinations of aggregates used in concrete to be performed in accordance with ASTM C295, “Petrographic Examination of Aggregates for Concrete.” The Cement is Type I and II, Portland cement conforming to ASTM C-150. However, increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide is applicable for a flowing water environment; therefore, the potential for leaching to occur due to the water flowing environment is considered. Groundwater considered aggressive due to low pH or high sulfates could potentially result in chemical attack or leaching of the concrete. Concrete degradation due to chemical attack or leaching has not been observed at Clinton Power Station.

   In 2009, white scaling and efflorescence was found on the walls of the Screenhouse shutdown service water tunnel, however, there was no indication of damage to the walls. During an inspection of the same areas of the tunnel in 2019, the condition identified in 2009 remained as-is. The white efflorescence was determined to be a result of seepage during construction. In 2019 efflorescence and light rust was observed on and near an embedded wall plate in the Fuel Building wall. Although some minor leaching has been observed in accessible areas, there has been no impact to the structural integrity or the loss of intended function of the Screenhouse tunnel or Fuel Building concrete.

   This operating experience provides objective evidence that the inaccessible below grade reinforced concrete at Clinton Power Station is not exhibiting reinforcing steel corrosion. Inaccessible below-grade reinforced concrete structures are not subject to an aggressive environment. Test results for well water samples taken from fall of 2022 to summer of 2023 showed pH limits are safely above the threshold limit pH > 5.5, sulfates are significantly lower than the threshold limit sulfates <1500 ppm, and chlorides are below the threshold limit chlorides < 500 ppm; which indicates a non-aggressive environment. In June of 2023, there was a single well where a sample showed that there were chlorides marginally greater than 500 ppm. This chloride value was significantly greater of all the previous tests of that well. After a re-sampling of that well, the chloride value significantly fell below the 500 ppm threshold. Therefore, from the previous tests and the re-sampling of that well, the environment is still considered to be non-aggressive.

The Structures Monitoring (B.2.1.34) program will continue to manage the increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in both accessible and inaccessible areas of Group 6 structures. In addition, Clinton Power Station will continue to examine exposed portions of the below-grade concrete, when excavated for any reason in accordance with the Structures Monitoring (B.2.1.34) program. Therefore, no additional measures for managing the aging effect of increase in porosity and permeability; loss of strength for concrete are required for inaccessible areas of Group 6 structures. Therefore, a plant-specific AMP is not required to manage this aging effect.

3.5.2.2.2.4 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. The GALL Report recommends further evaluation of plant-specific programs to manage these aging effects. The acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Table 3.5.1 Item Number 3.5.1-52: This item number is not applicable to Clinton Power Station. Clinton Power Station does not have Group 7 and 8 stainless steel tank liners exposed to standing water.

3.5.2.2.2.5 Cumulative Fatigue Damage due to Fatigue

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 CLB fatigue analysis exists. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4.3, "Metal Fatigue Analysis," of this SRP-LR.

Table 3.5.1 Item Number 3.5.1-53: This item number is not applicable to Clinton Power Station. The Clinton Power Station current licensing basis contains no fatigue analysis for Groups B1.1, B1.2, and B1.3 component supports, which are screened under the Component Support group. A CLB fatigue analysis does not exist for support members; welds; bolted connections, or supported anchorages to building structures. Therefore, a TLAA is not required to be evaluated in accordance with 10 CFR 54.21(c) for these components.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

QA provisions applicable to license renewal are discussed in Section B.1.3.

3.5.2.2.4 Ongoing Review of Operating Experience

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

3.5.2.3 Time-Limited Aging Analysis

The time-limited aging analyses identified below are associated with the Structures and Component Supports:

Section 4.6, Primary Containment Fatigue Analyses

3.5.3 CONCLUSION

The Structures and Component Supports that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Structures and Component Supports are identified in the summaries in Section 3.5.2.1 above.

A description of these 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 conclusions provided in Appendix B, the effects of aging associated with the Structures and Component Supports components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the current licensing basis during the period of extended operation.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-1	Concrete: dome; wall; basemat; ring girders; buttresses, Concrete elements, all	Cracking and distortion due to increased stress levels from settlement	Chapter XI.S2, "ASME Section XI, Subsection IWL" or Chapter XI.S6, "Structure Monitoring" 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 a de-watering system is relied upon to control settlement	Consistent with NUREG-1801. The ASME Section XI, Subsection IWL (B.2.1.30) program will be used to manage cracking and distortion of the reinforced concrete Primary Containment dome, walls, and basemat exposed to an air-indoor, uncontrolled and a groundwater/soil environment. Clinton Power Station does not rely on a de-watering system to control settlement. See subsection 3.5.2.2.1.1.
3.5.1-2	Concrete: foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	Chapter XI.S6, "Structures Monitoring" If a de-watering system is relied upon for control of erosion, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement	Not Applicable. This item number is not applicable to the Clinton Power Station Mark III containment. Clinton Power Station does not utilize porous concrete subfoundation material and does not rely on a de-watering system to control settlement, therefore a further evaluation of reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete foundations is not required. See subsection 3.5.2.2.1.1.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-3	Concrete: dome; wall; basemat; ring girders; buttresses, Concrete: containment; wall; basemat, Concrete: basemat, concrete fill-in annulus	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	A plant-specific aging management program is to be evaluated.	Yes, if temperature limits are exceeded	Not Applicable. There are no reinforced concrete elements of the Primary Containment dome, walls, basemat, etc. exposed to an air-indoor, uncontrolled, or air-outdoor environment that are subject to reduction of strength. See subsection 3.5.2.2.1.2.
3.5.1-4	Steel elements (inaccessible areas): drywell shell; drywell head; and drywell shell	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, "ASME Section XI, Subsection IWE," and Chapter XI.S4, "10 CFR Part 50, Appendix J"	Yes, if corrosion is indicated from the IWE examinations	Not Used. Aging effects for Clinton Power Station BWR Mark III Primary Containment steel structures in inaccessible areas are addressed under Item Number 3.5.1-5. See subsection 3.5.2.2.1.3.1.
3.5.1-5	Steel elements (inaccessible areas): liner; liner anchors; integral attachments, Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, "ASME Section XI, Subsection IWE" and Chapter XI.S4, "10 CFR Part 50, Appendix J"	Yes, if corrosion is indicated from the IWE examinations	Consistent with NUREG-1801. The ASME Section XI, Subsection IWE (B.2.1.29) and 10 CFR Part 50, Appendix J (B.2.1.32) programs will be used to manage loss of material of the containment steel liner (including anchors and integral attachments) exposed to an air-indoor, uncontrolled environment. See section 4.6.9 for a Containment Liner Corrosion Assessment TLAA. See subsection 3.5.2.2.1.3.1.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-6	Steel elements: torus shell	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, “ASME Section XI, Subsection IWE” and Chapter XI.S4, “10 CFR Part 50, Appendix J”	Yes, if corrosion is significant. Recoating of the torus is recommended.	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. This item number is applicable to Mark I containments. See subsection 3.5.2.2.1.3.2.
3.5.1-7	Steel elements: torus ring girders; downcomers;, Steel elements: suppression chamber shell (interior surface)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, “ASME Section XI, Subsection IWE”	Yes, if corrosion is significant	Not Used. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design with a stainless steel liner in the suppression pool. See subsection 3.5.2.2.1.3.3.
3.5.1-8	Prestressing system: tendons	Loss of prestress due to relaxation; shrinkage; creep; elevated temperature	Yes, TLAA	Yes, TLAA	Not Applicable. The Clinton Power Station reinforced concrete BWR Mark III Primary Containment does not use a prestressing system. See subsection 3.5.2.2.1.4.
3.5.1-9	Penetration sleeves; penetration bellows, Steel elements: torus; vent line; vent header; vent line bellows; downcomers, Suppression pool shell; unbraced downcomers, Steel elements: vent header; downcomers	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	Yes, TLAA	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.5.2.2.1.5.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-10	Penetration sleeves; penetration bellows	Cracking due to stress corrosion cracking	Chapter XI.S1, “ASME Section XI, Subsection IWE,” and Chapter XI.S4, “10 CFR Part 50, Appendix J”	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The ASME Section XI, Subsection IWE (B.2.1.29) and 10 CFR Part 50, Appendix J (B.2.1.32) programs will be used to manage cracking for Primary Containment dissimilar metal welds and the inclined fuel transfer tube penetration stainless steel bellows and dissimilar metal welds exposed to an air-indoor, uncontrolled environment. The drywell guard pipe bellows are not a Primary Containment boundary. The 10 CFR Part 50, Appendix J (B.2.1.32) program will be used to manage cracking of the bellows and associated dissimilar metal welds exposed to an air-indoor, uncontrolled environment. See subsection 3.5.2.2.1.6
3.5.1-11	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): dome; wall; basemat	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions	Not applicable. The Clinton Power Station containment building reinforced concrete dome and walls are not exposed to air-outdoor or groundwater/soil environments. The below grade concrete walls are not exposed to a groundwater/soil environment because the containment building is surrounded by the Fuel Building and Auxiliary Building above grade to the common basemat foundation. The common basemat foundation is exposed to a groundwater/soil environment, but it is located well below the frost line and not subject to freeze-thaw conditions. See subsection 3.5.2.2.1.7.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-12	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): containment; wall; basemat, Concrete (inaccessible areas): basemat, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated	Consistent with NUREG-1801. The ASME Section XI, Subsection IWL (B.2.1.30) program will be used to manage cracking of the concrete dome, walls, basemat, etc. exposed to a groundwater/soil, water-flowing, and air-indoor, uncontrolled environment. See subsection 3.5.2.2.1.8
3.5.1-13	Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): dome; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	Consistent with NUREG-1801. The ASME Section XI, Subsection IWL (B.2.1.30) program will be used to manage increase in porosity and permeability and loss of strength in the concrete basemat exposed to a water-flowing environment. The concrete dome and walls are not exposed to air-outdoor, water-flowing, or groundwater/soil environments. See subsection 3.5.2.2.1.9.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-14	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): containment; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	Not Used. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. This item number is applicable to PWRs, BWR Mark I, and Mark II containments. For components applicable to Clinton Power Station, management of this aging effect/mechanism is addressed under item number 3.5.1-13. See subsection 3.5.2.2.1.9.
3.5.1-15	Concrete (accessible areas): basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Chapter XI.S2, “ASME Section XI, Subsection IWL”	No	Not Used. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. This item number is applicable to PWR and BWR Mark III steel containments. For components applicable to Clinton Power Station, management of this aging effect/mechanism is addressed under item number 3.5.1-13.
3.5.1-16	Concrete (accessible areas): basemat, Concrete: containment; wall; basemat	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Chapter XI.S2, “ASME Section XI, Subsection IWL,” or Chapter XI.S6, “Structures Monitoring”	No	Not Used. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. This item number is applicable to PWRs, BWR Mark I, Mark II, Mark III steel containments. For components applicable to Clinton Power Station, management of this aging effect/mechanism is addressed under item number 3.5.1-24.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-17	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Chapter XI.S2, "ASME Section XI, Subsection IWL"	No	Not Used. For components applicable to Clinton Power Station, management of this aging effect/mechanism is addressed under item number 3.5.1-24.
3.5.1-18	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): basemat	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Chapter XI.S2, "ASME Section XI, Subsection IWL"	No	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. The accessible portions of the reinforced dome, walls, basemat, etc. are not exposed to air-outdoor or groundwater/soil.
3.5.1-19	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): basemat, Concrete (accessible areas): containment; wall; basemat, Concrete (accessible areas): basemat, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	Chapter XI.S2, "ASME Section XI, Subsection IWL"	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWL (B.2.1.30) program will be used to manage cracking of the reinforced concrete dome, walls, etc. exposed to an air-indoor, uncontrolled environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-20	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): containment; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Chapter XI.S2, “ASME Section XI, Subsection IWL”	No	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. The accessible portions of the reinforced concrete dome, wall, basemat, etc. are not exposed to an air-outdoor or water-flowing environment. Increase in porosity and permeability and loss of strength of the inaccessible Primary Containment foundation is addressed with item number 3.5.1-13.
3.5.1-21	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel, Concrete (accessible areas): basemat; reinforcing steel, Concrete (accessible areas): dome; wall; basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S2, “ASME Section XI, Subsection IWL”	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWL (B.2.1.30) program will be used to manage cracking, loss of bond, and loss of material (spalling, scaling) of the reinforced concrete dome, walls, basemat etc. exposed to an air-indoor, uncontrolled environment.
3.5.1-22	Concrete (inaccessible areas): basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S6, “Structures Monitoring”	No	Not Used. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. This item number is applicable to BWR Mark I and Mark II containments. For components applicable to Clinton Power Station, management of this aging effect/mechanism is addressed under item numbers 3.5.1-21 and 3.5.1-23.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-23	Concrete (inaccessible areas): basemat; reinforcing steel, Concrete (inaccessible areas): dome; wall; basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S2, “ASME Section XI, Subsection IWL,” or Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWL (B.2.1.30) program will be used to manage cracking, loss of bond, and loss of material of the reinforced concrete dome, walls, basemat etc. exposed to an air-indoor, uncontrolled environment.
3.5.1-24	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (accessible areas): dome; wall; basemat	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Chapter XI.S2, “ASME Section XI, Subsection IWL,” or Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWL (B.2.1.30) program will be used to manage increase in porosity and permeability of the concrete basemat exposed to a groundwater/soil in the Primary Containment. Increase in porosity and permeability, cracking, and loss of material due to aggressive chemical attack is not an aging mechanism likely to occur as the concrete is not exposed to acidic solutions with a pH < 5.5, chloride solutions > 500ppm, or sulfate solutions > 1500ppm.
3.5.1-25	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S2, “ASME Section XI, Subsection IWL,” or Chapter XI.S6, "Structures Monitoring"	No	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. This item number is applicable to PWRs.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-26	Moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects	Chapter XI.S1, "ASME Section XI, Subsection IWE"	No	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. The containment design does not include a moisture barrier between the containment liner and the concrete containment structure.
3.5.1-27	Penetration sleeves; penetration bellows, Steel elements: torus; vent line; vent header; vent line bellows; downcomers, Suppression pool shell	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	Chapter XI.S1, "ASME Section XI, Subsection IWE," and Chapter XI.S4, "10 CFR Part 50, Appendix J"	No	Not used. Primary containment components subject to cyclic loading at Clinton Power Station have a fatigue analysis and are addressed under item 3.5.1-9. Fatigue is a TLAA; further evaluation is documented in Subsection 3.5.2.2.1.5.
3.5.1-28	Personnel airlock, equipment hatch, CRD hatch	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, "ASME Section XI, Subsection IWE," and Chapter XI.S4, "10 CFR Part 50, Appendix J"	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWE (B.2.1.29) and 10 CFR Part 50, Appendix J (B.2.1.32) programs will be used to manage loss of material for the steel personnel airlocks (Containment), equipment hatch (Containment), and associated accessories exposed to an air-indoor, uncontrolled environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-29	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, and closure mechanisms	Loss of leak tightness due to mechanical wear of locks, hinges and closure mechanisms	Chapter XI.S1, “ASME Section XI, Subsection IWE,” and Chapter XI.S4, “10 CFR Part 50, Appendix J”	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWE (B.2.1.29) and 10 CFR Part 50, Appendix J (B.2.1.32) programs will be used to manage loss of leak tightness for the containment personnel airlocks, equipment hatch, and all associated accessories exposed to an air-indoor, uncontrolled environment.
3.5.1-30	Pressure-retaining bolting	Loss of preload due to self-loosening	Chapter XI.S1, “ASME Section XI, Subsection IWE,” and Chapter XI.S4, "10 CFR Part 50, Appendix J"	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWE (B.2.1.29) and 10 CFR Part 50, Appendix J (B.2.1.32) programs will be used to manage loss of preload for Primary Containment steel pressure-retaining bolting exposed to an air-indoor, uncontrolled environment.
3.5.1-31	Pressure-retaining bolting, Steel elements: downcomer pipes	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, “ASME Section XI, Subsection IWE”	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWE (B.2.1.29) program will be used to manage loss of material for Primary Containment steel pressure-retaining (Containment Closure) bolting exposed to an air-indoor, uncontrolled environment.
3.5.1-32	Prestressing system: tendons; anchorage components	Loss of material due to corrosion	Chapter XI.S2, “ASME Section XI, Subsection IWL”	No	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design and does not have a prestressing system.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-33	Seals and gaskets	Loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects	Chapter XI.S4, “10 CFR Part 50, Appendix J “	No	Consistent with NUREG-1801. The 10 CFR Part 50, Appendix J (B.2.1.32) program will be used to manage loss of sealing for elastomer seals and gaskets exposed to an air-indoor, uncontrolled environment.
3.5.1-34	Service Level I coatings	Loss of coating integrity due to blistering, cracking, flaking, peeling, or physical damage	Chapter XI.S8, “Protective Coating Monitoring and Maintenance”	No	Consistent with NUREG-1801. The Protective Coatings Maintenance and Monitoring (B.2.1.36) program will be used to manage loss of coating integrity for service level I coatings exposed to an air-indoor, uncontrolled environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-35	Steel elements (accessible areas): liner; liner anchors; integral attachments, Penetration sleeves, Steel elements (accessible areas): drywell shell; drywell head; drywell shell in sand pocket regions;, Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable), Steel elements (accessible areas): drywell shell; drywell head	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, "ASME Section XI, Subsection IWE," and Chapter XI.S4, "10 CFR Part 50, Appendix J"	No	Consistent with NUREG-1801. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. The ASME Section XI, Subsection IWE (B.2.1.29) and 10 CFR Part 50, Appendix J (B.2.1.32) programs will be used to manage loss of material for accessible portions of the steel containment liner, anchors, and integral attachments; the containment mechanical and electrical penetrations, and the inclined fuel transfer tube exposed to an air-indoor, uncontrolled environment.
3.5.1-36	Steel elements: drywell head; downcomers	Fretting or lockup due to mechanical wear	Chapter XI.S1, "ASME Section XI, Subsection IWE"	No	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. This item number is applicable to BWR Mark I and Mark II containments.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-37	Steel elements: suppression chamber (torus) liner (interior surface)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.S1, “ASME Section XI, Subsection IWE,“ and Chapter XI.S4, “10 CFR Part 50, Appendix J”	No	Consistent with NUREG-1801. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design. The ASME Section XI, Subsection IWE (B.2.1.29) and 10 CFR Part 50, Appendix J (B.2.1.32) programs will be used to manage loss of material for the stainless steel containment penetrations, stainless steel portions of the containment liner, anchors and integral attachments (suppression pool liner) exposed to a treated water environment. See subsection 3.5.2.2.1.3.3.
3.5.1-38	Steel elements: suppression chamber shell (interior surface)	Cracking due to stress corrosion cracking	Chapter XI.S1, “ASME Section XI, Subsection IWE,” and Chapter XI.S4, “10 CFR Part 50, Appendix J”	No	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design with a stainless steel liner in the suppression pool exposed to a treated water environment. SCC is applicable to stainless steel at temperatures exceeding 140 degrees F. The suppression pool normal operating temperature is 95 degrees F.
3.5.1-39	Steel elements: vent line bellows	Cracking due to stress corrosion cracking	Chapter XI.S1, “ASME Section XI, Subsection IWE," and Chapter XI.S4, “10 CFR Part 50, Appendix J”	No	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design and does not have vent line bellows. This item number is applicable to BWR Mark I containments.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-40	Unbraced downcomers, Steel elements: vent header; downcomers	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	Chapter XI.S1, "ASME Section XI, Subsection IWE"	No	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design and does not have downcomer or vent header components. This item number is applicable to BWR Mark II containments.
3.5.1-41	Steel elements: drywell support skirt, Steel elements (inaccessible areas): support skirt	None	None	NA - No AEM or AMP	Not Applicable. Clinton Power Station is a reinforced concrete BWR Mark III Primary Containment design and does not have a drywell support skirt or a support skirt. This item number is applicable to BWR Mark I & II containments.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-42	Groups 1-3, 5, 7-9:Concrete (inaccessible areas): foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is required for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557)	Yes, for plants located in moderate to severe weathering conditions (See subsection 3.5.2.2.2.1.1)	Consistent with NUREG-1801. Item 3.5.1-42 is used to address loss of material (spalling, scaling) and cracking of inaccessible above grade concrete exposed to an air-outdoor environment. This item is also used to address inaccessible below grade reinforced concrete walls and foundations in a groundwater/soil environment that are also subject to the freeze-thaw outdoor air temperature cycles above the frost line. The Structures Monitoring (B.2.1.34) program will be used to manage loss of material (spalling, scaling) and cracking of the reinforced concrete in inaccessible areas exposed to freeze-thaw outdoor air temperature cycles above the frost line in Group 1, 3, and 5 structures. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components associated with the Control Building. See Subsection 3.5.2.2.2.1.1.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-43	All Groups except Group 6:Concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated (See subsection 3.5.2.2.2.1.2)	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage cracking of the reinforced concrete (inaccessible areas) exposed to the air – indoor uncontrolled, air – outdoor, and groundwater/soil environments in Group 1, 3, 4, and 5 structures. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components associated with the Control Building. See Subsection 3.5.2.2.2.1.2.
3.5.1-44	All Groups: concrete: all	Cracking and distortion due to increased stress levels from settlement	Chapter XI.S6, “Structures Monitoring” 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 a de-watering system is relied upon to control settlement (See subsection 3.5.2.2.2.1.3)	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage cracking and distortion of the reinforced concrete structural elements of structures founded on and exposed to the groundwater/soil environment for Group 1, 3, 5, and 6 structures. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components associated with the Control Building. Clinton Power Station does not rely on a de-watering system to control settlement. See Subsection 3.5.2.2.2.1.3.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-45	Groups 1-3, 5-9: concrete: foundation; subfoundation	Reduction in foundation strength, cracking due to differential settlement, erosion of porous concrete subfoundation	Chapter XI.S6, “Structures Monitoring” 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 a de-watering system is relied upon to control settlement (See subsection 3.5.2.2.2.1.3)	Not Applicable. There are no porous concrete foundations or subfoundations subject to reduction in foundation strength, cracking due to differential settlement, erosion of porous concrete subfoundation in Structures and Component Supports. See Subsection 3.5.2.2.2.1.3.
3.5.1-46	Groups 1-3, 5-9: concrete: foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	Chapter XI.S6, “Structures Monitoring” 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 a de-watering system is relied upon to control settlement (See subsection 3.5.2.2.2.1.3)	Not Applicable. There are no porous concrete foundations or subfoundations subject to reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation in Structures and Component Supports. See Subsection 3.5.2.2.2.1.3.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-47	Groups 1-5, 7-9: concrete (inaccessible areas): exterior above- and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function (See subsection 3.5.2.2.2.1.4)	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage increase in porosity and permeability, loss of strength of the reinforced concrete (inaccessible areas): exterior above and below grade foundations for Group 1, 3, and 5 structures which are exposed to the water-flowing environment. Although some leaching has been observed in the accessible areas it is not significant and did not impact its intended function. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components associated with the Control Building. This Item Number does not apply to the Group 4 structures due to the Mark III containment design. See Subsection 3.5.2.2.2.1.4.
3.5.1-48	Groups 1-5: concrete: all	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	A plant-specific aging management program is to be evaluated.	Yes, if temperature limits are exceeded (See subsection 3.5.2.2.2.2)	Not Applicable. There is no reinforced concrete subjected to reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local) in Structures and Component Supports. See Subsection 3.5.2.2.2.2.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-49	Groups 6 - concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is required for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557)	Yes, for plants located in moderate to severe weathering conditions (See subsection 3.5.2.2.2.3.1)	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.36) program will be used to manage loss of material (spalling, scaling) and cracking due to freeze-thaw of the inaccessible below grade reinforced concrete walls and foundations in a groundwater/soil environment that are subject to the freeze-thaw outdoor air temperature cycles above the frost line in Group 6 structures. See Subsection 3.5.2.2.2.3.1.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-50	Groups 6: concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated See subsection 3.5.2.2.2.3.2)	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage cracking of the Group 6 inaccessible reinforced concrete structural elements exposed to the air – outdoor, water – flowing, groundwater/soil, and air – indoor, uncontrolled environments for Group 6 structures. Concrete fine and coarse aggregates conform to ASTM C33. Construction specifications required petrographic examinations of aggregates used in concrete to be performed in accordance with ASTM C295 and other ASTM C289 standards tests to prevent use of reactive aggregates. In addition, concrete structures were constructed in accordance with ACI 318 and ACI 301. Cracking associated with expansion due to reaction with aggregates has not been observed on accessible portions of the concrete structures. If significant conditions are observed in accessible areas, the Structures Monitoring (B.2.1.34) program will evaluate potential effect on inaccessible areas. The Structures Monitoring program (B.2.1.34) will require below grade surfaces to be examined for signs of aging, including cracking due to expansion of aggregates when exposed during excavation. See Subsection 3.5.2.2.2.3.2.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-51	Groups 6: concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function (See subsection 3.5.2.2.2.3.3)	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage increase in porosity and permeability, loss of strength of reinforced concrete exterior below-grade foundation and interior slab inaccessible areas exposed to the water - flowing environment for Group 6 structures. Although some leaching has been observed in the accessible areas it is not significant and did not impact an intended function. See Subsection 3.5.2.2.2.3.3.
3.5.1-52	Groups 7, 8 - steel components: tank liner	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 (See subsection 3.5.2.2.2.4)	Not Applicable. There are no Group 7 or 8 steel tank liners exposed to standing water in Structures and Component Supports. See Subsection 3.5.2.2.2.4.
3.5.1-53	Support members; welds; bolted connections; support anchorage to building structure	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	Yes, TLAA	Yes, TLAA (See subsection 3.5.2.2.2.5)	Not Applicable. Clinton Power Station current licensing basis contains no fatigue analyses for component support members, welds, bolted connections, or support anchorages to the building structures. Therefore, a TLAA is not evaluated in accordance with 10 CFR 54.21(c) for these components. See Subsection 3.5.2.2.2.5.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-54	All groups except 6: concrete (accessible areas): all	Cracking due to expansion from reaction with aggregates	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage cracking due to expansion from reaction with aggregates of concrete in accessible areas exposed to the air – outdoor, groundwater/soil, water – flowing, and air – indoor, uncontrolled environments for all structural groups. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components associated with the Control Building.
3.5.1-55	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	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms for components exposed to the air – indoor, uncontrolled and air – outdoor environments in the Component Supports Commodity Group.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-56	Concrete: exterior above- and below-grade; foundation; interior slab	Loss of material due to abrasion; cavitation	Chapter XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35) program will be used to manage loss of material for concrete exposed to the water – flowing environment for Group 6 Structures.
3.5.1-57	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	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWF (B.2.1.31) program will be used to manage loss of mechanical function of the carbon steel constant and variable load spring hangers; guides; and stops for ASME Class 1, 2, 3 and MC piping and components exposed to the air – indoor, uncontrolled environment for the Component Supports Commodity Group. The Structures Monitoring (B.2.1.34) program has been substituted and will be used to manage loss of mechanical function of the carbon steel sliding surfaces exposed to the air-outdoor environment for the Control Building.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-58	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	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35) program will be used to manage loss of material or loss of form of the earthen water-control structures exposed to the water – flowing and water – standing environments for the Cooling Lake.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-59	Group 6: concrete (accessible areas): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35) program will be used to manage cracking, loss of bond, and loss of material (spalling, scaling) of concrete (accessible areas): above-grade and below-grade exterior, interior, curbs, precast concrete - beams and panel (roof slab), foundations, equipment supports and foundations, masonry walls, and hatches/plugs exposed to the air – indoor, uncontrolled and air – outdoor environments in the Group 6 structures. The water-flowing environment is the only environment applicable to accessible portions of the Screen House foundation because there are portions of the foundation submerged in water. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35) program will be used to manage cracking, loss of bond, and loss of material (spalling, scaling) of the accessible portions of the concrete foundation exposed to a water-flowing environment for Group 6 structures.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-60	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35) program will be used to manage loss of material (spalling, scaling) and cracking of the concrete (accessible areas): precast concrete – beams and panel (roof slab), curbs, above-grade exterior and hatches/plugs exposed to the air – outdoor environment in the Group 6 structures.
3.5.1-61	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35) program will be used to manage increase in porosity and permeability, loss of strength of the concrete (accessible areas): precast concrete – beams and panel (roof slab), curbs, above-grade and below-grade exterior, interior, foundations, and equipment supports and foundations exposed to the water – flowing environment in the Group 6 structures.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-62	Group 6: Wooden Piles; sheeting	Loss of material; change in material properties due to weathering, chemical degradation, and insect infestation repeated wetting and drying, fungal decay	Chapter XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Not Applicable. There are no Wooden Piles; sheeting subject to loss of material; change in material properties in Structures and Component Supports.
3.5.1-63	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above- and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage increase in porosity and permeability, loss of strength for concrete in the accessible areas of above grade exterior concrete, missile barriers, hatches/plugs, manholes, handholes, and duct banks, and foundations for Groups 1, 3, 5, and 7. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components associated with the Control Building.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-64	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage loss of material (spalling, scaling) and cracking for concrete in the accessible areas of above-grade exterior, foundations, missile barriers, equipment supports and foundations, hatches and plugs, and manholes, handholes, and duct banks exposed to the air-outdoor environment for Groups 1, 3, 5, and 7. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components associated with the Control Building.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-65	Groups 1-3, 5, 7-9: concrete (inaccessible areas): below-grade exterior; foundation, Groups 1-3, 5, 7-9: concrete (accessible areas): below-grade exterior; foundation, Groups 6: concrete (inaccessible areas): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage cracking, loss of bond, and loss of material (spalling, scaling) for concrete in the inaccessible areas of above-grade and below-grade exterior concrete, foundation, interior, equipment supports and foundations, manholes, handholes, and duct banks, and Group 6 and other concrete in the inaccessible areas exposed to the air-indoor, uncontrolled, air-outdoor, and groundwater/soil environments for Groups 1, 3, and 5. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 or 8 structures are missile barrier components associated with the Control Building. The ASME Section XI, Subsection IWL (B.2.1.30) program is substituted to manage cracking, loss of bond, and loss of material (spalling, scaling) for concrete in the inaccessible areas of the Primary Containment structure exposed to a groundwater/soil environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-66	Groups 1-5, 7, 9: concrete (accessible areas): interior and above-grade exterior	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage cracking, loss of bond, and loss of material (spalling, scaling) for accessible areas of concrete interior, above-grade exterior, curbs, missile barriers, foundations, equipment supports and foundations, hatches/plugs, manholes, handholes, and duct banks, and masonry walls subject to the air-indoor, uncontrolled and air-outdoor environments for Groups 1, 3, 4, 5, and 7. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 structure is the missile barrier component associated with the Control Building.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-67	Groups 1-5, 7, 9: Concrete: interior; above-grade exterior, Groups 1-3, 5, 7-9 - concrete (inaccessible areas): below-grade exterior; foundation, Group 6: concrete (inaccessible areas): all	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage increase in porosity and permeability, cracking, loss of material (spalling, scaling) for concrete below-grade exterior, foundations, equipment supports and foundations, and manholes, handholes, and duct banks exposed to the groundwater/soil environment for Group 1, 3, 5, and 6 structures. Group 2 and 9 structures are not applicable to Clinton Power Station and the only Group 7 structure is the missile barrier component associated with the Control Building.
3.5.1-68	High-strength structural bolting	Cracking due to stress corrosion cracking	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Not Applicable. There is no high strength structural bolting subject to cracking in structures and component supports at Clinton Power Station.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-69	High-strength structural bolting	Cracking due to stress corrosion cracking	Chapter XI.S6, “Structures Monitoring“ Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No	Not Applicable. There is no high strength structural bolting subject to cracking in structures and component supports at Clinton Power Station.
3.5.1-70	Masonry walls: all	Cracking due to restraint shrinkage, creep, and aggressive environment	Chapter XI.S5, “Masonry Walls”	No	Consistent with NUREG-1801. The Masonry Walls (B.2.1.33) program, which is implemented by the Structures Monitoring (B.2.1.34) program, will be used to manage cracking of concrete block masonry walls exposed to the air – indoor uncontrolled and air – outdoor environments. The Fire Protection (B.2.1.16) program will be used to manage cracking of concrete block masonry walls exposed to the air – indoor, uncontrolled and air – outdoor environments for the Fire Protection System.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-71	Masonry walls: all	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Chapter XI.S5, “Masonry Walls"	No	Consistent with NUREG-1801. The Masonry Walls (B.2.1.33) program, which is implemented by the Structures Monitoring (B.2.1.34) program, will be used to manage loss of material (spalling, scaling) and cracking of the concrete block masonry walls exposed to the air - outdoor environment. The Fire Protection (B.2.1.16) program will be used to manage loss of material (spalling, scaling) and cracking of concrete block masonry walls exposed to the air – outdoor environment for the Fire Protection System.
3.5.1-72	Seals; gasket; moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage loss of sealing of seals; gasket; moisture barriers (caulking, flashing, and other sealants) and roofing exposed to various environments for the Structural Commodity Group.
3.5.1-73	Service Level I coatings	Loss of coating integrity due to blistering, cracking, flaking, peeling, physical damage	Chapter XI.S8, "Protective Coating Monitoring and Maintenance"	No	Not Applicable. Clinton Power Station does not utilize Service Level 1 Coatings outside the Primary Containment. Service Level 1 coatings inside the Primary Containment are addressed within Item 3.5.1-34.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-74	Sliding support bearings; sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	Chapter XI.S6, “Structures Monitoring”	No	Not Applicable. Clinton Power Station does utilize sliding surfaces. However, the sliding support surfaces for the Primary Containment and the Component Supports Commodity Group are addressed within Item Number 3.5.1-75. The steel sliding support surfaces for the Control Building are addressed within Item Number 3.5.1-57.
3.5.1-75	Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWF (B.2.1.31) program will be used to manage loss of mechanical function of sliding surfaces for ASME supports exposed to the air-indoor, uncontrolled environment for Primary Containment and the Component Supports Commodity Group.
3.5.1-76	Sliding surfaces: radial beam seats in BWR drywell	Loss of mechanical function due to corrosion, distortion, dirt, overload, wear	Chapter XI.S6, “Structures Monitoring"	No	Not Applicable. There are no sliding surfaces: radial beam seats in the Clinton Power Station drywell exposed to the Air indoor, uncontrolled environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-77	Steel components: all structural steel	Loss of material due to corrosion	Chapter XI.S6, “Structures Monitoring” 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.	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage loss of material of structural steel components exposed to the air-indoor, uncontrolled, and air-outdoor environments.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-78	Steel components: fuel pool liner	Cracking due to stress corrosion cracking; Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Monitoring of the spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	No, unless leakages have been detected through the SFP liner that cannot be accounted for from the leak chase channels	Consistent with NUREG-1801 with exceptions. The Water Chemistry (B.2.1.2) program will be used to manage loss of material of the stainless steel spent fuel pool and containment pool gates and liner exposed to the treated water environment. The Water Chemistry (B.2.1.2) program will be used to manage loss of material of the stainless steel weir wall liner and drywell wall liner exposed to the treated water environment. Clinton Power Station has a Mark III Primary Containment design, and the weir wall and drywell wall are not Primary Containment boundaries. The weir wall liner and portions of the drywall liner are not containment boundary but provide a watertight boundary for the suppression pool. The suppression pool water chemistry and level are monitored in accordance with technical specifications. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation. See subsection 3.5.2.2.1.3.3.
3.5.1-79	Steel components: piles	Loss of material due to corrosion	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage loss of material of the carbon steel penetration sleeves exposed to the groundwater/soil environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-80	Structural bolting	Loss of material due to general, pitting and crevice corrosion	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage loss of material of steel structural bolting exposed to the air – indoor, uncontrolled environment. Bolting components in the Cranes, Hoists, and Refueling Equipment System have been aligned to this item number based on material, environment, and aging effect. The Inspection of Overhead Heavy and Light Load (Related to Refueling) Handling Systems (B.2.1.14) program has been substituted to manage the loss of material of structural bolting in this system.
3.5.1-81	Structural bolting	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S3, "ASME Section XI, Subsection IWF"	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWF (B.2.1.31) program will be used to manage the loss of material of steel structural bolting used in ASME Class 1, 2, 3 and MC piping and component supports exposed to the air – indoor, uncontrolled environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-82	Structural bolting	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage loss of material of the steel and galvanized steel bolting for concrete anchors, miscellaneous steel (catwalks, stairs, handrails, ladders, platforms, etc.), panels, racks, frames, cabinets, and other enclosures, supports non-ASME piping and components exposed to the air - outdoor environment.
3.5.1-83	Structural bolting	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35) program will be used to manage loss of material of the steel bolting, concrete anchors, and embedments exposed to the water – flowing and air outdoor environments. The ASME Section XI, Subsection IWF (B.2.1.31) program will be used to manage loss of material of carbon steel supports exposed to water - flowing environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-84	Structural bolting	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.S3, "ASME Section XI, Subsection IWF"	No	Consistent with NUREG-1801 with exceptions. Clinton Power Station does not use stainless steel structural bolting for Class MC supports in the treated water environment. The drywell head is not a Class MC Primary Containment boundary at Clinton. The One-Time Inspection program will be substituted to confirm that the Water Chemistry program is effectively managing loss of material of the stainless steel drywell head closure bolting in a treated water environment. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-85	Structural bolting	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” for BWR water, and Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-1801 with exceptions. The Water Chemistry (B.2.1.2) program will be used to manage loss of material of the stainless steel bolting and supports for ASME Class 1, 2, and 3 piping and components exposed to the treated water environment. Stainless steel bolting components in the Cranes, Hoists, and Refueling Equipment System have been aligned to this item number based on material, environment, and aging effect. The Inspection of Overhead Heavy and Light Load (Related to Refueling) Handling Systems (B.2.1.14) program has been substituted for the ASME Section XI, Subsection IWF (B.2.1.31) program, however, the Water Chemistry (B.2.1.2) program will continue to also be used to manage the loss of material of structural bolting in this system. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.5.1-86	Structural bolting	Loss of material due to pitting and crevice corrosion	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Not Applicable. There are no steel or galvanized steel bolting for Class 1, 2, 3 or MC piping and component supports exposed to the air-outdoor environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-87	Structural bolting	Loss of preload due to self-loosening	Chapter XI.S3, "ASME Section XI, Subsection IWF"	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWF (B.2.1.31) program will be used to manage loss of preload of the carbon and low alloy steel bolting used in ASME Class 1, 2, 3, and MC supports exposed to air – indoor, uncontrolled environment in the Component Supports Commodity Group.
3.5.1-88	Structural bolting	Loss of preload due to self-loosening	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage loss of preload for any structural bolting material exposed to any environment. Bolting components in the Cranes, Hoists, and Refueling Equipment System have been aligned to this item number based on material, environment, and aging effect. The Inspection of Overhead Heavy and Light Load (Related to Refueling) Handling Systems (B.2.1.14) program has been substituted to manage the loss of preload of the structural bolting for this system. Bolting components in the Fuel Building have been aligned to this item number based on material, environment, and aging effect. The Structures Monitoring (B.2.1.34) program will be used to manage the loss of preload of structural stainless steel bolting in this system.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-89	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No	Not Applicable. Item Number 3.5.1-89 is applicable to PWRs only and is not used for Clinton Power Station.
3.5.1-90	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M2, “Water Chemistry,” for BWR water, and Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-1801 with exceptions. The ASME Section XI, Subsection IWF (B.2.1.31) program will be used to manage loss of material for the stainless steel support members, welds, bolted connections and support anchorage for ASME Class 2 & 3 components exposed to a treated water environment. An exception applies to the NUREG-1801 recommendations for Water Chemistry (B.2.1.2) program implementation.
3.5.1-91	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-1801. The ASME Section XI, Subsection IWF (B.2.1.31) program will be used to manage loss of material of the carbon steel support members, welds, bolted connections, and support anchorage for ASME Class 1, 2, 3, and MC components exposed to the air – indoor, uncontrolled environment.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-92	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage loss of material of the carbon and galvanized steel support members and miscellaneous steel, welds, bolted connections, and support anchorage to building structures exposed to the air – indoor, uncontrolled and air - outdoor environments.
3.5.1-93	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.1.34) program will be used to manage loss of material of the aluminum, galvanized steel, and stainless steel support members, welds, bolted connections, support anchorage and other structural component parts exposed to the air - outdoor environment.
3.5.1-94	Vibration isolation elements	Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading	Chapter XI.S3, "ASME Section XI, Subsection IWF"	No	Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited. HVAC component supports are not included in the ASME Section XI, Subsection IWF Program. The Structures Monitoring (B.2.1.34) program will be used to manage reduction or loss of isolation function of elastomer vibration isolation elements of the support.

Table 3.5.1 Summary of Aging Management Evaluations for the Containments, Structures and Component Supports

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-95	Aluminum, galvanized steel and stainless steel 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. Clinton Power Station aging management review concluded that aluminum, galvanized steel, and stainless steel components exposed to the air-indoor, uncontrolled environment have no aging effects requiring aging management. Components from the Cranes, Hoists, and Refueling Equipment System and Primary Containment have also been aligned to this item number based on material, environment, and aging effect for the aluminum alloy and stainless steel system components exposed to the air – indoor, uncontrolled environment. There are no aging effects requiring management.

Table 3.5.2-1
Auxiliary Building
Summary of Aging Management Evaluation

Table 3.5.2-1 Auxiliary Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
				None	None	III.B5.TP-8	3.5.1-95	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Curbs	Direct Flow	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A

Table 3.5.2-1 Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Above-grade exterior (accessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A
Concrete: Above-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: All (accessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A3.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A

Table 3.5.2-1 Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Below-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Pressure Barrier Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: Foundation (inaccessible)	Flood Barrier Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: Interior	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A

Table 3.5.2-1 Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Interior (Steam Tunnel)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support HELB/MELB Shielding	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Equipment supports and foundations	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Hatches/Plugs	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
			Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Masonry walls: Interior	Shelter/Protection Shielding Structural Support	Concrete Block	Air - Indoor, Uncontrolled	Cracking	Masonry Walls (B.2.1.33)	III.A3.T-12	3.5.1-70	A
Steel components: structural steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A

Table 3.5.2-1 Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Structural Miscellaneous-Siding (Gas Control Boundary)	Shelter/Protection Structural Pressure Barrier	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B4.TP-8	3.5.1-95	C

Table 3.5.2-1 Auxiliary Building (Continued)

Notes	Definition of Note
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:

1. Loss of Material and Cracking of inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment subject to the freeze-thaw outdoor air temperature cycles above the frost line will be managed by the Structures Monitoring (B.2.1.34) Program.

Table 3.5.2-2
Component Supports Commodity Group
Summary of Aging Management Evaluation

Table 3.5.2-2 Component Supports Commodity Group

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for ASME Class 1 Piping and Components (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support	Grout	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B1.1.TP-42	3.5.1-55	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B1.1.TP-42	3.5.1-55	A
Supports for ASME Class 1 Piping and Components (Constant and variable load spring hangers; guides; stops)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.T-24	3.5.1-91	A
				Loss of Mechanical Function	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.T-28	3.5.1-57	A
		Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.TP-226	3.5.1-81	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for ASME Class 1 Piping and Components (Constant and variable load spring hangers; guides; stops)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Preload	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.TP-229	3.5.1-87	A
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B1.1.TP-8	3.5.1-95	A
Supports for ASME Class 1 Piping and Components (Sliding surfaces)	Structural Support	Lubrite	Air - Indoor, Uncontrolled	Loss of Mechanical Function	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.TP-45	3.5.1-75	A
Supports for ASME Class 1 Piping and Components (Support members; welds; bolted connections; support anchorage to building structure; reactor vessel anchorage)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.T-24	3.5.1-91	A
		Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.TP-226	3.5.1-81	A
				Loss of Preload	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.TP-229	3.5.1-87	A
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B1.1.TP-8	3.5.1-95	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for ASME Class 2 and 3 Piping and Components (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support	Grout	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B1.2.TP-42	3.5.1-55	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B1.2.TP-42	3.5.1-55	A
Supports for ASME Class 2 and 3 Piping and Components (Constant and variable load spring hangers; guides; stops)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.2.T-24	3.5.1-91	A
				Loss of Mechanical Function	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.2.T-28	3.5.1-57	A
		Stainless Steel	Treated Water	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.2.TP-232	3.5.1-85	C
					Water Chemistry (B.2.1.2)	III.B1.2.TP-232	3.5.1-85	D
Supports for ASME Class 2 and 3 Piping and Components (Sliding Surfaces)	Structural Support	Lubrite	Air - Indoor, Uncontrolled	Loss of Mechanical Function	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.2.TP-45	3.5.1-75	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for ASME Class 2 and 3 Piping and Components (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.2.T-24	3.5.1-91	A
			Water - Flowing	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.A6.TP-221	3.5.1-83	E, 2
		Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.2.TP-226	3.5.1-81	A
				Loss of Preload	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.2.TP-229	3.5.1-87	A
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B1.2.TP-8	3.5.1-95	A
Supports for ASME Class MC Components (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support	Grout	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B1.3.TP-42	3.5.1-55	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B1.3.TP-42	3.5.1-55	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for ASME Class MC Components (Constant and variable load spring hangers; guides; stops)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.3.T-24	3.5.1-91	A
				Loss of Mechanical Function	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.3.T-28	3.5.1-57	A
		Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.3.TP-226	3.5.1-81	A
				Loss of Preload	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.3.TP-229	3.5.1-87	A
Supports for ASME Class MC Components (Sliding Surfaces)	Structural Support	Lubrite	Air - Indoor, Uncontrolled	Loss of Mechanical Function	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.3.TP-45	3.5.1-75	A
Supports for ASME Class MC Components (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.3.T-24	3.5.1-91	A
		Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.3.TP-226	3.5.1-81	A
				Loss of Preload	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.3.TP-229	3.5.1-87	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for Cable Trays, Conduit, HVAC Ducts, Tube Track, Instrument Tubing, Non-ASME Piping and Components (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support	Grout	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B2.TP-42	3.5.1-55	A
			Air - Outdoor	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B2.TP-42	3.5.1-55	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B2.TP-42	3.5.1-55	A
			Air - Outdoor	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B2.TP-42	3.5.1-55	A
Supports for Cable Trays, Conduit, HVAC Ducts, Tube Track, Instrument Tubing, Non-ASME Piping and Components (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-43	3.5.1-92	A
		Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-248	3.5.1-80	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for Cable Trays, Conduit, HVAC Ducts, Tube Track, Instrument Tubing, Non-ASME Piping and Components (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.B2.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.B2.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.B2.TP-261	3.5.1-88	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-43	3.5.1-92	A
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for Emergency Diesel Generator, HVAC System Components, and Other Miscellaneous Mechanical Equipment (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support	Grout	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B4.TP-42	3.5.1-55	A
			Air - Outdoor	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B4.TP-42	3.5.1-55	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B4.TP-42	3.5.1-55	A
			Air - Outdoor	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B4.TP-42	3.5.1-55	A
Supports for Emergency Diesel Generator, HVAC System Components, and Other Miscellaneous Mechanical Equipment (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for Emergency Diesel Generator, HVAC System Components, and Other Miscellaneous Mechanical Equipment (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.B4.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.B4.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.B4.TP-261	3.5.1-88	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B4.TP-8	3.5.1-95	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	A
	Vibration Isolation	Elastomer	Air - Indoor, Uncontrolled	Reduction or Loss of Isolation Function	Structures Monitoring (B.2.1.34)	III.B4.TP-44	3.5.1-94	E, 1

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for Platforms, Jet Impingement Shields, Masonry Walls, and Other Miscellaneous Structures (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support	Grout	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B5.TP-42	3.5.1-55	A
			Air - Outdoor	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B5.TP-42	3.5.1-55	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B5.TP-42	3.5.1-55	A
			Air - Outdoor	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B5.TP-42	3.5.1-55	A
Supports for Platforms, Jet Impingement Shields, Masonry Walls, and Other Miscellaneous Structures (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B5.TP-43	3.5.1-92	A
		Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B5.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.B5.TP-261	3.5.1-88	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for Platforms, Jet Impingement Shields, Masonry Walls, and Other Miscellaneous Structures (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.B5.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B5.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.B5.TP-261	3.5.1-88	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B5.TP-43	3.5.1-92	A
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Supports for Racks, Panels, Cabinets, and Enclosures for Electrical Equipment and Instrumentation (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support	Grout	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B3.TP-42	3.5.1-55	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for Racks, Panels, Cabinets, and Enclosures for Electrical Equipment and Instrumentation (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates)	Structural Support	Grout	Air - Outdoor	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B3.TP-42	3.5.1-55	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B3.TP-42	3.5.1-55	A
			Air - Outdoor	Reduction in Concrete Anchor Capacity	Structures Monitoring (B.2.1.34)	III.B3.TP-42	3.5.1-55	A
Supports for Racks, Panels, Cabinets, and Enclosures for Electrical Equipment and Instrumentation (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B3.TP-43	3.5.1-92	A
		Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.B3.TP-261	3.5.1-88	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Supports for Racks, Panels, Cabinets, and Enclosures for Electrical Equipment and Instrumentation (Support members; welds; bolted connections; support anchorage to building structure)	Structural Support	Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.B3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.B3.TP-261	3.5.1-88	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B3.TP-8	3.5.1-95	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B3.TP-43	3.5.1-92	A

Table 3.5.2-2 Component Supports Commodity Group (Continued)

Notes	Definition of Note
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:

1. HVAC component supports are not included in the ASME Section XI, Subsection IWF Program. . The Structures Monitoring program will be substituted to manage reduction or loss of isolation function of elastomer vibration isolation elements of the HVAC component support.
2. These component supports are not included in the Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program. The ASME Section XI, Subsection IWF Program will be substituted.

Table 3.5.2-3
Control Building
Summary of Aging Management Evaluation

Table 3.5.2-3 Control Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A1.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A1.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A1.TP-261	3.5.1-88	A
				None	None	III.B5.TP-8	3.5.1-95	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A1.TP-261	3.5.1-88	A
Concrete Elements (Missile Barrier)	Missile Barrier	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A1.TP-24	3.5.1-63	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-248	3.5.1-80	A

Table 3.5.2-3 Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A1.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A1.TP-261	3.5.1-88	A
Concrete Elements: Curbs	Direct Flow	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-26	3.5.1-66	A
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-302	3.5.1-77	A
Concrete: Above-grade exterior (accessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A1.TP-24	3.5.1-63	A
Concrete: Above-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A

Table 3.5.2-3 Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Above-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Outdoor	Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-108	3.5.1-42	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A1.TP-67	3.5.1-47	A
Concrete: All (accessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-25	3.5.1-54	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-204	3.5.1-43	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-204	3.5.1-43	A
			Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A1.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-204	3.5.1-43	A
Concrete: Below-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Pressure Barrier Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-212	3.5.1-65	A

Table 3.5.2-3 Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Below-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Pressure Barrier Structural Support	Reinforced concrete	Groundwater/Soil	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-108	3.5.1-42	A, 2
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A1.TP-67	3.5.1-47	A
Concrete: Foundation (inaccessible)	Flood Barrier Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A1.TP-108	3.5.1-42	A, 2
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A1.TP-67	3.5.1-47	A
Concrete: Interior	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-26	3.5.1-66	A

Table 3.5.2-3 Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Equipment supports and foundations	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-26	3.5.1-66	A
Hatches/Plugs	Shelter/Protection Shielding Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A1.TP-26	3.5.1-66	A
Masonry walls: Interior	Shelter/Protection Shielding Structural Support	Concrete Block	Air - Indoor, Uncontrolled	Cracking	Masonry Walls (B.2.1.33)	III.A1.T-12	3.5.1-70	A
Sliding Surfaces	Structural Support	Carbon Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-302	3.5.1-77	A
				Loss of Mechanical Function	Structures Monitoring (B.2.1.34)	III.B1.3.T-28	3.5.1-57	E, 1
Steel Components (Containment Access Walkway)	Structural Support	Carbon Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-302	3.5.1-77	A
Steel Components (Missile Barrier)	Missile Barrier	Carbon Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-302	3.5.1-77	A
Steel Components: Structural Steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-302	3.5.1-77	A
Structural Miscellaneous- Ceiling Panel Supports	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-302	3.5.1-77	A
Structural Miscellaneous- Siding	Shelter/Protection	Carbon Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-302	3.5.1-77	A
Structural Miscellaneous- vent	Shelter/Protection	Carbon Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A1.TP-302	3.5.1-77	A

Table 3.5.2-3 Control Building (Continued)

Notes	Definition of Note
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:

1. The sliding supports and bearings for the steel beams that are part of primary containment personnel access walkway do not use Lubrite or similar material but are instead steel to steel connections. The Structures Monitoring (B.2.1.34) Program is substituted to manage the aging effects for steel to steel surfaces consistent with the management of Lubrite surfaces.
2. Loss of Material and Cracking of inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment subject to the freeze-thaw outdoor air temperature cycles above the frost line will be managed by the Structures Monitoring (B.2.1.34) Program.

Table 3.5.2-4
Cooling Lake
Summary of Aging Management Evaluation

Table 3.5.2-4 Cooling Lake

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: All (accessible)	Direct Flow Structural Support	Reinforced concrete	Water - Flowing	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Direct Flow Structural Support	Reinforced concrete	Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A6.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A6.TP-220	3.5.1-50	A
Concrete: Below-grade exterior (accessible)	Direct Flow Structural Support	Reinforced concrete	Water - Flowing	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	H, 1
				Increase in Porosity and Permeability, Loss of Strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-37	3.5.1-61	A
				Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.T-20	3.5.1-56	A
Concrete: Below-grade exterior (inaccessible)	Direct Flow Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-107	3.5.1-67	A

Table 3.5.2-4 Cooling Lake (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Earthen water-control structures: Embankments (dikes)	Direct Flow Water Retaining Boundary	Soil, rip-rap, gravel, rock	Water - Flowing	Loss of Material; Loss of Form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.T-22	3.5.1-58	A
			Water - Standing	Loss of Material; Loss of Form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.T-22	3.5.1-58	A

Table 3.5.2-4 Cooling Lake (Continued)

Notes	Definition of Note
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:

1. The aging effect of Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling) due to Corrosion of Embedded Steel is included in the Water - Flowing environment because Water - Flowing is the only environment for this component.

Table 3.5.2-5
Diesel Generator Building
Summary of Aging Management Evaluation

Table 3.5.2-5 Diesel Generator Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Curbs	Direct Flow	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A

Table 3.5.2-5 Diesel Generator Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Concrete: Above-grade exterior (accessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A
Concrete: Above-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: All (accessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A

Table 3.5.2-5 Diesel Generator Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A3.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
Concrete: Below-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: Foundation (inaccessible)	Flood Barrier Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A

Table 3.5.2-5 Diesel Generator Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Interior	Shelter/Protection Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Equipment supports and foundations	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Hatches/Plugs	Shelter/Protection Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Masonry walls: Interior	Shelter/Protection Structural Support	Concrete Block	Air - Indoor, Uncontrolled	Cracking	Masonry Walls (B.2.1.33)	III.A3.T-12	3.5.1-70	A
Steel components: structural steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Structural Miscellaneous-vent (HVAC Vent Stack)	Missile Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A

Table 3.5.2-5 Diesel Generator Building (Continued)

Notes	Definition of Note
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:

1. Loss of Material and Cracking of inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment subject to the freeze-thaw outdoor air temperature cycles above the frost line will be managed by the Structures Monitoring (B.2.1.34) Program.

Table 3.5.2-6
Fuel Building
Summary of Aging Management Evaluation

Table 3.5.2-6 Fuel Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A5.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A5.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A5.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A5.TP-261	3.5.1-88	A
		Stainless Steel Bolting	Treated Water	Loss of Material	Water Chemistry (B.2.1.2)	III.B1.2.TP-232	3.5.1-85	B, 1
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A5.TP-261	3.5.1-88	A
Concrete Elements (Missile Barrier)	Missile Barrier	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A5.TP-24	3.5.1-63	A

Table 3.5.2-6 Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A5.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A5.TP-261	3.5.1-88	A
Concrete Elements: Curbs	Direct Flow	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-26	3.5.1-66	A
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Concrete: Above-grade exterior (accessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A5.TP-24	3.5.1-63	A

Table 3.5.2-6 Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Above-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-108	3.5.1-42	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A5.TP-67	3.5.1-47	A
Concrete: All (accessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-25	3.5.1-54	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-204	3.5.1-43	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-204	3.5.1-43	A
			Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A5.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-204	3.5.1-43	A
Concrete: Below-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Pressure Barrier Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-212	3.5.1-65	A

Table 3.5.2-6 Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Below-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Pressure Barrier Structural Support	Reinforced concrete	Groundwater/Soil	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-108	3.5.1-42	A, 2
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A5.TP-67	3.5.1-47	A
Concrete: Foundation (inaccessible)	Flood Barrier Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-108	3.5.1-42	A, 2
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A5.TP-67	3.5.1-47	A
Concrete: Interior	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-26	3.5.1-66	A

Table 3.5.2-6 Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Equipment supports and foundations	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-26	3.5.1-66	A
Hatches/Plugs	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-302	3.5.1-77	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-26	3.5.1-66	A
			Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A5.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A5.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A5.TP-24	3.5.1-63	A
Masonry walls: Interior	Shelter/Protection Shielding Structural Support	Concrete Block	Air - Indoor, Uncontrolled	Cracking	Masonry Walls (B.2.1.33)	III.A5.T-12	3.5.1-70	A
Spent fuel pool gates	Water retaining boundary	Stainless Steel	Treated Water	Loss of Material	Water Chemistry (B.2.1.2)	III.A5.T-14	3.5.1-78	D, 1
Spent fuel pool gates (Gate Seals)	Water retaining boundary	Elastomer	Treated Water	Hardening and Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25)	VII.A4.AP-101	3.3.1-86	A

Table 3.5.2-6 Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Steel Components (missile barrier)	Missile Barrier	Carbon Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-302	3.5.1-77	A
Steel components: structural steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Steel elements: liner, liner anchors, integral attachments (Fuel Pool Liner)	Water retaining boundary	Stainless Steel	Treated Water	Loss of Material	Water Chemistry (B.2.1.2)	III.A5.T-14	3.5.1-78	B, 1
Structural Miscellaneous - Siding (Gas Control Boundary)	Shelter/Protection Structural Pressure Barrier	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
Structural Miscellaneous - Siding (Railroad Bay)	Shelter/Protection Structural Pressure Barrier	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C

Table 3.5.2-6 Fuel Building (Continued)

Notes	Definition of Note
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:

1. The spent fuel pool water level and chemistry are monitored in accordance with Technical Specifications. Leakage from the spent fuel pool is monitored in accordance with procedures. Therefore, the One-Time Inspection (B.2.1.21) program is not required with the Water Chemistry (B.2.1.2) program for this component type.
2. Loss of Material and Cracking of inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment subject to the freeze-thaw outdoor air temperature cycles above the frost line will be managed by the Structures Monitoring (B.2.1.34) Program.

Table 3.5.2-7
Insulation Commodities Group
Summary of Aging Management Evaluation

Table 3.5.2-7 Insulation Commodities Group

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Insulation - Thermal	Thermal Insulation	Fiberglass	Air - Indoor, Uncontrolled	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.I.S-403	3.4.1-64	A
			Air - Outdoor	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.I.S-403	3.4.1-64	A
		Stainless Steel	Air - Indoor, Uncontrolled	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.I.S-403	3.4.1-64	F, 1
Insulation Jacketing - Thermal (includes Clamps, Bands, and Fasteners)	Thermal Insulation Jacket Integrity	Aluminum	Air - Indoor, Uncontrolled	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.I.S-403	3.4.1-64	F, 1
			Air - Outdoor	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.I.S-403	3.4.1-64	F, 1
		Stainless Steel	Air - Indoor, Uncontrolled	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.I.S-403	3.4.1-64	F, 1
			Air - Outdoor	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B.2.1.24)	VIII.I.S-403	3.4.1-64	F, 1

Table 3.5.2-7 Insulation Commodities Group (Continued)

Notes	Definition of Note
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:

1. The External Surfaces Monitoring of Mechanical Components (B.2.1.24) aging management program will be used to manage the aging effect of Reduced Thermal Insulation Resistance due to Moisture Intrusion for the associated insulation materials (i.e., Aluminum, Stainless Steel) listed with Insulation Thermal and Insulation Jacketing component types which are not found in NUREG-1801.

Table 3.5.2-8
Primary Containment
Summary of Aging Management Evaluation

Table 3.5.2-8 Primary Containment

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Containment Closure)	Structural Pressure Barrier Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-148	3.5.1-31	A
				Loss of Preload	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-150	3.5.1-30	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-150	3.5.1-30	A
Bolting (Drywell Closure)	Structural Pressure Barrier Structural Support	Stainless Steel Bolting	Treated Water	Loss of Material	One-Time Inspection (B.2.1.21)	III.B1.3.TP-232	3.5.1-84	E, 2
					Water Chemistry (B.2.1.2)	III.B1.3.TP-232	3.5.1-84	E, 2
				Loss of Preload	Bolting Integrity (B.2.1.11)	V.E.EP-122	3.2.1-15	A
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A4.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A4.TP-261	3.5.1-88	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A4.TP-261	3.5.1-88	A

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Curbs	Direct Flow	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A4.TP-26	3.5.1-66	A
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A
Concrete: Dome; wall; basemat; reinforcing steel (accessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B.2.1.30)	II.B3.2.CP-88	3.5.1-21	A
				Cracking	ASME Section XI, Subsection IWL (B.2.1.30)	II.B3.2.CP-60	3.5.1-19	A
Concrete: Dome; wall; basemat; reinforcing steel (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B.2.1.30)	II.B3.2.CP-89	3.5.1-23	A
				Cracking	ASME Section XI, Subsection IWL (B.2.1.30)	II.B3.2.CP-121	3.5.1-12	A
			Groundwater/Soil	Cracking and Distortion	ASME Section XI, Subsection IWL (B.2.1.30)	II.B3.2.CP-105	3.5.1-1	A
				Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B.2.1.30)	III.A3.TP-212	3.5.1-65	E, 1
				Cracking	ASME Section XI, Subsection IWL (B.2.1.30)	II.B3.2.CP-121	3.5.1-12	A

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Dome; wall; basemat; reinforcing steel (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Reinforced concrete	Groundwater/Soil	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B.2.1.30)	II.B3.2.CP-73	3.5.1-24	A
			Water - Flowing	Cracking	ASME Section XI, Subsection IWL (B.2.1.30)	II.B3.2.CP-121	3.5.1-12	A
				Increase in Porosity and Permeability, Loss of Strength	ASME Section XI, Subsection IWL (B.2.1.30)	II.B3.2.CP-122	3.5.1-13	A
Concrete: Interior (Containment Pool)	Shielding Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A4.TP-26	3.5.1-66	A
Concrete: Interior (Drywell)	HELB/MELB Shielding Shelter/Protection Structural Pressure Barrier Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A4.TP-26	3.5.1-66	A
Concrete: Interior (Reactor Pedestal)	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A4.TP-26	3.5.1-66	A
Concrete: Interior (Reactor Shield Wall)	HELB/MELB Shielding Shielding Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Interior (Reactor Shield Wall)	HELB/MELB Shielding Shielding Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A4.TP-26	3.5.1-66	A
Concrete: Interior (Suppression Pool and Weir Wall)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A4.TP-26	3.5.1-66	A
Concrete: Interior (accessible)	Missile Barrier Shelter/Protection Shielding Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A4.TP-26	3.5.1-66	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A4.TP-25	3.5.1-54	A
Concrete: Interior (inaccessible)	Missile Barrier Shelter/Protection Shielding Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A4.TP-204	3.5.1-43	A
Containment Liner (accessible)	Structural Pressure Barrier Structural Support	Carbon Steel; dissimilar metal welds	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B2.2.C-48	3.5.1-9	A, 7
				Loss of Material	10 CFR Part 50, Appendix J (B.2.1.32)	II.B3.2.CP-35	3.5.1-35	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B3.2.CP-35	3.5.1-35	A
		Stainless Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B2.2.C-48	3.5.1-9	A, 7
			Treated Water	Cumulative Fatigue Damage	TLAA	II.B2.2.C-48	3.5.1-9	A, 7

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Containment Liner (accessible)	Structural Pressure Barrier Structural Support	Stainless Steel	Treated Water	Loss of Material	10 CFR Part 50, Appendix J (B.2.1.32)	II.B2.2.C-49	3.5.1-37	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B2.2.C-49	3.5.1-37	A
Containment Liner (inaccessible)	Structural Pressure Barrier Structural Support	Carbon Steel; dissimilar metal welds	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B2.2.C-48	3.5.1-9	A, 7
				Loss of Material	10 CFR Part 50, Appendix J (B.2.1.32)	II.B3.2.CP-98	3.5.1-5	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B3.2.CP-98	3.5.1-5	A
					TLAA	II.B3.2.CP-98	3.5.1-5	E, 8
		Stainless Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B2.2.C-48	3.5.1-9	A, 7
			Treated Water	Cumulative Fatigue Damage	TLAA	II.B2.2.C-48	3.5.1-9	A, 7
				Loss of Material	10 CFR Part 50, Appendix J (B.2.1.32)	II.B2.2.C-49	3.5.1-37	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B2.2.C-49	3.5.1-37	A
Equipment supports and foundations	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A4.TP-26	3.5.1-66	A
Hatches/Plugs	Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Hatches/Plugs	Missile Barrier Shelter/Protection Shielding Structural Pressure Barrier	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A4.TP-26	3.5.1-66	A
Masonry walls: Interior	Shielding Structural Support	Concrete Block	Air - Indoor, Uncontrolled	Cracking	Masonry Walls (B.2.1.33)	III.A3.T-12	3.5.1-70	A
Penetration - Containment Electrical	Shelter/Protection Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
				Loss of Material	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-36	3.5.1-35	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-36	3.5.1-35	A
		Elastomer	Air - Indoor, Uncontrolled	Various Aging Effects	TLAA	VI.B.L-05	3.6.1-1	A, 5
		Stainless Steel; Dissimilar metal welds	Air - Indoor, Uncontrolled	Cracking	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-38	3.5.1-10	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-38	3.5.1-10	A
				Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
Penetration - Containment Mechanical	Shelter/Protection Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
				Loss of Material	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-36	3.5.1-35	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-36	3.5.1-35	A

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Penetration - Containment Mechanical	Shelter/Protection Structural Pressure Barrier Structural Support	Stainless Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
			Treated Water	Loss of Material	10 CFR Part 50, Appendix J (B.2.1.32)	II.B2.2.C-49	3.5.1-37	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B2.2.C-49	3.5.1-37	A
		Stainless Steel; Dissimilar metal welds	Air - Indoor, Uncontrolled	Cracking	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-38	3.5.1-10	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-38	3.5.1-10	A
				Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
Penetration - Drywell Electrical	Shelter/Protection Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A
Penetration - Drywell Mechanical	Expansion/ Separation	Stainless Steel; dissimilar metal welds	Air - Indoor, Uncontrolled	Cracking	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-38	3.5.1-10	A, 6
				Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
	Shelter/Protection Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
				Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.T-24	3.5.1-91	A
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Penetration - Drywell Mechanical	Shelter/Protection Structural Pressure Barrier Structural Support	Stainless Steel	Treated Water	Loss of Material	ASME Section XI, Subsection IWF (B.2.1.31)	III.B1.1.TP-10	3.5.1-90	A
					Water Chemistry (B.2.1.2)	III.B1.1.TP-10	3.5.1-90	B
Personnel airlock, equipment hatch (Containment)	Shelter/Protection Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
				Loss of Material	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.C-16	3.5.1-28	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.C-16	3.5.1-28	A
Personnel airlock, equipment hatch (Drywell)	Shelter/Protection Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
				Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A
Personnel airlock, equipment hatch: Locks, hinges, and closure mechanisms	Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Leak tightness	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-39	3.5.1-29	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-39	3.5.1-29	A
Pipe Whip Restraints and Jet Impingement Shields	Pipe Whip Restraint HELB/MELB Shielding	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Seals, gaskets (caulking, flashing and other sealants)	Shelter/Protection Water Retaining Boundary	Elastomer	Air - Indoor, Uncontrolled	Loss of Sealing	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-41	3.5.1-33	A, 3
Service Level I Coatings	Maintain Adhesion	Coatings	Air - Indoor, Uncontrolled	Loss of Coating or Lining Integrity	Protective Coating Monitoring and Maintenance Program (B.2.1.36)	II.B4.CP-152	3.5.1-34	A
Sliding Surfaces	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Mechanical Function	Structures Monitoring (B.2.1.34)	III.B1.3.T-28	3.5.1-57	E, 10
Steel Components (Containment Pool Gates)	Water retaining boundary	Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
			Treated Water	Loss of Material	Water Chemistry (B.2.1.2)	III.A5.T-14	3.5.1-78	D, 4
Steel Components (Drywell Head Including Support Ring)	HELB/MELB Shielding Shelter/Protection Structural Pressure Boundary Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A
		Stainless Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
			Treated Water	Loss of Material	Water Chemistry (B.2.1.2)	III.A5.T-14	3.5.1-78	D, 4
Steel Components (Inclined Fuel Transfer Tube Penetration Including Bellows)	Expansion/ Separation	Stainless Steel	Air – Indoor, Uncontrolled	Cracking	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-38	3.5.1-10	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-38	3.5.1-10	A
				Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Steel Components (Inclined Fuel Transfer Tube Penetration Including Bellows)	Shelter/Protection Structural Pressure Barrier Structural Support	Carbon Steel; dissimilar metal welds	Air – Indoor, Uncontrolled	Cracking	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-38	3.5.1-10	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-38	3.5.1-10	A
				Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
				Loss of Material	10 CFR Part 50, Appendix J (B.2.1.32)	II.B4.CP-36	3.5.1-35	A
					ASME Section XI, Subsection IWE (B.2.1.29)	II.B4.CP-36	3.5.1-35	A
Steel Components (Reactor Pedestal Ring Girder)	Structural Support	Carbon Steel	Air – Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A
Steel Components (Refueling Bellows)	Expansion/ Separation Water Retaining Boundary	Stainless Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 7
Steel Components (Refueling Bulkhead)	Water retaining boundary	Stainless Steel	Air - Indoor, Uncontrolled	Cumulative Fatigue Damage	TLAA	II.B4.C-13	3.5.1-9	A, 9
Steel Components: structural steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-302	3.5.1-77	A
Steel Elements: liner, liner anchors, integral attachments (Containment Pool)	Shelter/Protection Structural Support Water Retaining Boundary	Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
			Treated Water	Loss of Material	Water Chemistry (B.2.1.2)	III.A5.T-14	3.5.1-78	D, 4

Table 3.5.2-8 Primary Containment (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Steel Elements: liner, liner anchors, integral attachments (Drywell)	Shelter/Protection Structural Pressure Barrier Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A5.TP-302	3.5.1-77	A
		Steel with Stainless Steel Cladding	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
			Treated Water	Loss of Material	Water Chemistry (B.2.1.2)	III.A5.T-14	3.5.1-78	D, 4
Steel Elements: liner, liner anchors, integral attachments (Weir Wall)	Shelter/Protection Structural Support Water Retaining Boundary	Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
			Treated Water	Loss of Material	Water Chemistry (B.2.1.2)	III.A5.T-14	3.5.1-78	D, 4
Structural Miscellaneous - Siding (Gas Control Boundary)	Shelter/Protection Structural Pressure Barrier	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	C

Table 3.5.2-8 Primary Containment (Continued)

Notes	Definition of Note
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:

1. In accordance with SLR-ISG-2021-STRUCTURES, the ASME Section XI, Subsection IWL (B.2.1.30) program will be used to manage cracking, loss of bond, and loss of material for the inaccessible portions of the containment basemat in a groundwater/soil environment.
2. Loss of material for the stainless steel drywell head closure bolts will be managed by the Water Chemistry (B.2.1.2) and One-Time Inspection (B.2.1.21) programs. Because the drywell head is not a primary containment boundary at Clinton, the One-Time Inspection program will be substituted to confirm that the Water Chemistry program is effectively managing loss of material of the stainless steel closure bolts in a treated water environment.
3. The containment liner does not have a moisture barrier. These seals are associated with penetrations (O-rings).
4. The suppression pool and containment pool water chemistry, level, and leakage are monitored in accordance with plant procedures. The One-Time Inspection (B.2.1.21) program is not required to confirm the effectiveness of the Water Chemistry (B.2.1.2) program to manage these stainless steel components exposed to treated water in the suppression pool and containment pool.
5. The TLAA designation in the Aging Management Programs column indicates fatigue of this component is evaluated in Section 4.4.

Table 3.5.2-8 Primary Containment (Continued)

Plant Specific Notes: (continued)

6. Clinton Power Station has a Mark III primary containment design. The drywell is not a primary containment boundary. The 10 CFR Part 50, Appendix J (B.2.1.32) program is used to manage cracking of drywell penetration stainless steel guard pipe bellows and associated dissimilar metal welds in an air-indoor uncontrolled environment.
7. The TLAA designation in the Aging Management Programs column indicates fatigue of this component is evaluated in Section 4.6.
8. The TLAA designation in the Aging Management Programs column indicates corrosion of this component is evaluated in Section 4.6.
9. The TLAA designation in the Aging Management Programs column indicates cracking of this component is evaluated in Section 4.7.
10. The Structures Monitoring (B.2.1.34) Program is substituted to manage the aging effects of steel to steel sliding surfaces.

Table 3.5.2-9
Radwaste Building
Summary of Aging Management Evaluation

Table 3.5.2-9 Radwaste Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Curbs	Direct Flow	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A

Table 3.5.2-9 Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Concrete: Above-grade exterior (accessible)	Flood Barrier Shelter/Protection Shielding Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A
Concrete: Above-grade exterior (inaccessible)	Flood Barrier Shelter/Protection Shielding Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: All (accessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A

Table 3.5.2-9 Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A3.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
Concrete: Below-grade exterior (inaccessible)	Flood Barrier Shelter/Protection Structural Support Water Retaining Boundary	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: Foundation (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Support Water Retaining Boundary	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A

Table 3.5.2-9 Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Foundation (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Shielding Structural Support Water Retaining Boundary	Reinforced concrete	Groundwater/Soil	Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: Interior	Flood Barrier Shelter/Protection Shielding Structural Support Water Retaining Boundary	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Equipment supports and foundations	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Hatches/Plugs	Shelter/Protection Shielding Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
			Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A

Table 3.5.2-9 Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Hatches/Plugs	Shelter/Protection Shielding Structural Support	Reinforced concrete	Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A
Masonry walls: Above-grade exterior	Shelter/Protection Shielding Structural Support	Concrete Block	Air - Outdoor	Cracking	Masonry Walls (B.2.1.33)	III.A3.T-12	3.5.1-70	A
				Loss of Material (Spalling, Scaling) and Cracking	Masonry Walls (B.2.1.33)	III.A5.TP-34	3.5.1-71	A
Masonry walls: Interior	Shelter/Protection Shielding Structural Support	Concrete Block	Air - Indoor, Uncontrolled	Cracking	Masonry Walls (B.2.1.33)	III.A3.T-12	3.5.1-70	A
Steel components: structural steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A

Table 3.5.2-9 Radwaste Building (Continued)

Notes	Definition of Note
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:

1. Loss of Material and Cracking of inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment subject to the freeze-thaw outdoor air temperature cycles above the frost line will be managed by the Structures Monitoring (B.2.1.34) Program.

Table 3.5.2-10
Screen House
Summary of Aging Management Evaluation

Table 3.5.2-10 Screen House

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A6.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A6.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Outdoor	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A6.TP-261	3.5.1-88	A
			Water - Flowing	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A6.TP-261	3.5.1-88	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	A

Table 3.5.2-10 Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A6.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A6.TP-261	3.5.1-88	A
Concrete Elements: Curbs	Direct Flow	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	A
				Loss of Material (Spalling, Scaling) and Cracking	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-36	3.5.1-60	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-37	3.5.1-61	A, 1
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
			Air - Outdoor	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	C
			Water - Flowing	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	C

Table 3.5.2-10 Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Above-grade exterior (accessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	A
				Loss of Material (Spalling, Scaling) and Cracking	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-36	3.5.1-60	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-37	3.5.1-61	A, 1
Concrete: All (accessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support Water retaining boundary	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Water - Flowing	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support Water retaining boundary	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A6.TP-220	3.5.1-50	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A6.TP-220	3.5.1-50	A

Table 3.5.2-10 Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: All (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support Water retaining boundary	Reinforced concrete	Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A6.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A6.TP-220	3.5.1-50	A
			Water - Flowing	Cracking	Structures Monitoring (B.2.1.34)	III.A6.TP-220	3.5.1-50	A
Concrete: Below-grade exterior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-107	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-110	3.5.1-49	A, 3
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A6.TP-109	3.5.1-51	A
Concrete: Foundation (accessible)	Flood Barrier Structural support Water retaining boundary	Reinforced concrete	Water - Flowing	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	H, 2

Table 3.5.2-10 Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Foundation (accessible)	Flood Barrier Structural support Water retaining boundary	Reinforced concrete	Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-37	3.5.1-61	A
				Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.T-20	3.5.1-56	A
Concrete: Foundation (inaccessible)	Flood Barrier Structural support Water retaining boundary	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-107	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-110	3.5.1-49	A, 3
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A6.TP-109	3.5.1-51	A
Concrete: Interior (accessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-37	3.5.1-61	A

Table 3.5.2-10 Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Interior (accessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Water - Flowing	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.T-20	3.5.1-56	A
Concrete: Interior (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A6.TP-109	3.5.1-51	A
Equipment supports and foundations	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	A
					Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
			Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-37	3.5.1-61	A
Hatches/Plugs	Missile Barrier Shelter/Protection Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A

Table 3.5.2-10 Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Hatches/Plugs	Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	A
			Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	A
				Loss of Material (Spalling, Scaling) and Cracking	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-36	3.5.1-60	A
Masonry walls: Above-grade exterior	Shelter/Protection Structural Support	Concrete Block	Air - Outdoor	Cracking	Masonry Walls (B.2.1.33)	III.A6.T-12	3.5.1-70	A
				Loss of Material (Spalling, Scaling) and Cracking	Masonry Walls (B.2.1.33)	III.A5.TP-34	3.5.1-71	A
Masonry walls: Interior	Shelter/Protection Structural Support	Concrete Block	Air - Indoor, Uncontrolled	Cracking	Masonry Walls (B.2.1.33)	III.A6.T-12	3.5.1-70	A
Precast Concrete - Beams and Panel (Roof slab)	Missile Barrier Shelter/Protection	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	A
			Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-38	3.5.1-59	A
				Loss of Material (Spalling, Scaling) and Cracking	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-36	3.5.1-60	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-37	3.5.1-61	A, 1

Table 3.5.2-10 Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Steel Components (Bar Grill)	Filter	Galvanized Steel	Air - Outdoor	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	C
			Water - Flowing	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	C
Steel components: structural steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Water - Flowing	Loss of Material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.1.35)	III.A6.TP-221	3.5.1-83	C
Structural Miscellaneous-Siding	Shelter/Protection	Carbon Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A

Table 3.5.2-10 Screen House (Continued)

Notes	Definition of Note
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:

1. The Water - Flowing environment for above-grade exterior environments is included due to the potential for rainwater to flow over or collect. Water velocities in rainwater will not exceed 4 fps; therefore, Loss of Material (spalling, scaling) due to Abrasion is not an aging effect requiring management for this material and environment combination.
2. The aging effect of Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling) due to Corrosion of Embedded Steel is included in the Water - Flowing environment because Water - Flowing is the only environment for this component, which is the submerged internal surface of the foundation.
3. This item is used to address inaccessible below grade reinforced concrete walls and foundations in a Groundwater/Soil environment that are also subject to the freeze-thaw outdoor air temperature cycles above the frost line.

Table 3.5.2-11
Structural Commodity Group
Summary of Aging Management Evaluation

Table 3.5.2-11 Structural Commodity Group

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
				None	None	III.B5.TP-8	3.5.1-95	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Cable Trays	Shelter/Protection Structural Support	Aluminum	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-6	3.5.1-93	C
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-6	3.5.1-93	C
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A

Table 3.5.2-11 Structural Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Conduit	Shelter/Protection Structural Support	Aluminum	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-6	3.5.1-93	C
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-6	3.5.1-93	C
Doors	Flood Barrier HELB/MELB Shielding Shelter Protection Structural Pressure Barrier	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	C
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-6	3.5.1-93	C
		Glass	Air - Indoor, Uncontrolled	None	None	VII.J.AP-14	3.3.1-117	C
			Air - Outdoor	None	None	VII.J.AP-167	3.3.1-117	C

Table 3.5.2-11 Structural Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Miscellaneous steel (catwalks, stairs, handrails, ladders, vents and louvers, platforms, etc.)	Missile Barrier Shielding Shelter/Protection Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	C
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-6	3.5.1-93	C
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	C
Panels, Racks, Cabinets, and Other Enclosures	Shelter/Protection Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	C
Penetration Seals	Flood Barrier HELB/MELB Shielding Shelter/Protection Shielding Structural Pressure Barrier Structural Support	Elastomer	Air - Indoor, Uncontrolled	Loss of Sealing	Structures Monitoring (B.2.1.34)	III.A6.TP-7	3.5.1-72	A
			Air - Outdoor	Loss of Sealing	Structures Monitoring (B.2.1.34)	III.A6.TP-7	3.5.1-72	A
			Groundwater/Soil	Loss of Sealing	Structures Monitoring (B.2.1.34)	III.A6.TP-7	3.5.1-72	A

Table 3.5.2-11 Structural Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Penetration Sleeves	Flood Barrier HELB/MELB Shielding Shelter/Protection Shielding Structural Pressure Barrier Structural Support Water Retaining Boundary	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-43	3.5.1-92	C
			Groundwater/Soil	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-219	3.5.1-79	C
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	C
Roofing	Shelter/Protection	Elastomer	Air - Outdoor	Loss of Sealing	Structures Monitoring (B.2.1.34)	III.A6.TP-7	3.5.1-72	A
Seals, gaskets, and moisture barriers (caulking, flashing and other sealants)	Flood Barrier HELB/MELB Shielding Shelter/Protection Shielding Structural Pressure Barrier Structural Support Water Retaining Boundary	Elastomer	Air - Indoor, Uncontrolled	Loss of Sealing	Structures Monitoring (B.2.1.34)	III.A6.TP-7	3.5.1-72	A
			Air - Outdoor	Loss of Sealing	Structures Monitoring (B.2.1.34)	III.A6.TP-7	3.5.1-72	A

Table 3.5.2-11 Structural Commodity Group (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Seals, gaskets, and moisture barriers (caulking, flashing and other sealants)	Flood Barrier HELB/MELB Shielding Shelter/Protection Shielding Structural Pressure Barrier Structural Support Water Retaining Boundary	Elastomer	Groundwater/Soil	Loss of Sealing	Structures Monitoring (B.2.1.34)	III.A6.TP-7	3.5.1-72	A
Structural Miscellaneous (catwalks, grating, handrails, kick plates, ladders, manhole covers, platforms, stairs, etc)	Shelter/Protection Structural Support	Aluminum	Air - Indoor, Uncontrolled	None	None	III.B4.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	C
Tube Track	Shelter/Protection Structural Support	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B2.TP-6	3.5.1-93	C
		Stainless Steel	Air - Indoor, Uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	C

Table 3.5.2-11 Structural Commodity Group (Continued)

Notes	Definition of Note
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:

None.

Table 3.5.2-12
Switchyard Structures
Summary of Aging Management Evaluation

Table 3.5.2-12 Switchyard Structures

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A

Table 3.5.2-12 Switchyard Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Embedments	Structural Support	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Concrete: All (accessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A3.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
Concrete: Below-grade exterior (inaccessible)	Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: Foundation (accessible)	Shelter/Protection Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A

Table 3.5.2-12 Switchyard Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Foundation (accessible)	Shelter/Protection Structural Support	Reinforced concrete	Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A
Concrete: Foundation (inaccessible)	Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: Interior	Shelter/Protection Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Equipment supports and foundations (Including Transmission Tower Foundations)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
			Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A

Table 3.5.2-12 Switchyard Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Equipment supports and foundations (Including Transmission Tower Foundations)	Structural Support	Reinforced concrete	Groundwater/Soil	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Manholes, Handholes & Duct Banks	Missile Barrier Shelter/Protection	Ductile Cast Iron	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	C
		Galvanized Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	C
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	C
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	C
Steel components: structural steel (Transmission Towers)	Structural Support	Carbon Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A

Table 3.5.2-12 Switchyard Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Steel components: structural steel (Transmission Towers)	Structural Support	Galvanized Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	C
Steel components: structural steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Structural Miscellaneous-Siding	Shelter/Protection	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	C

Table 3.5.2-12 Switchyard Structures (Continued)

Notes	Definition of Note
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:

1. Loss of Material and Cracking of inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment subject to the freeze-thaw outdoor air temperature cycles above the frost line will be managed by the Structures Monitoring (B.2.1.34) Program.

Table 3.5.2-13

Tank Foundations and Dikes
Summary of Aging Management Evaluation

Table 3.5.2-13 Tank Foundations and Dikes

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	A
Concrete: All (accessible)	Structural Support	Reinforced concrete	Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A3.TP-30	3.5.1-44	A

Table 3.5.2-13 Tank Foundations and Dikes (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
Concrete: Foundation (accessible)	Shelter/Protection Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A
Concrete: Foundation (inaccessible)	Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Steel components: structural steel (RCIC Valve Enclosure)	Shelter/Protection	Galvanized Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	A

Table 3.5.2-13 Tank Foundations and Dikes (Continued)

Notes	Definition of Note
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:

1. Loss of Material and Cracking of inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment subject to the freeze-thaw outdoor air temperature cycles above the frost line will be managed by the Structures Monitoring (B.2.1.34) Program.

Table 3.5.2-14
Turbine Building
Summary of Aging Management Evaluation

Table 3.5.2-14 Turbine Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A4.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Curbs	Direct Flow	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A

Table 3.5.2-14 Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Concrete: Above-grade exterior (accessible)	Flood Barrier Shelter/Protection Shielding Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A
Concrete: Above-grade exterior (inaccessible)	Flood Barrier Shelter/Protection Shielding Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A6.TP-104	3.5.1-65	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: All (accessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A

Table 3.5.2-14 Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: All (inaccessible)	Structural Support	Reinforced concrete	Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A3.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
Concrete: Below-grade exterior (inaccessible)	Flood Barrier Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: Foundation (inaccessible)	Flood Barrier Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A

Table 3.5.2-14 Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Interior	Flood Barrier Shelter/Protection Shielding Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Equipment supports and foundations	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Hatches/Plugs	Shelter/Protection Shielding Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
			Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A
Masonry walls: Interior	Shelter/Protection Shielding Structural Support	Concrete Block	Air - Indoor, Uncontrolled	Cracking	Masonry Walls (B.2.1.33)	III.A3.T-12	3.5.1-70	A
Steel components: structural steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A

Table 3.5.2-14 Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Structural Miscellaneous-Siding	Shelter/Protection Pressure Relief	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	C

Table 3.5.2-14 Turbine Building (Continued)

Notes	Definition of Note
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:

1. Loss of Material and Cracking of inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment subject to the freeze-thaw outdoor air temperature cycles above the frost line will be managed by the Structures Monitoring (B.2.1.34) Program.

Table 3.5.2-15
Yard Structures
Summary of Aging Management Evaluation

Table 3.5.2-15 Yard Structures

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Bolting (Structural)	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
		Galvanized Bolting	Air - Indoor, Uncontrolled	Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Anchors	Structural Support	Carbon and Low Alloy Steel Bolting	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-248	3.5.1-80	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-274	3.5.1-82	A
				Loss of Preload	Structures Monitoring (B.2.1.34)	III.A3.TP-261	3.5.1-88	A
Concrete Elements: Embedments	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A

Table 3.5.2-15 Yard Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete Elements: Embedments	Structural Support	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Concrete: All (accessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
			Groundwater/Soil	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-25	3.5.1-54	A
Concrete: All (inaccessible)	Flood Barrier Missile Barrier Shelter/Protection Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Air - Outdoor	Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
			Groundwater/Soil	Cracking and Distortion	Structures Monitoring (B.2.1.34)	III.A3.TP-30	3.5.1-44	A
				Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-204	3.5.1-43	A
Concrete: Foundation (accessible)	Flood Barrier Shelter/Protection Structural Support	Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A

Table 3.5.2-15 Yard Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Concrete: Foundation (inaccessible)	Flood Barrier Shelter/Protection Structural Support	Reinforced concrete	Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-108	3.5.1-42	A, 1
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A
Concrete: Interior	Shelter/Protection Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Equipment supports and foundations	Structural Support	Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
Hatches/Plugs	Shelter/Protection Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Indoor, Uncontrolled	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
			Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-67	3.5.1-47	A

Table 3.5.2-15 Yard Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Manholes, Handholes & Duct Banks	Missile Barrier Shelter/Protection	Galvanized Steel	Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Reinforced concrete	Air - Outdoor	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-26	3.5.1-66	A
				Loss of Material (Spalling, Scaling) and Cracking	Structures Monitoring (B.2.1.34)	III.A3.TP-23	3.5.1-64	A
			Groundwater/Soil	Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-212	3.5.1-65	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B.2.1.34)	III.A3.TP-29	3.5.1-67	A
			Water - Flowing	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B.2.1.34)	III.A3.TP-24	3.5.1-63	A
Steel components: structural steel	Structural Support	Carbon Steel	Air - Indoor, Uncontrolled	Loss of Material	Structures Monitoring (B.2.1.34)	III.A3.TP-302	3.5.1-77	A
		Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Structural Miscellaneous - Siding	Shelter/Protection	Galvanized Steel	Air - Indoor, Uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
			Air - Outdoor	Loss of Material	Structures Monitoring (B.2.1.34)	III.B4.TP-6	3.5.1-93	C

Table 3.5.2-15 Yard Structures (Continued)

Notes	Definition of Note
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:

1. Loss of Material and Cracking of inaccessible reinforced concrete walls and foundations in a Groundwater/Soil environment subject to the freeze-thaw outdoor air temperature cycles above the frost line will be managed by the Structures Monitoring (B.2.1.34) Program.

3.6 AGING MANAGEMENT OF ELECTRICAL COMPONENTS

3.6.1 INTRODUCTION

This section provides the results of the aging management review for the electrical commodity groups identified in Section 2.5, Electrical, as being subject to aging management review. The electrical commodity groups, which are addressed in this section are described in the indicated sections.

- Cable Connections (Metallic Parts) (2.5.2.5.1)
- Electrical Penetrations (2.5.2.5.2)
- Fuse Holders (2.5.2.5.3)
- High Voltage Insulators (2.5.2.5.4)
- Insulation Material for Electrical Cables and Connections (2.5.2.5.5)
- Metal Enclosed Bus (2.5.2.5.6)
- Switchyard Bus and Connections, Transmission Conductors, and Transmission Connectors (2.5.2.5.7)

The electrical commodity groups which are addressed in this section are described in the indicated sections. Electrical Penetrations are not subject to their own aging management review in this section in that they are addressed 1) as a TLAA in the Environmental Qualification (EQ) of Electric Components (B.3.1.2) program and 2) in the primary containment aging management review.

3.6.2 RESULTS

The following tables summarize the results of the aging management review for Electrical Commodities.

Table 3.6.2-1 Electrical Commodities - Summary of Aging Management Evaluation

3.6.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.6.2.1.1 Cable Connections (Metallic Parts)

Materials

The materials of construction for the Cable Connections (Metallic Parts) are:

- Various Metals Used for Electrical Contacts

Environments

The Cable Connections (Metallic Parts) are exposed to the following environments:

- Air - Indoor, Uncontrolled
- Air - Outdoor

Aging Effect Requiring Management

The following aging effect associated with the Cable Connections (Metallic Parts) components requires management:

- Increased Resistance of Connection

Aging Management Program

The following aging management program manages the aging effects for the Cable Connections (Metallic Parts):

- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.41)

3.6.2.1.2 Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements

Materials

The materials of construction for the Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements are:

- Various Metallic Materials
- Various Polymeric Materials

Environments

The Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements are exposed to the following environments:

- Adverse Localized Environment

Aging Effect Requiring Management

The following aging effect associated with the Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements requires management:

- Various Aging Effects

Aging Management Program

The following aging management program manages the aging effects for the Electrical Equipment Subject to 10 CFR 50.49 EQ Requirements:

- Environmental Qualification (EQ) of Electric Components (B.3.1.2)

3.6.2.1.3 <u>Fuse Holders</u>

Materials

The materials of construction for Fuse Holder components are:

- Bakelite
- Molded Polycarbonate

- Phenolic Melamine or Ceramic
- Other
- Various Metals Used for Electrical Connections

Environment

The Fuse Holders are exposed to the following environment:

- Air - Indoor, Uncontrolled

Aging Effects Requiring Management

The Fuse Holder components have no aging effects requiring management. See subsection 3.6.2.3.1 for further evaluation.

Aging Management Programs

Because there are no aging effects requiring management, no aging management programs are required for the Fuse Holder components.

3.6.2.1.4 High Voltage Insulators

Materials

The materials of construction for High Voltage Insulators are:

- Aluminum
- Aluminum Alloy
- Cement
- Fiberglass
- Galvanized Steel
- Malleable Iron
- Polymer
- Porcelain
- Silicone Rubber
- Toughened Glass

Environment

The High Voltage Insulators are exposed to the following environment:

- Air – Outdoor

Aging Effects Requiring Management

The High Voltage Insulators have no aging effects requiring management. See subsection 3.6.2.2.2 for further evaluation.

Aging Management Programs

Because there are no aging effects requiring management, no aging management programs are required for the High Voltage Insulators.

3.6.2.1.5 Insulation Material for Electrical Cables and Connections

The insulation material for electrical cables and connections commodity group was broken down for aging management review of insulation into subcategories based on categorization in NUREG-1801:

- Conductor Insulation for Inaccessible Power Cables Greater Than or Equal to 400V
- Insulation Material for Electrical Cables and Connections
- Insulation Material for Electrical Cables and Connections Used in Instrumentation Circuits

This insulation material commodity group includes insulated cables and connections, inaccessible switchyard cable bus, splices, electrical penetration pigtails, terminal blocks, and fuse holders.

Materials

The materials of construction for Insulation Material for Electrical Cables and Connections are:

- Various Organic Polymers

Environment

The Insulation Material for Electrical Cables and Connections are exposed to the following environment:

- Adverse Localized Environment

Aging Effect Requiring Management

The following aging effect associated with the Insulation Material for Electrical Cables and Connections requires management:

- Reduced Insulation Resistance

Aging Management Programs

The following aging management programs manage the aging effects for the Insulation Material for Electrical Cables and Connections:

- Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.39)

- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.37)

- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.1.38)

3.6.2.1.6 Metal Enclosed Bus

Materials

The materials of construction for the Metal Enclosed Bus are:

- Aluminum
- Elastomers
- Porcelain
- Thermo-plastic Organic Polymers
- Xenoy
- Various Metals Used for Electrical Bus and Connections

Environments

The Metal Enclosed Bus components are exposed to the following environments:

- Air – Indoor, Uncontrolled
- Air – Outdoor

Aging Effects Requiring Management

The following aging effects associated with the Metal Enclosed Bus require management:

- Increased Resistance of Connection
- Loss of Material
- Reduced Insulation Resistance
- Surface Cracking, Crazing, Scuffing, Dimensional Change, Shrinkage, Discoloration, Hardening and Loss of Strength

Aging Management Program

The following aging management program manages the aging effects for the Metal Enclosed Bus:

- Metal Enclosed Bus (B.2.1.40)

3.6.2.1.7 Switchyard Bus and Connections, Transmission Conductors, Transmission Connectors

Materials

The materials of construction for the Switchyard Bus and Connections, Transmission Conductors, and Transmission Connectors are:

- Aluminum
- Aluminum, Steel
- Bronze
- Copper
- Galvanized Steel
- Stainless Steel

Environment

The Switchyard Bus and Connections, Transmission Conductors, and Transmission Connectors are exposed to the following environment:

- Air - Outdoor

Aging Effects Requiring Management

The Switchyard Bus and Connections, Transmission Conductors, and Transmission Connectors have no aging effects requiring management. See Subsection 3.6.2.2.3 for further evaluation.

Aging Management Programs

Because there are no aging effects requiring management, no aging management programs are required for the Switchyard Bus and Connections, Transmission Conductors, and Transmission Connectors.

3.6.2.2 AMR Results for Which Further Evaluation is Recommended by the GALL Report

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the license renewal application. For the Electrical Commodities, those programs are addressed in the following subsections.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental qualification 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 this TLAA is addressed separately in Section 4.4, “Environmental Qualification (EQ) of Electrical Equipment,” of this SRP-LR.

The evaluation of this TLAA is addressed in Section 4.4, “Environmental Qualification (EQ) of Electric Components,” of this application.

3.6.2.2.2 Reduced Insulation Resistance due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear Caused by Wind Blowing on Transmission Conductors

Reduced insulation resistance due to presence of any salt deposits and surface contamination could occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP for plants located such that the potential exists for salt deposits or surface contamination (e.g., in the vicinity of *salt water bodies or industrial pollution). Loss of material due to mechanical wear caused by wind blowing on transmission conductors could occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

The high-voltage insulators evaluated for Clinton Power Station are those used to support in scope, uninsulated, high voltage electrical commodities such as transmission conductors and switchyard bus. The supported commodities are those credited for supplying power to in scope components and for recovery of offsite power following a station blackout event.

Clinton Power Station has both porcelain and polymer high-voltage insulators that are credited for supplying power to in scope components via the SBO recovery path. As noted in EPRI Report 3002010401 "Long-Term Operations: Subsequent License Renewal Electrical Handbook," (polymer not addressed in initial license renewal documentation) Section 10, notes that polymer high-voltage insulators have the same aging effects as porcelain HVIs with the additional effect of reduced insulation resistance (IR) due to polymer degradation. The reduced IR of the polymer HVIs could result from a buildup of surface contamination from airborne contaminants or degradation from thermal/thermo-oxidative degradation of organics, radiation-induced oxidation, and moisture intrusion. These specific aging effects will be evaluated later in this section.

<u>Salt Deposits and Surface Contamination</u>

Various airborne materials such as dust, salt, and industrial effluents can contaminate insulator surfaces. The buildup of surface contamination is gradual and in most areas such contamination is washed away by rain; the glazed insulator surface aids this contamination removal. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. Surface contamination can be a problem in areas where there are greater concentrations of airborne particles such as near facilities that discharge soot or near the seacoast where salt spray is prevalent.

Clinton Power Station is not located near a seacoast. It is located inland, in central Illinois, in Harp Township, DeWitt County approximately six miles east of the city of Clinton in east-central Illinois. Clinton Power Station with its associated approximately 4900-acre man-made cooling reservoir (Lake Clinton) is an irregular U-shaped site. Condenser cooling is provided by water taken from Lake Clinton which was formed by the construction of a dam downstream from the confluence of Salt Creek and the North Fork of Salt Creek. Clinton Power Station is located in an area where industrial airborne particle concentrations are comparatively low, since it is located in a rural area with no heavy industry nearby. Minor contamination is washed away by rainfall or snow, and cumulative build up has not been experienced and is not expected to occur.

Based on Clinton Power Station's location and confirmed by reviewing 10 years of operating experience it is concluded, surface contamination is not a significant aging effect for Clinton Power Station porcelain high-voltage insulators. Therefore, aging management activities for surface contamination of porcelain high-voltage insulators from dust, salt, and industrial effluents are not required for the period of extended operation.

Similar to porcelain high-voltage electrical insulators, various airborne contaminates such as dust, salt, or industrial effluent can contaminate polymer high-voltage electrical insulator surfaces leading to reduced insulation resistance. The buildup of surface contamination is gradual and, in most cases, removed by rainfall. The silicone rubber of the polymer high-voltage insulator is superior to porcelain due to its hydrophobic properties. Hydrophobicity is the surface property that causes a water drop to form a bead. Silicone rubber is naturally hydrophobic, has excellent resistance to UV, electrical aging, corona effect, and minimizes leakage currents on the surface of the insulator, all of which help polymer insulators perform well in contaminated environments. Silicone rubbers are characterized by having a low surface energy that results in highly hydrophobic surfaces. This property prevents the insulator surface from becoming completely wet, thereby suppressing leakage currents under contaminated conditions. Water deposited on the surface of the rubber cannot dissolve the encapsulated contamination thereby preventing the formation of a conductive film. The lightweight silicone chains in the rubber surface material impregnate the contaminant layer, making it hydrophobic as well which is what gives the silicone rubber superior contamination performance. Consequently, silicone rubber insulators can withstand high levels of contamination minimizing the potential aging effects from swelling of silicone rubber layer due to chemical contamination, sheath wetting caused by chemicals absorbed by oil from silicone rubber compound and chalking and crazing of the insulator surface resulting in contamination, arcing, and flash over.

Based on the properties of polymer high-voltage insulators and confirmed by reviewing 10 years of operating experience, it is concluded the rate of contamination buildup on polymer high-voltage electrical insulators is not significant enough to cause a loss of intended function during the PEO. Therefore, aging management activities for surface contamination of polymer high-voltage insulators from dust, salt, and industrial effluents are not required for the period of extended operation.

Mechanical Wear

Mechanical wear is an aging effect for strain and suspension insulators in that they are subject to movement. Movement can be caused by wind blowing the supported transmission conductor, causing it to swing from side to side. If this swinging is frequent enough, it could cause wear in the metal contact points of the insulator string and between an insulator and the supporting hardware. Although this mechanism is possible, experience has shown that the transmission conductors do not normally swing and that when they do, due to substantial wind, they do not continue to swing for very long once the wind has subsided.

Wind loading that can cause a transmission line insulator to sway is considered in the design and installation. Although rare, surface rust of the metallic cap may form where galvanizing is burnt off due to flashover from lightning strikes. Surface rust is not a significant concern and would not cause a loss of intended function if left unmanaged for the period of extended operation. Wear and surface rust have not been identified during routine switchyard inspections or review of the operating experience for the last 10 years.

Based on Clinton Power Station's design and confirmed by reviewing 10 year of operating experience, mechanical wear caused by wind blowing on transmission conductors is not significant enough to cause a loss of intended function. Therefore, aging management activities for loss of material due to mechanical wear is not required for the period of extended operation.

Conclusion

Aging management activities for Clinton Power Station high-voltage insulators are not required for the period of extended operation.

3.6.2.2.3 Loss of Material due to Wind-Induced Abrasion, Loss of Conductor Strength due to Corrosion, and Increased Resistance of Connection due to Oxidation or Loss of Pre-load

Loss of material due to wind-induced abrasion, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of pre-load could occur in transmission conductors and connections, and in switchyard bus and connections. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Table 3.6.1
- Item Number 3.6.1-4 – Transmission Conductors - Aluminum
- Item Number 3.6.1-5 – Transmission Connectors
- Item Number 3.6.1-6 – Switchyard Bus and Connections
- Item Number 3.6.1-7 - Transmission Conductors - ACSR

The switchyard bus and connections, transmission conductors, and transmission connectors evaluated for Clinton Power Station are those credited for supplying power to in scope components and for recovery of offsite power following a station blackout.

Wind-Induced Abrasion and Fatigue – Transmission Conductors

Transmission conductor vibration or sway could be caused by wind loading. Industry experience has shown that the transmission conductors do not normally swing significantly. When transmission conductors do swing due to a substantial wind, they do not continue to swing for very long once the wind has subsided. Wind loading that can cause a transmission line to vibrate or sway is considered in design and installation. Therefore, the loss of material aging effect that could result from wind-induced transmission conductor vibration or sway is not applicable and would not cause a loss of intended function for transmission conductors for the period of extended operation.

Corrosion – Transmission Conductors

The 138 kV transmission conductors in scope for license renewal at Clinton Power Station consist of 4/0 all aluminum alloy conductor (AAC) wire and includes the overhead portion from circuit switcher B018 to the high-side of the Emergency Reserve Auxiliary Transformer (ERAT). The 345-kV transmission conductors in scope for license renewal consist of 1113 MCM, 54/19, aluminum conductor steel reinforced (ACSR) conductors two (2) per phase and includes the overhead portion from circuit switcher 4538 to the high-side of Reserve Auxiliary Transformer (RAT) "B."

The 138 kV circuit has three 4/0 aluminum AAC transmission conductors that are aluminum. Because these conductors are aluminum, they are not subject to the aging effect of loss of conductor strength due to corrosion. Therefore, the aluminum transmission conductors between the ERAT and circuit switch B018 do not require aging management.

The 345KV circuit is 1113 MCM 54/19 ACSR transmission conductor which is a large, substantial transmission conductor. It is approximately 1.292 inches in diameter and is configured with 19 steel conductors wrapped by 54 aluminum conductors. The rated or ultimate strength per American Society for Testing and Materials (ASTM) standards and National Electric Safety Code (NESC) heavy load tension requirements of 1113 MCM ACSR are 39,100 lbs. and 23,460 lbs., respectively.

The Ameren Transmission and Distribution design practices follow the NESC methodologies. The NESC requires that tension on installed conductors be a maximum of 60 percent of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand heavy load requirements, which include consideration of ice, wind, and temperature.

The most prevalent contribution to loss of conductor strength of an ACSR transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. For ACSR conductors, degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend largely on air quality which includes suspended particles chemistry, sulfur dioxide (SO_2) concentration in air, precipitation, fog chemistry, and meteorological conditions.

Ontario Hydroelectric performed a study that is documented in 1992 IEEE Transactions on Power Delivery. The papers present the methodology and results of both field and laboratory tests on ACSR conductors from Ontario Hydro-electric's older transmission lines. The field tests were performed on-line, to detect steel core galvanizing loss by using an overhead line conductor corrosion detector. Potential conductor degradation is measured by an eddy current sensor that travels along the conductor, between transmission towers. Laboratory tests were performed for fatigue, tensile strength, torsional ductility, and electrical performance. The fatigue tests simulating 50 years of service life were performed to assess existing cables as well as a new cable. The tensile strength was assessed by the individual wire method, and torsional ductility was assessed by the twist to failure method. Both the tensile strength and torsional ductility tests were performed in accordance with published standards. Additional considerations in the performance of these aging assessments included metallurgical data and analysis for potential environmental contributors. Tests performed by Ontario Hydroelectric showed a 30 percent loss of composite conductor strength of an 80-year-old ACSR conductor due to corrosion. The Clinton Power Station in scope transmission conductors are the same type of transmission conductors evaluated in the Ontario Hydroelectric study analysis, and in the EPRI License Renewal Electrical Handbook. The test methodology as published in the IEEE Transactions on Power Delivery is applicable to in scope Clinton Power Station transmission conductors.

Clinton Power Station is located in an area where industrial airborne particle concentrations are comparatively low, since it is located in a rural area with no heavy industry nearby. In the Ontario Hydroelectric Study, the conductors most affected by atmospheric corrosion were located in areas subject to pollution sources and a major urban area. Therefore, the environmental impact to the Clinton Power Station transmission conductors (which are located in a rural area) are bounded by the Ontario Hydroelectric conductors (which are located in polluted and urban environments).

An example presented in the EPRI License Renewal Electrical Handbook, 1013475, compares a 4/0 conductor to the results of the Ontario Hydroelectric Study. The EPRI License Renewal Electrical Handbook evaluation documents that a 4/0 ACSR conductor (equivalent to a 211 MCM conductor size), which was included in the Ontario Hydroelectric study, has the smallest ultimate strength margin. Larger, more substantial transmission conductors (e.g., 336.4 MCM 30/7 conductors) that had a greater strength margin were bounded by the 4/0, 6/1 ACSR conductor example. The Clinton Power Station transmission conductors are physically more substantial than the limiting 4/0 ACSR conductor. NESC requirements and the handbook guidance are used to evaluate the in scope transmission conductors at Clinton Power Station.

Assuming a 30 percent loss of strength as demonstrated by the Ontario Hydroelectric tests, there would still be significant margin between what is required by the NESC and actual conductor strength. The margin between the NESC heavy load and the ultimate strength is 15,460 lbs. The Ontario Hydroelectric study showed a 30 percent loss of composite conductor strength in an 80-year-old conductor. In the case of the 1113 MCM ACSR transmission conductors, a 30 percent loss of ultimate strength would mean that there would still be a 3,910 lbs. margin between the 80-year-old ultimate strength and the strength required by the NESC. Therefore, the design and physical construction of the Clinton Power Station in scope transmission conductors provide strength margin exceeding the handbook analysis of the 4/0 ACSR conductor and is also bounded by the Ontario Hydroelectric study.

1113 MCM 54/19 ACSR Transmission Conductor	
Ultimate Strength, New	39,100 lbs.
Postulated Ultimate Strength at 80 Years	27,370 lbs.
NESC Design Strength, Required	23,460 lbs.
NESC Heavy Load Tension, Required	6,877 lbs.

In conclusion, the in scope Clinton Power Station transmission conductors are bounded by the Ontario Hydroelectric study, by test methodology, design and construction, and environment. The above evaluations demonstrate with reasonable assurance that transmission conductors will have ample strength margin through the period of extended operation. Therefore, based on Clinton Power Station design and confirmed by their operating experience, the loss of transmission conductor strength is not applicable and would not cause a loss of intended function for transmission conductors for the period of extended operation.

Oxidation or Loss of Pre-Load – Transmission Connectors

Transmission connectors employ good utility practices for bolting. The transmission connectors are designed and installed using stainless steel bolts, nuts, flat and Belleville washers and aluminum connectors that provide vibration absorption and prevent loss of preload. Therefore, based on Clinton Power Station design and confirmed by their operating experience for the past 10 years, oxidation and loss of preload are not applicable aging mechanisms.

Wind-Induced Abrasion and Fatigue – Switchyard Bus

Switchyard buses are connected to flexible conductors that do not normally vibrate and are supported by insulators and ultimately by static, structural components, such as concrete footings and structural steel. Switchyard bus is rigidly mounted and is therefore not subject to abrasion induced by wind loading. Therefore, based on Clinton Power Station design and confirmed by their operating experience for the past 10 years, wind-induced abrasion and fatigue are not applicable to Clinton Power Station switchyard bus.

Corrosion – Switchyard Bus

Clinton Power Station switchyards are not subject to a saline environment or industrial air pollution. It is located inland, in central Illinois, 161 miles southwest of Chicago in Harp Township, DeWitt County approximately six miles east of the city of Clinton in east-central Illinois. The Clinton Power Station with its associated approximately 4900-acre man-made cooling reservoir (Lake Clinton) is an irregular U-shaped site. Condenser cooling is provided by water taken from Lake Clinton which was formed by the construction of a dam downstream from the confluence of Salt Creek and the North Fork of Salt Creek. Clinton Power Station is located in an area where industrial airborne particle concentrations are comparatively low, since it is located in a rural area with no heavy industry nearby or a system cooling tower. Minor contamination is washed away by rainfall or snow, and cumulative build up has not been experienced and is not expected to occur. Therefore, based on Clinton Power Station design and confirmed by their operating experience for the past 10 years (keyword reviews for “switchyard” and “transmission”), corrosion is not an applicable aging mechanism.

Conclusion

Aging management activities for Clinton Power Station switchyard bus and connections, transmission conductors, and transmission connectors are not required for the period of extended operation.

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

QA provisions applicable to License Renewal are discussed in Section B.1.3.

3.6.2.2.5 Ongoing Review of Operating Experience

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

3.6.2.3 AMR Results Not Consistent With or Not Addressed in the GALL Report

3.6.2.3.1 Fuse Holders

Table 3.6.1 Item Numbers 3.6.1-16 and 3.6.1-17 – Fuse Holders (not part of active equipment) Metallic Clamps: Potential aging effects for the metallic clamps of fuse holders, not part of active equipment were evaluated to determine if the GALL-LR report XI.E5, “Fuse Holders” aging management program was to be implemented for Clinton Power Station license renewal.

Fuse holders are in scope for license renewal at Clinton Power Station by meeting (a)(1), (a)(2) functional, or (a)(3) license renewal 10 CFR 54.4 scoping criteria. In accordance with the bounding approach described in NEI 95-10, the fuse holders are an electrical commodity group and are assessed for aging management review by applying the criteria of 10 CFR 54.21(a)(1)(i). The resulting fuse holder population evaluated for aging effects are those that are passive and long lived; i.e., those that are not part of active equipment or assembly. The passive, long lived fuse holders that screen in are evaluated to determine if they are subject to:

- adverse environmental conditions that could cause an increase in electrical resistance of connection,
- fatigue from ohmic heating, thermal cycling, or electrical transients, or
- fatigue from frequent fuse removal/manipulation or vibration.

A systematic review of the fuse holders: metallic clamps was performed for Clinton Power Station, considering the above scoping and screening criteria and aging effects and mechanisms.

The list of fuses/fuse holders for consideration was compiled from fuse and fuse holder components identified from the plant equipment database. The population of fuse holders for consideration totaled 3,419. The systematic review applied the above criteria in parallel. The results of the review identified four fuse holders that require aging management review. These fuse holders are located in an enclosed electrical box.

High Pressure Core Spray System

Four fuse holders found in enclosed electrical boxes serve the High Pressure Core Spray System. The fuse holders are in the Clinton Power Station switchgear room.

The potential aging effects as discussed in NUREG-1801 are not applicable to these fuse holders. The evaluation of aging effects is discussed below.

- Chemical Contamination, Corrosion, and Oxidation

The electrical box in the Clinton Power Station switchgear room is in an environment that does not subject them to environmental aging mechanisms. They are located inside of an isolation panel. The fuse holders are protected from chemical contamination and are within a mild environment inside electrical box during normal conditions. There are no sources of uncontrolled chemicals near the electrical boxes during normal conditions. The environment inside the rooms is air-conditioned by a ventilation system, therefore, they do not experience high relative humidity during normal conditions. The fuse holders are not subject to outside weather conditions and therefore, are not subject to moisture from precipitation. A second barrier that protects the fuse holders from exposure to moisture is their location inside an enclosed electrical box. The fuse holders are not located in or near humid areas and they are not exposed to industrial or oceanic environments.

A walkdown of these electrical boxes containing the in scope fuse holders confirmed that the operating conditions for these fuse holders are clean and dry, with no evidence of moisture intrusion, chemical contamination, oxidation, or corrosion. Therefore, chemical contamination, corrosion, and oxidation are not considered applicable aging mechanisms for these fuse holders.

- Ohmic Heating, Thermal Cycling, and Electrical Transients

Fuse holders for circuits that carry significant current in power applications could potentially be exposed to thermal fatigue in the form of high resistance caused by thermal cycling and ohmic heating. The loads fed from these panels are control circuits that operate at low currents. Control power circuits characteristically operate at low currents where no appreciable thermal cycling or ohmic heating occurs. Therefore, ohmic heating and thermal cycling is not considered an applicable aging mechanism for these fuse holders.

Mechanical stress due to forces associated with electrical faults and transients are mitigated by the fast action of the circuit protective devices at high currents. Also, mechanical stress due to electrical faults is not considered a credible aging mechanism since such faults are infrequent and random in nature. The corrective action program is used to document adverse conditions and provides corrective actions associated with electrical faults and transients that cause the actuation of circuit protective devices. Therefore, electrical transients are not considered an applicable aging mechanism for these fuse holders.

- Frequent Manipulation and Vibration

Wear and fatigue is caused by repeated insertion and removal of fuses. The fuses in these fuse holders are not subject to frequent manipulation (i.e., removal and reinsertion) because they are neither clearance nor isolation points which support periodic testing or preventative maintenance. Additionally, if fuses are manipulated for non-routine inspection or maintenance, proceduralized good work practices would identify any abnormal condition such as loose or corroded fuse clips. These fuse holders are in electrical boxes that are not mounted on moving or rotating equipment such as compressors, fans, or pumps. Because the electrical boxes are mounted with no attached sources of vibration, vibration is not an applicable aging mechanism. Therefore, the metallic clamps of these fuse holders will not exhibit the aging effects/mechanisms of fatigue due to frequent manipulation or vibration.

Summary of Aging Management Review Results

There are four fuse holders in scope for license renewal that are not part of active equipment at Clinton Power Station that are subject to aging management review. Based on installed location, design configuration, operating service conditions, and operating experience, the four fuse holders inside the electrical boxes located in the Clinton Power Station switchgear room are not susceptible to the aging effects and mechanisms associated with metallic clamps. Therefore, aging management activities are not required for these four fuse holders (not part of active equipment): metallic clamps, at Clinton Power Station.

Clinton Power Station fuse holders (not part of active equipment): insulation material, that may be subject to an adverse localized environment that may affect insulation resistance is addressed as part of Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. Fuse holder insulation material that is not subject to an adverse environment does not have aging effects requiring management.

Conclusion

Fuse Holders (not part of active equipment): metallic clamps aging effect of increased resistance of connection due to fatigue caused by frequent manipulation or vibration is not applicable to the four fuse holders identified. These fuses are not removed frequently as noted previously and are not located in an adverse local environment or subject to ohmic heating. Therefore, GALL-1801, AMP XI.E5 "Fuse Holders" is not applicable to Clinton Power Station for the period of extended operation.

3.6.2.4 <u>Time-Limited Aging Analysis</u>

The time-limited aging analysis identified below is associated with Electrical Commodities:

- Section 4.4, Environmental Qualification (EQ) of Electric Components.

3.6.3 CONCLUSION

The Electrical Commodities that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Electrical Commodities are identified in the summaries in Section 3.6.2.1 above.

A description of these 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 conclusions provided in Appendix B, the effects of aging associated with the Electrical Commodities will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the current licensing basis during the period of extended operation.

Table 3.6.1 Summary of Aging Management Evaluations for the Electrical Components

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-1	Electrical equipment subject to 10 CFR 50.49 EQ requirements composed of Various polymeric and metallic materials exposed to Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage	Various aging effects due to various mechanisms in accordance with 10 CFR 50.49	EQ is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See Chapter X.E1, "Environmental Qualification (EQ) of Electric Components," of this report for meeting the requirements of 10 CFR 54.21(c)(1)(iii).	Yes, TLAA	Environmental Qualification is a TLAA; further evaluation is documented in Subsection 3.6.2.2.1.
3.6.1-2	High-voltage insulators composed of Porcelain; malleable iron; aluminum; galvanized steel; cement exposed to Air – outdoor	Loss of material due to mechanical wear caused by wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Not applicable. NUREG-1801, loss of material aging effects are not applicable to Clinton Power Station. See subsection 3.6.2.2.2 for further evaluation.

Table 3.6.1 Summary of Aging Management Evaluations for the Electrical Components

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-3	High-voltage insulators composed of Porcelain; malleable iron; aluminum; galvanized steel; cement exposed to Air – outdoor	Reduced insulation resistance due to presence of salt deposits or surface contamination	A plant-specific aging management program is to be evaluated for plants located such that the potential exists for salt deposits or surface contamination (e.g., in the vicinity of salt water bodies or industrial pollution)	Yes, plant-specific	Not applicable. NUREG-1801, reduced insulation resistance aging effects are not applicable to Clinton Power Station. See subsection 3.6.2.2.2 for further evaluation.
3.6.1-4	Transmission conductors composed of Aluminum; steel exposed to Air - outdoor	Loss of conductor strength due to corrosion	A plant-specific aging management program is to be evaluated for ACSR	Yes, plant-specific	Not applicable. NUREG-1801, loss of conductor strength aging effects are not applicable to Clinton Power Station. See subsection 3.6.2.2.3 for further evaluation.
3.6.1-5	Transmission connectors composed of Aluminum; steel exposed to Air - outdoor	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	Not applicable. NUREG-1801, increased resistance of connection aging effects are not applicable to Clinton Power Station. See subsection 3.6.2.2.3 for further evaluation.

Table 3.6.1 Summary of Aging Management Evaluations for the Electrical Components					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-6	Switchyard bus and connections composed of Aluminum; copper; bronze; stainless steel; galvanized steel exposed to Air – outdoor	Loss of material due to wind-induced abrasion; 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	Not applicable. NUREG-1801, loss of material and increased resistance of connection aging effects are not applicable to Clinton Power Station. See subsection 3.6.2.2.3 for further evaluation.
3.6.1-7	Transmission conductors composed of Aluminum; Steel exposed to Air - outdoor	Loss of material due to wind-induced abrasion	A plant-specific aging management program is to be evaluated for ACAR and ACSR	Yes, plant-specific	Not applicable. NUREG-1801, loss of material aging effects are not applicable to Clinton Power Station. See subsection 3.6.2.2.3 for further evaluation.
3.6.1-8	Insulation material for electrical cables and connections (including terminal blocks, fuse holders, etc.) composed of Various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to Adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance due to thermal /thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Chapter XI.E1, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No	Consistent with NUREG-1801. The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.37) program will be used to manage reduced insulation resistance of the various organic polymer insulation material in electrical cables and connections, including terminal blocks, fuse holders, splices and electrical penetration pigtails, exposed to an adverse localized environment caused by heat, radiation, or moisture.

Table 3.6.1 Summary of Aging Management Evaluations for the Electrical Components

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-9	Insulation material for electrical cables and connections used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance (IR) composed of Various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to Adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Chapter XI.E2, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits"	No	Consistent with NUREG-1801. The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.1.38) program will be used to manage reduced insulation resistance of the various organic polymer insulation material in electrical cables and connections used in instrumentation circuits, including terminal blocks, fuse holders, splices and electrical penetration pigtails, exposed to an adverse localized environment caused by heat, radiation, or moisture.
3.6.1-10	Conductor insulation for inaccessible power cables greater than or equal to 400 volts (e.g., installed in conduit or direct buried) composed of Various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to Adverse localized environment caused by significant moisture	Reduced insulation resistance due to moisture	Chapter XI.E3, "Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No	Consistent with NUREG-1801 with exceptions. The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.39) program will be used to manage reduced insulation resistance of the various organic polymer conductor insulation for inaccessible power cables greater than or equal to 400 volts, exposed to an adverse localized environment caused by significant moisture including inaccessible switchyard cable bus. An exception applies to the NUREG-1801 recommendations for the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.39) program implementation.

Table 3.6.1 Summary of Aging Management Evaluations for the Electrical Components

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-11	Metal enclosed bus: enclosure assemblies composed of Elastomers exposed to Air – indoor, controlled or uncontrolled or Air – outdoor	Surface cracking, crazing, scuffing, dimensional change (e.g. “ballooning” and “necking”), shrinkage, discoloration, hardening and loss of strength due to elastomer degradation	Chapter XI.E4, "Metal Enclosed Bus," or Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Metal Enclosed Bus (B.2.1.40) program will be used to manage surface cracking, crazing, scuffing, dimensional change, shrinkage, discoloration, hardening and loss of strength of the elastomers in metal enclosed bus: enclosure assemblies exposed to air – indoor, uncontrolled, or air - outdoor.
3.6.1-12	Metal enclosed bus: bus/connections composed of Various metals used for electrical bus and connections exposed to Air – indoor, controlled or uncontrolled or Air – outdoor	Increased resistance of connection due to the loosening of bolts caused by thermal cycling and ohmic heating	Chapter XI.E4, "Metal Enclosed Bus"	No	Consistent with NUREG-1801. The Metal Enclosed Bus (B.2.1.40) program will be used to manage increased resistance of connection of the various metals used for electrical bus and connections in metal enclosed bus: bus/connections exposed to air – indoor, uncontrolled, or air - outdoor.
3.6.1-13	Metal enclosed bus: insulation; insulators composed of Porcelain; xenoy; thermo-plastic organic polymers exposed to Air – indoor, controlled or uncontrolled or Air – outdoor	Reduced insulation resistance due to thermal/ thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation, moisture/debris intrusion, and ohmic heating	Chapter XI.E4, "Metal Enclosed Bus"	No	Consistent with NUREG-1801. The Metal Enclosed Bus (B.2.1.40) program will be used to manage reduced insulation resistance of the porcelain, various organic polymers in metal enclosed bus: insulation, insulators exposed to air – indoor, uncontrolled, or air - outdoor.

Table 3.6.1 Summary of Aging Management Evaluations for the Electrical Components

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-14	Metal enclosed bus: external surface of enclosure assemblies composed of Steel exposed to Air – indoor, uncontrolled or Air - outdoor	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.E4, "Metal Enclosed Bus," or Chapter XI.S6, "Structures Monitoring"	No	Not Applicable. There are no steel metal enclosed bus, external surface enclosure assemblies, exposed to an air – indoor, uncontrolled or air – outdoor environment that are in the scope of license renewal at Clinton Power Station.
3.6.1-15	Metal enclosed bus: external surface of enclosure assemblies composed of Galvanized steel; aluminum exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.E4, "Metal Enclosed Bus," or Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Metal Enclosed Bus (B.2.1.40) program will be used to manage loss of material/pitting and crevice corrosion of the aluminum in metal enclosed bus: external surface of enclosure assemblies exposed to air – outdoor.

Table 3.6.1 Summary of Aging Management Evaluations for the Electrical Components

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-16	Fuse holders (not part of active equipment): metallic clamps composed of Various metals used for electrical connections exposed to Air – indoor, uncontrolled	Increased resistance of connection due to chemical contamination, corrosion, and oxidation (in an air, indoor controlled environment, increased resistance of connection due to chemical contamination, corrosion and oxidation do not apply); fatigue due to ohmic heating, thermal cycling, electrical transients	Chapter XI.E5, "Fuse Holders"	Yes	Not Applicable. There are fuse holders (not part of active equipment): metallic clamps exposed to an air – indoor, uncontrolled environment that are in the scope of license renewal at Clinton Power Station. See subsection 2.5.2.5.3 for more information. See subsection 3.6.2.3.1 for further evaluation.
3.6.1-17	Fuse holders (not part of active equipment): metallic clamps composed of Various metals used for electrical connections exposed to Air – indoor, controlled or uncontrolled	Increased resistance of connection due to fatigue caused by frequent manipulation or vibration	Chapter XI.E5, "Fuse Holders" No aging management program is required for those applicants who can demonstrate these fuse holders are located in an environment that does not subject them to environmental aging mechanisms or fatigue caused by frequent manipulation or vibration	No	Not Applicable. There are fuse holders (not part of active equipment): metallic clamps exposed to an air – indoor, uncontrolled environment that are in the scope of license renewal at Clinton Power Station. See subsection 2.5.2.5.3 for more information. See subsection 3.6.2.3.1 for further evaluation.

Table 3.6.1 Summary of Aging Management Evaluations for the Electrical Components

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-18	Cable connections (metallic parts) composed of Various metals used for electrical contacts exposed to Air - indoor, controlled or uncontrolled or Air - outdoor	Increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Chapter XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No	Consistent with NUREG-1801. The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.41) program will be used to manage increased resistance of connection of the various metals used for electrical contacts in the metallic parts of cable connections, exposed to air – indoor, uncontrolled, or air - outdoor.
3.6.1-19	PWRs Only				
3.6.1-20	Transmission conductors composed of Aluminum exposed to Air – outdoor	Loss of conductor strength due to corrosion	None - for Aluminum Conductor Aluminum Alloy Reinforced (ACAR)	None	Consistent with NUREG-1801.
3.6.1-21	Fuse holders (not part of active equipment): insulation material, Metal enclosed bus: external surface of enclosure assemblies composed of Insulation material: bakelite; phenolic melamine or ceramic; molded polycarbonate; other, Galvanized steel; aluminum, Steel exposed to Air – indoor, controlled or uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.6.2-1
Electrical Commodities
Summary of Aging Management Evaluation

Table 3.6.2-1 Electrical Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Cable connections (metallic parts)	Electrical Continuity	Various metals used for electrical contacts	Air – indoor, uncontrolled, or Air – outdoor	Increased resistance of connection	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.41)	VI.A.LP-30	3.6.1-18	A
Conductor insulation for inaccessible power cables greater than or equal to 400V	Insulate (Electrical)	Various organic polymers	Adverse localized environment caused by significant moisture	Reduced insulation resistance	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.39)	VI.A.LP-35	3.6.1-10	B
Electrical equipment subject to 10 CFR 50.49 EQ requirements	Electrical Continuity	Various metallic materials	Adverse localized environment	Various aging effects	Environmental Qualification (EQ) of Electric Components (B.3.1.2)	VI.B.L-05	3.6.1-1	A
	Insulate (Electrical)	Various polymeric materials	Adverse localized environment	Various aging effects	Environmental Qualification (EQ) of Electric Components (B.3.1.2)	VI.B.L-05	3.6.1-1	A
Fuse holders (not part of active equipment): insulation material	Electrical Continuity	Various metals used for electrical connections	Air - Indoor, Uncontrolled	None	None	VI.A.LP-23	3.6.1-16	I, 9
					None	VI.A.LP-31	3.6.1-17	I, 10

Table 3.6.2-1 Electrical Commodities (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Fuse holders (not part of active equipment): insulation material	Insulate (Electrical)	Insulation material: bakelite; phenolic melamine or ceramic; molded polycarbonate; other	Air - Indoor, Uncontrolled	None	None	VI.A.LP-24	3.6.1-21	A, 1
High-voltage insulators	Insulate (Electrical)	Polymer: toughened glass silicone rubber, fiberglass, aluminum alloy	Air – outdoor	None	None	IV.A.LP-28	3.6.1-3	I, 2
		Porcelain: malleable iron, aluminum, galvanized steel, cement	Air – outdoor	None	None	VI.A.LP-28	3.6.1-3	I, 2
High-voltage insulators	Insulate (Electrical)	Polymer: toughened glass silicone rubber, fiberglass, aluminum alloy	Air - outdoor	None	None	VI.A.LP-32	3.6.1-2	I, 3
		Porcelain: malleable iron, aluminum, galvanized steel, cement	Air - outdoor	None	None	VI.A.LP-32	3.6.1-2	I, 3
Insulation material for electrical cables and connections	Insulate (Electrical)	Various organic polymers	Adverse localized environment caused by heat, radiation, or moisture	Reduced Insulation resistance	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.37)	VI.A.LP-33	3.6.1-8	A

Table 3.6.2-1 Electrical Commodities (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Insulation material for electrical cables and connections used in instrumentation circuits	Insulate (Electrical)	Various organic polymers	Adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.1.38)	VI.A.LP-34	3.6.1-9	A
Metal enclosed bus: bus/connections	Electrical Continuity	Various metals used for electrical bus and connections	Air – indoor, uncontrolled, or Air – outdoor	Increased resistance of connection	Metal Enclosed Bus (B.2.1.40)	VI.A.LP-25	3.6.1-12	A
Metal enclosed bus: enclosure assemblies	Shelter Protection	Elastomers	Air – indoor, uncontrolled, or Air – outdoor	Surface cracking, crazing, scuffing, dimensional change (e.g. "ballooning" and "necking"), shrinkage, discoloration, hardening and loss of strength	Metal Enclosed Bus (B.2.1.40)	VI.A.LP-29	3.6.1-11	A
Metal enclosed bus: external surface of enclosure assemblies	Shelter Protection	Aluminum	Air - Indoor, Uncontrolled	None	None	VI.A.LP-41	3.6.1-21	A
			Air - outdoor	Loss of material	Metal Enclosed Bus (B.2.1.40)	VI.A.LP-42	3.6.1-15	A
Metal enclosed bus: insulation; insulators	Insulate (Electrical)	Porcelain; xenoy; thermo-plastic organic polymers	Air – indoor, uncontrolled, or Air – outdoor	Reduced insulation resistance	Metal Enclosed Bus (B.2.1.40)	VI.A.LP-26	3.6.1-13	A
Switchyard bus and connections	Electrical Continuity	Aluminum; copper; bronze; stainless steel; galvanized steel	Air – outdoor	None	None	VI.A.LP-39	3.6.1-6	I, 4
Transmission conductors	Electrical Continuity	Aluminum	Air – outdoor	None	None	VI.A.LP-46	3.6.1-20	A, 5
		Aluminum; steel	Air – outdoor	None	None	VI.A.LP-47	3.6.1-7	I, 7

Table 3.6.2-1 Electrical Commodities (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	NUREG-1800 Table 1 Item	Notes
Transmission conductors	Electrical Continuity	Aluminum; steel	Air – outdoor	None	None	VI.A.LP-38	3.6.1-4	I, 6
Transmission connectors	Electrical Continuity	Aluminum; steel	Air – outdoor	None	None	VI.A.LP-48	3.6.1-5	I, 8

Table 3.6.2-1 Electrical Commodities (Continued)

Notes	Definition of Note
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:

1. In alignment with NUREG-1801 no aging management program is required when fuse holders are located in an environment that does not subject them to environmental aging mechanisms. Fuse holder insulation material in an adverse localized environment is managed via the XI.E1 AMP. Clinton fuse holders (not in active components) insulation material and environment combination has no aging effects requiring management. For more information see Section 3.6.2.3.1.
2. Based on CPS design and operating experience, loss of material is not an applicable aging effect for CPS high voltage insulators. In scope high voltage insulator comprised of porcelain, malleable iron, aluminum, galvanized steel, cement, and polymer in an air - outdoor environment are not subject to mechanical wear caused by wind blowing on transmission conductors. For more information see Section 3.6.2.2.3.
3. Based on CPS design and operating experience, reduced insulation resistance is not an applicable aging effect for CPS high voltage insulators. In scope high voltage insulator comprised of porcelain, malleable iron, aluminum, galvanized steel, cement, and polymer in an air - outdoor environment are not subject to contamination. For more information see Section 3.6.2.2.3.
4. Based on CPS design and operating experience, loss of material and increased resistance of connection are not applicable aging effect for CPS switchyard bus and connections. In scope switchyard bus and connections comprise of aluminum and stainless steel in an air – outdoor environment are not subject to wind induced abrasion nor oxidation or loss of pre-load. For more information see Section 3.6.2.2.4.

Table 3.6.2-1 Electrical Commodities (Continued)

Plant Specific Notes: (continued)

5. Based on SRP Table 3.6-1 Item 20 and CPS design and operating experience, loss of conductor strength due to corrosion is not applicable for ACAR and All Aluminum Conductor (AAC). This line item is consistent with NUREG-1801.
6. Based on CPS design and operating experience, loss of conductor strength is not applicable to the aging effect for CPS transmission conductors. In scope transmission conductors comprised of aluminum and steel in an air – outdoor environment are not subject to corrosion. For more information see Section 3.6.2.2.4.
7. Based on CPS design and operating experience, loss of material is not applicable to the aging effect for CPS ACSR transmission conductors. In scope transmission conductors comprised of aluminum and steel in an air – outdoor environment are not subject to wind induced abrasion. For more information see Section 3.6.2.2.4.
8. Based on CPS design and operating experience, increased resistance of connection is not an applicable aging effect for CPS transmission connectors. In scope CPS transmission connectors comprised of stainless steel in an air – outdoor environment is not subject to oxidation or loss of pre-load. For more information see Section 3.6.2.2.3, Further Evaluation.
9. In alignment with NUREG-1801, no aging management program is required when fuse holders are located in an environment that does not subject them to environmental aging mechanisms and effects due to chemical contamination, corrosion, and oxidation. See Section 3.6.2.3.1 for additional information.
10. In alignment with NUREG-1801, no aging management program is required when fuse holders are not subject to fatigue due to frequent fuse removal/manipulation or removal. See Section 3.6.2.3.1 for additional information.

4.0 TIME-LIMITED AGING ANALYSES

4.1 IDENTIFICATION AND EVALUATION OF TIME-LIMITED AGING ANALYSES (TLAAS)

Pursuant to 10 CFR 54.3, time-limited aging analyses (TLAAs) are those licensee calculations and analyses that meet all six (6) criteria below:

1. Involve systems, structures, and components within the scope of license renewal;
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; and
6. Are contained or incorporated by reference in the current licensing basis (CLB).

4.1.1 IDENTIFICATION OF CPS TIME-LIMITED AGING ANALYSES

TLAAs have been identified for Clinton Power Station (CPS) using methods consistent with those provided in 10 CFR 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants (Reference 4.8.1) and NUREG-1800, Revision 2, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP) (Reference 4.8.2).

A list of potential generic TLAAs was assembled from NRC and industry guidance including:

- NUREG-1800, Revision 2, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP)* (Reference 4.8.2)
- NUREG-1801, Revision 2, *Generic Aging Lessons Learned (GALL) Report,* (Reference 4.8.3)
- NEI 95-10, Revision 6, Industry Guideline for Implementing the Requirements of 10 CFR 54, the License Renewal Rule (Reference 4.8.4)
- The 10 CFR 54 Final Rule, Statement of Considerations

In addition, the Clinton Power Station CLB (Current License Basis) documentation was searched to identify potential TLAAs. The document search included the following:

- Updated Safety Analysis Report (USAR)
- Technical Specifications and Bases

- Docketed Licensing Correspondence
- NRC Safety Evaluation Reports (SERs)
- Design Bases Documents (DBDs)
- General Electric and General Electric Hitachi (GEH) Design Analyses & Reports
- Chicago Bridge and Iron Design Analyses and Reports
- Structural Integrity Associates Design Analyses and Reports
- Passport Component Record List
- Environmental Qualification Binders
- Engineering Specifications
- Engineering Change Requests
- Corrective Action Program Reports
- 10 CFR 50.12 Exemption Requests
- Inservice Inspection Relief Requests

Each potential TLAA was reviewed against the six criteria from 10 CFR 54.3(a) listed in LRA Section 4.1 above. Those that meet all six criteria were identified as TLAAs that require evaluation for the period of extended operation.

4.1.2 EVALUATION OF CPS TIME-LIMITED AGING ANALYSES

Each CPS TLAA has been evaluated for the period of extended operation. Each evaluation contains the following information:

TLAA Description: A description of the CLB analysis that has been identified as a TLAA, including a description of the aging effect evaluated, the time-limited variable used in the analysis, and its basis.

TLAA Evaluation: An evaluation of the TLAA for the period of extended operation. This section provides information associated with 60 years of operation for comparison with the information used in the TLAA that considered the previous license term of operation. This evaluation provides the basis for the disposition, which falls into one of the three disposition categories described below.

TLAA Disposition: The disposition is classified in accordance with one of the acceptance criteria from 10 CFR 54.21(c)(1) specified below in Section 4.1.3.

4.1.3 ACCEPTANCE CRITERIA

10 CFR 54.21, Contents of application – technical information, states that an application must contain the following 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.

One of these three methods must be used to disposition each TLAA identified for the period of extended operation for CPS.

4.1.4 SUMMARY OF RESULTS

LRA Table 4.1-1 lists the example TLAAs provided in NUREG-1800, Revision 2, Tables 4.1-2 and 4.1-3, and specifies whether they have been identified as TLAAs for CPS. Those examples with a "Yes" entry apply to CPS and the section(s) where the TLAA(s) are evaluated are provided. Those examples with a "No" entry do not apply for CPS and no TLAA was identified for these categories either because they are associated with design features not employed at CPS or because no analysis was identified that met all six TLAA criteria.

LRA Table 4.1-2 is a summary of the TLAAs identified for CPS. The TLAAs are grouped by affected component and aging effect analyzed. The table entries also state the disposition method used in evaluating the TLAA and include a reference to the applicable LRA section where the TLAA is evaluated for the period of extended operation.

4.1.5 IDENTIFICATION OF EXEMPTIONS PURSUANT TO 10 CFR 50.12

Exemptions pursuant to 10 CFR 50.12 currently in effect for CPS were reviewed to determine if they are based upon a TLAA. There were no exemptions pursuant to 10 CFR 50.12 identified that are currently in effect that are based upon or are associated with a TLAA.

TABLE 4.1-1 REVIEW OF GENERIC TLAAs LISTED IN NUREG-1800 REVISION 2, TABLES 4.1-2 AND 4.1-3		
NUREG-1800, Revision. 2, Example TLAAs	**Applies for CPS?**	**LRA Section**
NUREG-1800, Revision. 2, Table 4.1-2 – Potential TLAAs		
Reactor Vessel Neutron Embrittlement	Yes	4.2
Metal Fatigue	Yes	4.3
Environmental Qualification of Electrical Equipment	Yes	4.4
Concrete Containment Tendon Prestress	No	N/A
Inservice Local Metal Containment Corrosion Analyses	Yes	4.6
NUREG-1800, Revision. 2, Table 4.1-3 – Additional Examples of Plant-Specific TLAAs		
Intergranular Separation in the Heat-Affected Zone (HAZ) of Reactor Vessel Low-Alloy Steel Under Austenitic SS Cladding	No	N/A
Low-Temperature Overpressure Protection (LTOP) Analyses	No	N/A
Fatigue Analysis for the Main Steam Supply Lines to the Turbine Driven Auxiliary Feedwater Pumps	No	NA
Fatigue Analysis for the Reactor Coolant Pump Flywheel	No	N/A
Fatigue Analysis of Polar Crane (Crane Cycle Limits)	Yes	4.7.1
Flow-Induced Vibration Endurance Limit for the Reactor Vessel Internals	No	N/A
Transient Cycle Count Assumptions for the Reactor Vessel Internals	Yes	4.3.7
Ductility Reduction of Fracture Toughness for the Reactor Vessel Internals	No	N/A
Leak-Before-Break	No	N/A
Fatigue Analysis for the Containment Liner Plate	Yes	4.6.2
Containment Penetration Pressurization Cycles	Yes	4.6.1
Metal Corrosion Allowance	Yes	4.6.9
High-Energy Line-Break Postulation Based on Fatigue CUF	Yes	4.3.6
Inservice Flaw Growth Analysis that Demonstrates Structure Stability for 40 years	No	N/A

TABLE 4.1-2 SUMMARY OF RESULTS - CPS TIME-LIMITED AGING ANALYSES		
TLAA DESCRIPTION	**Disposition**	**SECTION**
REACTOR PRESSURE VESSEL AND INTERNALS NEUTRON EMBRITTLEMENT ANALYSES		4.2
Reactor Pressure Vessel Neutron Fluence Analyses	§54.21(c)(1)(ii)	4.2.1.1
Reactor Pressure Vessel Internals Neutron Fluence Analyses	§54.21(c)(1)(ii)	4.2.1.2
Reactor Pressure Vessel Upper-Shelf Energy (USE) Analyses	§54.21(c)(1)(ii)	4.2.2
Reactor Pressure Vessel Adjusted Reference Temperature (ART) Analyses	§54.21(c)(1)(ii)	4.2.3
Reactor Pressure Vessel Pressure-Temperature (P-T) Limits	§54.21(c)(1)(iii)	4.2.4
Reactor Pressure Vessel Circumferential Weld Failure Probability Analyses	§54.21(c)(1)(iii)	4.2.5
Reactor Pressure Vessel Axial Weld Failure Probability Analyses	§54.21(c)(1)(ii)	4.2.6
Reactor Pressure Vessel Reflood Thermal Shock Analysis	§54.21(c)(1)(ii)	4.2.7
Jet Pump Beam Bolts and Core Plate Bolts Preload Relaxation Analysis	§54.21(c)(1)(ii)	4.2.8
Core Shroud Repair Stablizer Assembly Bracket Preload Relaxation Analysis	§54.21(c)(1)(ii)	4.2.9
Reactor Pressure Vessel Core Support Structure Strain Evaluation	§54.21(c)(1)(ii)	4.2.10
Top Guide IASCC Analysis	§54.21(c)(1)(iii)	4.2.11
METAL FATIGUE ANALYSES		4.3
Transient Cycle and Cumulative Usage Projections for 60 Years		4.3.1
ASME Section III, Class 1 RPV and Piping Component Fatigue Analyses	§54.21(c)(1)(iii)	4.3.2.1
Environmental Fatigue Analyses for Class 1 RPV and Piping.	§54.21(c)(1)(iii)	4.3.2.2
Main Steam System Transients	§54.21(c)(1)(iii)	4.3.3.1
Main Steam Isolation Valve Transients	§54.21(c)(1)(i)	4.3.3.2
Safety/Relief Valve Transients	§54.21(c)(1)(i)	4.3.3.3

TABLE 4.1-2 SUMMARY OF RESULTS - CPS TIME-LIMITED AGING ANALYSES		
TLAA DESCRIPTION	**Disposition**	**SECTION**
Recirculation System Transients	§54.21(c)(1)(iii)	4.3.3.4
Recirculation Flow Control Valve Transients	§54.21(c)(1)(i)	4.3.3.5
Recirculation Gate Valve Transients	§54.21(c)(1)(i)	4.3.3.6
Recirculation Pump Transients	§54.21(c)(1)(i)	4.3.3.7
Control Rod Drive System Transients	§54.21(c)(1)(i)	4.3.3.8
ASME Section III, Class 1 Fatigue Exemptions	§54.21(c)(1)(ii)	4.3.4
ASME Section III, Class 2, Class 3, and ANSI B31.1 Allowable Stress Analyses and Related HELB Selection Analyses	§54.21(c)(1)(i)	4.3.5
High-Energy Line Break (HELB) Analyses Based on Cumulative Fatigue Usage	§54.21(c)(1)(i) and §54.21(c)(1)(iii)	4.3.6
Reactor Vessel Internals Fatigue Analysis	§54.21(c)(1)(i) and §54.21(c)(1)(iii)	4.3.7.1
ASME Section III, Class CS Fatigue Exemptions	§54.21(c)(1)(ii)	4.3.7.2
Core Shroud Support and Stabilizer Assembly Brackets	§54.21(c)(1)(ii)	4.3.7.3
ENVIRONMENTAL QUALIFICATION OF ELECTRIC AND MECHANICAL EQUIPMENT		4.4
Environmental Qualification of Electric and Mechanical Equipment	§54.21(c)(1)(iii)	4.4.1
PRIMARY CONTAINMENT FATIGUE ANALYSES		4.6
Containment Class MC Mechanical Penetrations	§54.21(c)(1)(i) And §54.21(c)(1)(ii)	4.6.1
Containment Liner	§54.21(c)(1)(i)	4.6.2
Suppression Pool Liner	§54.21(c)(1)(i)	4.6.3
Containment and Drywell Equipment Hatch and Personnel Locks, and Drywell Head Fatigue Assessment	§54.21(c)(1)(i)	4.6.4

TABLE 4.1-2 SUMMARY OF RESULTS - CPS TIME-LIMITED AGING ANALYSES		
TLAA DESCRIPTION	**Disposition**	**SECTION**
Inclined Fuel Transfer Tube Bellows	§54.21(c)(1)(i)	4.6.5
Refueling Bellows	§54.21(c)(1)(i)	4.6.6
SRV X-Quenchers	§54.21(c)(1)(i)	4.6.7
Containment/Drywell Penetration High Energy Guard Pipe Bellows	§54.21(c)(1)(i)	4.6.8
Containment Liner Corrosion Assessment	§54.21(c)(1)(ii)	4.6.9
Containment Electrical Penetrations	§54.21(c)(1)(iii)	4.6.10
ECCS Suction Strainer Bellows	§54.21(c)(1)(i)	4.6.11
OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES		4.7
Clinton Power Station Crane Cyclic Loading Analyses	§54.21(c)(1)(i)	4.7.1
Main Steam Line Flow Restrictor Erosion Analysis	§54.21(c)(1)(i)	4.7.2
Generic Letter 81-11 Crack Growth Analysis to Demonstrate Conformance to the Intent of NUREG-0619	§54.21(c)(1)(i)	4.7.3
Reactor Shield Wall Fluence	§54.21(c)(1)(i)	4.7.4
Hydraulic Control Units	§54.21(c)(1)(i)	4.7.5
Fuel Pool Storage Rack Fatigue Analysis	§54.21(c)(1)(i)	4.7.6
Refueling Bulkhead Ring Flaw Evaluation	§54.21(c)(1)(i)	4.7.7
Fuel Pool Cleanup System, Flow Control Valves	§54.21(c)(1)(i)	4.7.8

4.2 REACTOR PRESSURE VESSEL AND INTERNALS NEUTRON EMBRITTLEMENT ANALYSES

Reactor Pressure Vessel (RPV) Embrittlement TLAAs

10 CFR 50.60 (Reference 4.8.6) requires that all light-water reactors meet the fracture toughness, P-T limits, and material surveillance program requirements for the reactor coolant pressure boundary as set forth in 10 CFR 50, Appendices G and H (References 4.8.7 and 4.8.8). The ferritic materials of the reactor pressure vessel are subject to embrittlement due to high energy (E > 1.0 MeV) neutron exposure. Embrittlement means the material has lower toughness (i.e., will absorb less strain energy during a crack or rupture), thus allowing a crack to propagate more easily under thermal and pressure loading. Neutron embrittlement analyses are used to account for the reduction in fracture toughness associated with cumulative neutron fluence (total number of neutrons that intersect a square centimeter of component area during the life of the unit).

Toughness (indirectly measured in foot-pounds of absorbed energy in a Charpy impact test) is temperature dependent in ferritic materials. An initial nil-ductility Reference Temperature (RT_{NDT}) is associated with the transition from ductile to brittle behavior and is determined for vessel materials through a combination of Charpy and drop-weight testing. Toughness increases with temperature up to a maximum value called the “upper-shelf energy,” or USE. Neutron embrittlement results in a decrease in the USE value of reactor pressure vessel steels. This means greater temperatures are required for the material to behave in a ductile manner.

To reduce the potential for brittle fracture during reactor pressure vessel operation, changes in material toughness as a function of neutron radiation exposure (fluence) are accounted for through the use of operating pressure-temperature (P-T) limits that are managed using the Technical Specifications. The P-T limits account for the decrease in material toughness of the reactor pressure vessel extended beltline materials associated with a given fluence. P-T limit curves are generated to provide minimum temperature limits that must be achieved during operations prior to application of specified reactor pressure vessel (RPV) pressures. The P-T limit curves are based, in part, upon Adjusted Reference Temperature (ART) values for each material located within the extended beltline region of the reactor vessel. The ART value is computed using the initial RT_{NDT} (nil-ductility temperature) and ΔRT_{NDT} (change in nil-ductility temperature due to fluence) computed for the current operating period, along with appropriate margins.

The extended beltline region includes the RPV plates, welds, and forging materials that are predicted to receive a cumulative neutron exposure of 1.0E+17 (1.0×10^{17}) neutrons/cm^2 (n/cm^2) through the end of the period of extended operation. Since the cumulative neutron fluence will increase during the period of extended operation, a review is required to determine if any additional components will exceed this threshold value and require evaluation for neutron embrittlement.

Based on the projected drop in toughness for each Extended Beltline material as a result of exposure to the predicted fluence values, USE calculations are performed to determine if the components will continue to have adequate fracture toughness at the end of the current operating term to meet the required minimums. The reactor pressure vessel material ART values, USE values, and Equivalent Margin Analysis (EMA) evaluations, are based on neutron fluence, as well as the P-T limit curves which are based on the ART values, are part of the licensing basis and support safety determinations and therefore have been identified as TLAAs. The increases in RT_{NDT} (ΔRT_{NDT}) also affect the bases for relief from circumferential weld inspection and the supporting calculation of limiting axial weld conditional failure probability. Therefore, these calculations have been identified as TLAAs. The reflood thermal shock analysis for the RPV that is based upon irradiated material properties derived using neutron fluence values has also been identified as a TLAA.

The following TLAAs related to neutron embrittlement of the RPV are evaluated in the LRA subsections listed below:

- Reactor Pressure Vessel Neutron Fluence Analyses (Section 4.2.1.1)
- Reactor Pressure Vessel Upper-Shelf Energy (USE) Analyses (Section 4.2.2)
- Reactor Pressure Vessel Adjusted-Reference Temperature (ART) Analyses (Section 4.2.3)
- Reactor Pressure Vessel Pressure–Temperature (P-T) Limits (Section 4.2.4)
- Reactor Pressure Vessel Circumferential Weld Failure Probability Analyses (Section 4.2.5)
- Reactor Pressure Vessel Axial Weld Failure Probability Analyses (Section 4.2.6)
- Reactor Pressure Vessel Reflood Thermal Shock Analysis (Section 4.2.7)

Reactor Vessel Internal Component Fluence TLAAs

Several RPV internal components, including the Jet Pump Beam Bolts, the Core Plate Bolts, and the Core Shroud Stabilizer Assembly Bracket Tie Rods have been analyzed for preload relaxation due to neutron fluence. In addition, the Reactor Core Support Structure has been evaluated for the effect of fluence on calculated strain. The Top Guide has been analyzed for Irradiation Assisted Stress Corrosion Cracking (IASSC) due to fluence. These analyses have been identified as TLAAs that are evaluated in the LRA subsections listed below:

- Reactor Pressure Vessel Internals Neutron Fluence Analyses (Section 4.2.1.2)
- Jet Pump Beam Bolts and Core Plate Bolts Preload Relaxation Analyses (Section 4.2.8)
- Core Shroud Repair Stabilizer Assembly Bracket Preload Relaxation Analysis (Section 4.2.9)
- Reactor Pressure Vessel Core Support Structure Strain Evaluation (Section 4.2.10)
- Top Guide IASCC Analysis (Section 4.2.11)

4.2.1 REACTOR PRESSURE VESSEL AND INTERNALS NEUTRON FLUENCE ANALYSES

Neutron fluence is the term used to represent the cumulative number of neutrons per square centimeter that contacts the RPV shell and its internal components over a given period of time. The fluence projections that quantify the number of neutrons that contact these surfaces have been used as inputs to the neutron embrittlement analyses that evaluate the loss of fracture toughness aging effect.

The NRC approved General Electric Hitachi (GEH) Discrete Ordinates Transfer (DORT) methodology has been used in developing the 60-year fluence projections and associated RPV embrittlement analyses. The projections and analyses account for an Extended Power Uprate (EPU). These 60-year fluence projections are based on the methodology in Licensing Topical Report (LTR) NEDC-32983P-A (Reference 4.8.9).

The current uprated power level of 3473 megawatts thermal (MWt) is the maximum power level evaluated for the period of extended operation. Sixty-year fluence projections for the Clinton Power Station (CPS) RPV are used in evaluating the neutron embrittlement TLAAs in LRA Sections 4.2.2 through 4.2.7.

Below is a summary of CPS historical operating power levels which have been considered in developing the 60-year fluence projections:

- The Original Licensed Thermal Power (OLTP) level for CPS was 2894 MWt.
- By Amendment Number 149, dated April 5, 2002 (Reference 4.8.26), the NRC approved a 20 percent EPU that authorized an increase in the maximum thermal power level from 2894 MWt to the current licensed thermal power (CLTP) level of 3473 MWt.

4.2.1.1 REACTOR PRESSURE VESSEL NEUTRON FLUENCE ANALYSES

TLAA Description:

Fluence projections developed using the NRC approved GEH DORT methodology have been used as inputs in the current licensing basis RPV neutron embrittlement analyses for extended beltline components, including analyses of Upper Shelf Energy (USE), Adjusted Reference Temperatures (ART), Pressure-Temperature (P-T) limits, axial, and circumferential weld failure probability, and RPV reflood thermal shock. The current licensing basis fluence projections were generated for the currently approved P-T curves, which were developed for 40 years and 32 Effective Full Power Years (EFPY). This current fluence analysis has been identified as a TLAA that requires evaluation for the period of extended operation.

TLAA Evaluation:

The first step in updating fluence projections from 40 years to 60 years was to update the EFPY projections, based upon past power history records, including capacity factors and power production data. In order to determine an EFPY value applicable for 60 years, a review of cumulative neutron exposure and EFPY through recent completed operating cycles was performed, and a 52 EFPY value was conservatively projected for 60 years.

The basis for 52 EFPY is as follows. CPS has previously projected a 31.64 EFPY value up to April 2027, based on actual accumulated EFPY values up to September 2019 and an expected capacity factor of 94.7 percent from September 2019 until April 2027, which is the last month of the current 40-year life of the station. Therefore, an assumption of 100 percent capacity (no outages) for the period of extended operation results in a projection of a total of 51.64 EFPY in April 2047. Based upon this review, 52 EFPY was determined to be a conservative value to use in projecting the 60-year fluence values to be used in evaluating the neutron embrittlement TLAAs in Sections 4.2 through 4.7.

The upper edge of the extended beltline at 52 EFPY will extend above 378.26 inches above Vessel “0 inches.” The lower edge of the extended beltline at 52 EFPY will extend below 188.96 inches below Vessel “0 inches.” For clarity, the RPV shell region which exceeds a fluence of 1.0E+17 n/cm^2 at 52 EFPY will be referred to as the “Extended Beltline” in the remaining sections of the LRA. As a result, the following RPV components will be added to the extended beltline: the top of the N1 nozzle, the top of the N2 nozzle, the N12 nozzle, the bottom of the N6 nozzle, RPV shell 3, axial welds on RPV shell 3, and the girth weld between shells 2 and 3.

The 52 EFPY fluence projections have been developed by first compiling cumulative fluence resulting from each past operating cycle and then adding the predicted fluence for future operating cycles through the period of extended operation.

The 52 EFPY fluence projections are provided in the following tables:

1. LRA Table 4.2.1.1-1, CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Shell Plates at 52 EFPY.

2. LRA Table 4.2.1.1-2, CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Vertical Welds at 52 EFPY.

3. LRA Table 4.2.1.1-3, CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Axial (Girth) Welds at 52 EFPY.

4. LRA Table 4.2.1.1-4, CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Nozzles and Nozzle Welds at 52 EFPY.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The RPV extended beltline component fluence analyses have been satisfactorily projected through the period of extended operation. They are used as inputs in the RPV TLAA evaluations in Sections 4.2.2 through 4.2.7.

Table 4.2.1.1-1
CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Shell Plates at 52 EFPY

Plate No.	Heat Number	0T Fluence (n/cm^2)	1/4T Fluence (n/cm^2)
CPS Shell 1 Plates			
PC Mark 21-1-1	A2758-1	1.15E+18	8.17E+17
PC Mark 21-1-2	A2740-1	1.15E+18	8.17E+17
CPS Shell 2 Plates			
PC Mark 22-1	C4363-2	8.65E+18	6.15E+18
PC Mark 22-3	C4380-2	8.65E+18	6.15E+18
PC Mark 22-4	C4320-2	8.65E+18	6.15E+18
CPS Shell 3 Plates			
PC Mark 23-1-1	C4209-1	3.94E+17	2.80E+17
PC Mark 23-1-2	C4212-1	3.94E+17	2.80E+17
PC Mark 23-1-3	C4245-1	3.94E+17	2.80E+17

Table 4.2.1.1-2 CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Vertical Welds at 52 EFPY			
Weld No.	**Heat / Lot Number**	**0T Fluence (n/cm^2)**	**1/4T Fluence (n/cm^2)**
CPS Shell 1 Vertical Welds			
Seam BA and BB	432N1891/G415B27AF 07R458/G418B27AH 661N635/G410B27AE 494K2351/A404A27AD 3P4955/0342 (Single) 3P4955/0342 (Tandem) 3P4955/0951 (Single) 3P4955/0951 (Tandem) 5P6756 623275/L121A27A 659N315/F414B27AF 624263/E204A27A	9.91E+17	7.04E+17
CPS Shell 2 Vertical Welds			
Seam BE, BF, and BG	3P4955/0342 (Single) 3P4955/0342 (Tandem)	8.65E+18	6.15E+18

Table 4.2.1.1-2 CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Vertical Welds at 52 EFPY			
CPS Shell 3 Vertical Welds			
Seam BJ, BK, and BM	432N1891/G415B27AF 07R458/G418B27AH 661N635/G410B27AE 494K2351/A404A27AD 3P4955/0342 (Single) 3P4955/0342 (Tandem) 3P4955/0951 (Single) 3P4955/0951 (Tandem) 5P6756 623275/L121A27A 659N315/F414B27AF 624263/E204A27A	3.87E+17	2.75E+17

Table 4.2.1.1-3 CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Axial (Girth) Welds at 52 EFPY			
Weld No.	**Heat / Lot Number**	**0T Fluence (n/cm^2)**	**1/4T Fluence (n/cm^2)**
CPS Girth Welds Between Shells 1 and 2:			
Girth Weld between Shells 1 and 2	76492/L430B27AE 76616/A506B27AF 431T1831/A626B27AG 661N635/G410B27AE 422P5621/L414B27AD 401S0351/B511B27AG 3P4955/0951 (Single) 3P4955/0951 (Tandem) 5P6756 623275/L121A27A 659N315/F414B27AF 624263/E204A27A	1.15E+18	8.17E+17
CPS Girth Welds Between Shells 2 and 3:			
Girth Weld between Shells 2 and 3	76492/L430B27AE 76616/A506B27AF 431T1831/A626B27AG 661N635/G410B27AE 422P5621/L414B27AD 401S0351/B511B27AG 3P4955/0951 (Single) 3P4955/0951 (Tandem) 5P6756 623275/L121A27A 659N315/F414B27AF 624263/E204A27A	3.94E+17	2.80E+17

Table 4.2.1.1-4 CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Nozzles and Nozzle Welds at 52 EFPY			
Nozzle Location	**Heat Number**	**0T Fluence (n/cm²)**	**1/4T Fluence (n/cm²)**
CPS Nozzles			
N1	Q2QL13W	1.31E+17	9.31E+16
N2	Q2QL4W Q2QL8QT Q2QL8W	1.31E+17	9.31E+16
N6	Q2QL8QT Q2QL19QT	2.87E+17	2.04E+17
N12 **[1]** Mark 22-3	C4380-2	3.15E+18	2.24E+18
CPS Nozzles Welds			
N1 and N2 Welds	432N1891/G415B27AF 07R458/G418B27AH 661N635/G410B27AE 494K2351/A404A27AD 3P4955/0342 (Single) 3P4955/0342 (Tandem) 3P4955/3478 (Single) 3P4955/3478 (Tandem) 3P4955/0951 (Single) 3P4955/0951 (Tandem) 5P6756 623275/L121A27A 659N315/F414B27AF 624263/E204A27A	1.31E+17	9.31E+16

Table 4.2.1.1-4 CPS - Maximum Neutron Fluence (>1.0 MeV) in RPV Extended Beltline Nozzles and Nozzle Welds at 52 EFPY			
Nozzle Location	**Heat Number**	**0T Fluence (n/cm^2)**	**1/4T Fluence (n/cm^2)**
N6 Welds	432N1891/G415B27AF 07R458/G418B27AH 661N635/G410B27AE 494K2351/A404A27AD 3P4955/0342 (Single) 3P4955/0342 (Tandem) 3P4955/3478 (Single) 3P4955/3478 (Tandem) 3P4955/0951 (Single) 3P4955/0951 (Tandem) 5P6756 623275/L121A27A 659N315/F414B27AF 624263/E204A27A	2.87E+17	2.04E+17
N12 Weld **[1]**	Inconel	3.15E+18	2.24E+18

Notes:

[1] The N12 Water Level Instrumentation nozzle forging and weld are fabricated from stainless steel with Inconel welds, which are not a ferritic material and do not require evaluation of loss of fracture toughness. Instead, evaluation of loss of fracture toughness of the surrounding ferritic shell material is evaluated in later sections.

4.2.1.2 REACTOR PRESSURE VESSEL INTERNALS NEUTRON FLUENCE ANALYSES

TLAA Description:

Neutron fluence exposure for the 40-year operating period has been used as input in analyses of CPS RPV internal components, including the jet pump beam bolts, the core plate bolts, core shroud repair stabilizer assembly tie rods, the core support structure, and the top guide. Since the neutron fluence exposure is time dependent, these analyses have been identified as TLAAs that require evaluation for the period of extended operation.

TLAA Evaluation:

Fluence projections for 60 years at a projected 52 EFPY value have been developed to evaluate the neutron fluence dependent TLAAs associated with the RPV internal components. These TLAAs are described and evaluated for 60 years in LRA Sections 4.2.8 through 4.2.11.

The RPV internal fluence projections used the same methodology and core and vessel model as described in LRA Section 4.2.1.1. The NRC approved GEH DORT methodology has been used in developing 60-year fluence projections that account for an Extended Power Uprate (EPU). These 60-year fluence projections are based on the methodology in Licensing Topical Report (LTR) NEDC-32983P-A (Reference 4.8.9).

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The CPS RPV internal component fluence analyses have been satisfactorily projected through the period of extended operation. They are used as inputs in the RPV internal components fluence-related TLAA evaluations in Sections 4.2.8 through 4.2.10.

4.2.2 REACTOR PRESSURE VESSEL UPPER-SHELF ENERGY (USE) ANALYSES

TLAA Description:

Appendix G of 10 CFR 50, (Reference 4.8.7) Paragraph IV.A.1.a, states that RPV extended beltline materials must have a Charpy upper-shelf energy (USE) value of no less than 75 ft-lb initially and must maintain Charpy USE values, throughout the life of the vessel, of no less than a 50 ft-lb., unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation, that lower values of Charpy USE will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

For the CPS RPV, extended beltline components for which initial unirradiated USE values are available, irradiated USE values have been determined based upon 32 EFPY fluence values. For some CPS RPV shell plates there is insufficient data available to establish the unirradiated USE values. Therefore, for these components the current licensing basis Charpy USE evaluations are based upon Equivalent Margin Analysis (EMA) as specified in BWRVIP-74-A (Reference 4.8.22), which meet the alternative requirements specified above. Since the USE values and EMA methodology are based upon 32 EFPY fluence values assumed for the 40-year life of the station, these analyses have been identified as TLAAs requiring evaluation for the period of extended operation.

TLAA Evaluation:

In order to evaluate USE values for 60 years for RPV extended beltline components in which initial unirradiated USE values are available, irradiated USE values have been determined based upon 52 EFPY fluence values. For RPV extended beltline components which do not have unirradiated USE values, EMA was performed for the limiting shell materials for 60 years of operation (52 EFPY), and compared against the limits defined in Appendix B of BWRVIP-74-A.

- LRA Table 4.2.2-1 summarizes the 60-year USE values for the RPV shell materials in the extended beltline. All materials are shown to be acceptable with respect to the design limits.

- LRA Table 4.2.2-2 summarizes the 60-year USE values for the RPV shell weld materials in the extended beltline. All materials are shown to be acceptable with respect to the design limits.

- LRA Table 4.2.2-3 summarizes the 60-year USE values for the RPV nozzle materials in the extended beltline. All materials are shown to be acceptable with respect to the design limits.

- LRA Table 4.2.2-4 summarizes the 60-year USE values for the RPV nozzle weld materials in the extended beltline. All materials are shown to be acceptable with respect to the design limits.

- LRA Table 4.2.2-5 provides a comparison of USE values for CPS limiting materials. All materials are shown to be acceptable with respect to the design limits.

- LRA Table 4.2.2-6 provides the EMA results for the shell 1 plates. All materials are shown to be acceptable with respect to the design limits.
- LRA Table 4.2.2-7 provides the EMA Results for the shell 3 plates. All materials are shown to be acceptable with respect to the design limits.

10 CFR 50, Appendix G (Reference 4.8.7), only requires USE evaluations for ferritic extended beltline materials. The N12 Water Level Instrument nozzles are forgings fabricated from stainless steel with partial penetration Inconel welds, which are not ferritic materials, and therefore do not require evaluation. Therefore, the properties of the surrounding plate material and fluence at the N12 nozzle location (shell number 2, plate PC Mark 22-3) are used to determine the decrease in USE, applicable for the N12 nozzle location.

The USE values for the CPS RPV extended beltline materials have been satisfactorily evaluated for the period of extended operation using 60-year (52 EFPY) fluence projections.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The RPV USE analyses have been satisfactorily projected through the period of extended operation.

Table 4.2.2-1 CPS - USE Calculation in RPV Extended Beltline Shell Materials at 52 EFPY						
Component	**Heat Number**	**%Cu**	**Transverse Initial USE (ft-lb)**	**1/4 T Fluence (n/cm^2)**	**% Decrease USE**	**Transverse USE at 52 EFPY (ft-lb)**
CPS Shell 1 Plates:						
PC Mark 21-1-1	A2758-1	0.10	NA	8.17E+17	10.5	EMA
PC Mark 21-1-2	A2740-1	0.11	NA	8.17E+17	11.5	EMA
CPS Shell 2 Plates						
PC Mark 22-1	C4363-2	0.06	105	6.15E+18	17.5	87
PC Mark 22-3	C4380-2	0.07	102	6.15E+18	17.5	84
PC Mark 22-4	C4320-2	0.05	105	6.15E+18	17.5	87
CPS Shell 3 Plates						
PC Mark 23-1-1	C4209-1	0.18	NA	2.80E+17	12.0	EMA
PC Mark 23-1-2	C4212-1	0.18	NA	2.80E+17	12.0	EMA
PC Mark 23-1-3	C4245-1	0.18	NA	2.80E+17	12.0	EMA

Table 4.2.2-2 CPS - USE Calculation in RPV Extended Beltline Shell Weld Materials at 52 EFPY [1]						
Component	**Heat Number**	**%Cu**	**Initial USE (ft-lb)**	**1/4T Fluence (n/cm^2)**	**% Decrease USE**	**USE at 52 EFPY (ft-lb)**
CPS Vertical Welds for Shell 1						
Seam BA and BB	432N1891/G415B27AF	0.02	121	7.04E+17	10.5	108
	07R458/G418B27AH	0.03	122	7.04E+17	10.5	109
	661N635/G410B27AE	0.03	117	7.04E+17	10.5	105
	494K2351/A404A27AD	0.04	175	7.04E+17	10.5	157
	3P4955/0342 (Single)	0.023	90	7.04E+17	10.5	81
	3P4955/0342 (Tandem)	0.025	95	7.04E+17	10.5	85
	3P4955/0951 (Single)	0.03	93	7.04E+17	10.5	83
	3P4955/0951 (Tandem)	0.03	80	7.04E+17	10.5	72
	5P6756	0.08	126	7.04E+17	12.0	111
	623275/L121A27A	0.05	102	7.04E+17	10.5	91
	659N315/F414B27AF	0.04	136	7.04E+17	10.5	122
	624263/E204A27A	0.06	89	7.04E+17	11.0	79
CPS Vertical Welds for Shell 2						
Seam BE, BF, BG	3P4955/0342 (Single)	0.023	90	6.15E+18	17.5	74

Table 4.2.2-2 CPS - USE Calculation in RPV Extended Beltline Shell Weld Materials at 52 EFPY [1]						
Component	**Heat Number**	**%Cu**	**Initial USE (ft-lb)**	**1/4T Fluence (n/cm^2)**	**% Decrease USE**	**USE at 52 EFPY (ft-lb)**
	3P4955/0342 (Tandem)	0.025	95	6.15E+18	17.5	78
CPS Vertical Welds for Shell 3						
Seam BJ, BK, BM	432N1891/G415B27AF	0.02	121	2.75E+17	8.5	111
	07R458/G418B27AH	0.03	122	2.75E+17	8.5	112
	661N635/G410B27AE	0.03	117	2.75E+17	8.5	107
	494K2351/A404A27AD	0.04	175	2.75E+17	8.5	160
	3P4955/0342 (Single)	0.023	90	2.75E+17	8.5	82
	3P4955/0342 (Tandem)	0.025	95	2.75E+17	8.5	87
	3P4955/0951 (Single)	0.03	93	2.75E+17	8.5	85
	3P4955/0951 (Tandem)	0.03	80	2.75E+17	8.5	73
	5P6756	0.08	126	2.75E+17	10.0	113
	623275/L121A27A	0.05	102	2.75E+17	8.5	93
	659N315/F414B27AF	0.04	136	2.75E+17	8.5	124
	624263/E204A27A	0.06	89	2.75E+17	9.0	81
ISP Best Estimate Chemistry						

Table 4.2.2-2
CPS - USE Calculation in RPV Extended Beltline Shell Weld Materials at 52 EFPY [1]

Component	Heat Number	%Cu	Initial USE (ft-lb)	1/4T Fluence (n/cm^2)	% Decrease USE	USE at 52 EFPY (ft-lb)
ISP	3P4955/0342 (Single)	**[2]**	90	6.15E+18	17.5	74
	3P4955/0342 (Tandem)	**[2]**	95	6.15E+18	17.5	78
	3P4955/0951 (Single)	**[2]**	93	7.04E+17	10.5	83
	3P4955/0951 (Tandem)	**[2]**	80	7.04E+17	10.5	72
	5P6756	**[2]**	126	7.04E+17	12.0	111
CPS Girth Weld						
Weld Between Shell 1 and 2	76492/L430B27AE	0.10	97	8.17E+17	13.5	84
	76616/A506B27AF	0.02	126	8.17E+17	10.5	113
	431T1831/A626B27AG	0.03	109	8.17E+17	10.5	98
	661N635/G410B27AE	0.03	117	8.17E+17	10.5	105
	422P5621/L414B27AD	0.07	133	8.17E+17	12.0	117
	401S0351/B511B27AG	0.03	136	8.17E+17	10.5	122
	3P4955/0951 (Single)	0.03	93	8.17E+17	10.5	83
	3P4955/0951(Tandem)	0.03	80	8.17E+17	10.5	72
	5P6756	0.08	126	8.17E+17	12.5	110

Table 4.2.2-2 CPS - USE Calculation in RPV Extended Beltline Shell Weld Materials at 52 EFPY [1]						
Component	**Heat Number**	**%Cu**	**Initial USE (ft-lb)**	**1/4T Fluence (n/cm^2)**	**% Decrease USE**	**USE at 52 EFPY (ft-lb)**
	623275/L121A27A	0.05	102	8.17E+17	10.5	91
	659N315/F414B27AF	0.04	136	8.17E+17	10.5	122
	624263/E204A27A	0.06	89	8.17E+17	11.5	79
CPS Girth Weld						
Weld Between Shell 2 and 3	76492/L430B27AE	0.10	97	2.80E+17	10.5	87
	76616/A506B27AF	0.02	126	2.80E+17	8.5	115
	431T1831/A626B27AG	0.03	109	2.80E+17	8.5	100
	661N635/G410B27AE	0.03	117	2.80E+17	8.5	107
	422P5621/L414B27AD	0.07	133	2.80E+17	9.5	120
	401S0351/B511B27AG	0.03	136	2.80E+17	8.5	124
	3P4955/0951 (Single)	0.03	93	2.80E+17	8.5	85
	3P4955/0951 (Tandem)	0.03	80	2.80E+17	8.5	73
	5P6756	0.08	126	2.80E+17	10.0	113
	623275/L121A27A	0.05	102	2.80E+17	8.5	93
	659N315/F414B27AF	0.04	136	2.80E+17	8.5	124

Table 4.2.2-2 CPS - USE Calculation in RPV Extended Beltline Shell Weld Materials at 52 EFPY [1]						
Component	**Heat Number**	**%Cu**	**Initial USE (ft-lb)**	**1/4T Fluence (n/cm^2)**	**% Decrease USE**	**USE at 52 EFPY (ft-lb)**
	624263/E204A27A	0.06	89	2.80E+17	9.0	81
ISP - Best Estimate Chemistry						
ISP	3P4955/0951 (Single)	**[2]**	93	8.17E+17	10.5	83
	3P4955/0951 (Tandem)	**[2]**	80	8.17E+17	10.5	72
	5P6756	**[2]**	126	8.17E+17	12.5	110
ISP – Representative Materials						
ISP	5P6756	**[3]**	126	8.17E+17	18.0	103
	5P6756	**[4]**	126	8.17E+17	20.0	101
	5P6756	**[5]**	126	8.17E+17	16.5	105
	5P6756	**[6]**	126	8.17E+17	12.5	110

Notes:

[1] ISP information BWRVIP-135 Revision 4 is Proprietary.

[2] See Table D-1, D-16, and D-22 of BWRVIP-135, Revision 4. Considering RB183°F ISP data (BWRVIP-135, Revision 4 Table 2-12), Adjusted %Cu = 0.175, using higher fluence at circumferential weld between Shells #1 & #2.

[3] Considering RB183°F ISP data (BWRVIP-135, Revision 4 Table 2-12), Adjusted %Cu = 0.175, using higher fluence at circumferential weld between Shells #1 & #2.

[4] Considering SSP Capsule F data (BWRVIP-135, Revision 4 Table 2-12), Adjusted %Cu = 0.21, using higher fluence at circumferential weld between Shells #1 & #2.

[5] Considering SSP Capsule H data (BWRVIP-135, Revision 4 Table 2-12), Adjusted %Cu = 0.15, using higher fluence at circumferential weld between Shells #1 & #2.

[6] Considering SSP Capsule C data (BWRVIP-135, Revision 4 Table 2-12), No adjustment on %Cu, using higher fluence at circumferential weld between Shells #1 & #2.

Table 4.2.2-3 CPS - USE Calculation in RPV Extended Beltline Shell Nozzles Materials at 52 EFPY						
Component	**Heat Number**	**%Cu**	**Transverse Initial USE (ft-lb)**	**1/4T Fluence (n/cm^2)**	**% Decrease USE**	**Transverse USE at 52 EFPY (ft-lb)**
CPS N1 Nozzles						
N1	Q2QL13W	0.17	125	9.31E+16	9.0	114
CPS N2 Nozzles						
N2	Q2QL4W	0.11	70	9.31E+16	7.0	65
	Q2QL8QT	0.09	70	9.31E+16	6.5	65
	Q2QL8W	0.09	70	9.31E+16	6.5	65
CPS N6 Nozzles						
N6	Q2QL8QT	0.17	95	2.04E+17	10.5	85
	Q2QL19QT	0.10	93	2.04E+17	8.0	86
CPS N12 Nozzles						
N12	Stainless Steel	NA	NA	NA	NA	NA

Table 4.2.2-4 CPS - USE Calculation in RPV Extended Beltline Nozzle Weld Materials at 52 EFPY [1]						
Component	**Heat Number**	**%Cu**	**Initial USE (ft-lb)**	**1/4T Fluence (n/cm^2)**	**% Decrease USE**	**USE at 52 EFPY (ft-lb)**
CPS Nozzle Welds						
Welds for Nozzles N1 and N2	432N1891/G415B27AF	0.02	121	9.31E+16	6.5	113
	07R458/G418B27AH	0.03	122	9.31E+16	6.5	114
	661N635/G410B27AE	0.03	117	9.31E+16	6.5	109
	494K2351/A404A27AD	0.04	175	9.31E+16	6.5	164
	3P4955/0342 (Single)	0.023	90	9.31E+16	6.5	84
	3P4955/0342 (Tandem)	0.025	95	9.31E+16	6.5	89
	3P4955/3478 (Single)	0.02	111	9.31E+16	6.5	104
	3P4955/3478 (Tandem)	0.03	104	9.31E+16	6.5	97
	3P4955/0951 (Single)	0.03	93	9.31E+16	6.5	87
	3P4955/0951 (Tandem)	0.03	80	9.31E+16	6.5	75
	5P6756	0.08	126	9.31E+16	7.5	117
	623275/L121A27A	0.05	102	9.31E+16	6.5	95
	659N315/F414B27AF	0.04	136	9.31E+16	6.5	127
	624263/E204A27A	0.06	89	9.31E+16	7.0	83

Table 4.2.2-4 CPS - USE Calculation in RPV Extended Beltline Nozzle Weld Materials at 52 EFPY [1]						
Component	**Heat Number**	**%Cu**	**Initial USE (ft-lb)**	**1/4T Fluence (n/cm^2)**	**% Decrease USE**	**USE at 52 EFPY (ft-lb)**
CPS Nozzle Welds						
Welds for Nozzle N6	432N1891/G415B27AF	0.02	121	2.04E+17	8.0	111
	07R458/G418B27AH	0.03	122	2.04E+17	8.0	112
	661N635/G410B27AE	0.03	117	2.04E+17	8.0	108
	494K2351/A404A27AD	0.04	175	2.04E+17	8.0	161
	3P4955/0342 (Single)	0.023	90	2.04E+17	8.0	83
	3P4955/0342 (Tandem)	0.025	95	2.04E+17	8.0	87
	3P4955/3478 (Single)	0.02	111	2.04E+17	8.0	102
	3P4955/3478 (Tandem)	0.03	104	2.04E+17	8.0	96
	3P4955/0951 (Single)	0.03	93	2.04E+17	8.0	86
	3P4955/0951 (Tandem)	0.03	80	2.04E+17	8.0	74
	5P6756	0.08	126	2.04E+17	9.0	115
	623275/L121A27A	0.05	102	2.04E+17	8.0	94
	659N315/F414B27AF	0.04	136	2.04E+17	8.0	125
	624263/E204A27A	0.06	89	2.04E+17	8.5	81

Table 4.2.2-4 CPS - USE Calculation in RPV Extended Beltline Nozzle Weld Materials at 52 EFPY [1]						
Component	**Heat Number**	**%Cu**	**Initial USE (ft-lb)**	**1/4T Fluence (n/cm^2)**	**% Decrease USE**	**USE at 52 EFPY (ft-lb)**
CPS Nozzle Welds						
Welds for Nozzle N12	Inconel	NA	NA	NA	NA	NA
ISP – Best Estimate Chemistry						
ISP	3P4955/0342 (Single)	**[2]**	90	2.04E+17	8.0	83
	3P4955/0342 (Tandem)	**[2]**	95	2.04E+17	8.0	87
	3P4955/3478 (Single)	**[2]**	111	2.04E+17	8.0	102
	3P4955/3478 (Tandem)	**[2]**	104	2.04E+17	8.0	96
	3P4955/0951 (Single)	**[2]**	93	2.04E+17	8.0	86
	3P4955/0951 (Tandem)	**[2]**	80	2.04E+17	8.0	74
	5P6756	**[2]**	126	2.04E+17	9.0	115
ISP - Representative Material						
ISP	5P6756	**[3]**	126	8.17E+17	18.0	103

Table 4.2.2-4 CPS - USE Calculation in RPV Extended Beltline Nozzle Weld Materials at 52 EFPY [1]						
Component	**Heat Number**	**%Cu**	**Initial USE (ft-lb)**	**1/4T Fluence (n/cm^2)**	**% Decrease USE**	**USE at 52 EFPY (ft-lb)**
	5P6756	**[4]**	126	8.17E+17	20.0	101
	5P6756	**[5]**	126	8.17E+17	16.5	105
	5P6756	**[6]**	126	8.17E+17	12.5	110

Notes:

[1] ISP information for representative Vertical and Grith Welds from BWRVIP-135 Revision 4 is Proprietary.

[2] See Table D-1, D-16, and D-22 of BWRVIP-135, Revision 4.

[3] Considering RB183°F ISP data (BWRVIP-135, Revision 4 Table 2-12), Adjusted %Cu = 0.175, using higher fluence at circumferential weld between Shells #1 & #2.

[4] Considering SSP Capsule F data (BWRVIP-135, Revision 4 Table 2-12), Adjusted %Cu = 0.21, using higher fluence at circumferential weld between Shells #1 & #2.

[5] Considering SSP Capsule H data (BWRVIP-135, Revision 4 Table 2-12), Adjusted %Cu = 0.15, using higher fluence at circumferential weld between Shells #1 & #2.

[6] Considering SSP Capsule C data (BWRVIP-135, Revision 4 Table 2-12), No adjustment on %Cu, using higher fluence at circumferential weld between Shells #1 & #2.

Table 4.2.2-5
Comparison of CPS USE for Limiting Extended Beltline Materials [1, 2]

Item	Analysis	Limiting Extended Beltline Material	% Decrease - LRA Value	Allowable % Decrease	Comparison
1	USE/EMA **[1, 2, and 3]**	USE/EMA Extended Beltline Plate Material for Shell #1 (Limiting for plate Heats A2758-1& A2740-1)	11.5%	See Section B.2 of BWRVIP-74-A for 54 EFPY limits. **[4]**	The CPS LRA USE/EMA value 52 EFPY remains within the prescribed BWRVIP-74-A 54 EFPY limits.
2	USE/EMA **[1, 2, and 3]**	USE/EMA Extended Beltline Plate Material for Shell #3 (Limiting for plate Heats C4209-1, C4212-1 & C4245-1)	12.0%	See Section B.2 of BWRVIP-74-A for 54 EFPY limits. **[4]**	The CPS LRA USE/EMA value 52 EFPY remains within the prescribed BWRVIP-74-A 54 EFPY limits.

Notes:

[1] CPS requires USE evaluation in accordance with EMA because there is insufficient data available to establish an unirradiated USE for Shells #1 and #3.

[2] The design limit for USE is 50 ft-lb at end of license. The EMA methods provide design limits based upon percent decrease in USE that equate to the 50-ft-lb requirement.

[3] All the other components including nozzles meet the requirements of 50 ft-lb for LRA conditions.

[4} BWRVIP-74-A Is Proprietary.

Table 4.2.2-6 CPS Equivalent Margin Analysis for 52 EFPY Limiting Extended Beltline Shell 1 Plates		
ISP Surveillance Program Plate USE (Heat C3054-2):		
%Cu	=	0.08
Unirradiated USE	=	95.3 ft-lb
1st Capsule Measured USE	=	100.6 ft-lb
1st Capsule Fluence	=	1.16E+18 n/cm^2
1st Capsule Measured % Decrease	=	-5.3 ft-lb
1st Capsule RG 1.99 Predicted % Decrease	=	10.2 (RG 1.99, Rev. 2, Figure 2)
Limiting Extended Beltline Plates USE For Shell #1 (Heat A2758-1 and A2740-1):		
%Cu	=	0.11
52 EFPY ¼T Fluence	=	8.17E+17 n/cm^2
RG 1.99 Predicted % Decrease	=	11.5 (RG 1.99, Rev. 2, Figure 2)
Adjusted % Decrease	=	N/A (RG 1.99, Rev. 2, Position 2.2)
% Decrease Limit from BWRVIP-74-A	=	See Section B.2 of BWRVIP-74-A for 54 EFPY limits.
Comparison of Limiting % Decrease Value to Limit:		
11.5%	≤	See Section B.2 of BWRVIP-74-A for 54 EFPY limits **[1]**
Therefore, these vessel plates are bounded by Equivalent Margin Analysis		

Notes:

[1] BWRVIP-74-A Is Proprietary.

Table 4.2.2-7 CPS Equivalent Margin Analysis for 52 EFPY Limiting Extended Beltline Shell 3 Plates		
ISP Surveillance Plate USE (Heat C3054-2):		
%Cu	=	0.08
Unirradiated USE	=	95.3 ft-lb
1st Capsule Measured USE	=	100.6 ft-lb
1st Capsule Fluence	=	1.16E+18 n/cm^2
1st Capsule Measured % Decrease	=	-5.3 ft-lb
1st Capsule RG 1.99 Predicted % Decrease	=	10.2 (RG 1.99, Rev. 2, Figure 2)
Limiting Extended Beltline Plate USE For Shell #3 (Heat C4209-1, C4212-1, and C4245-1):		
%Cu	=	0.18
52 EFPY ¼T Fluence	=	2.80E+17 n/cm^2
RG 1.99 Predicted % Decrease	=	12.0 (RG 1.9 9, Rev. 2, Figure 2)
Adjusted % Decrease	=	N/A (RG 1.99, Rev. 2, Position 2.2)
% Decrease Limit From BWRVIP-74-A	=	See Section B.2 of BWRVIP-74-A for 54 EFPY limits.
Comparison of Limiting % Decrease Value to Limit:		
12.0%	≤	See Section B.2 of BWRVIP-74-A for 54 EFPY limits **[1]**
Therefore, vessel welds are bounded by Equivalent Margin Analysis		

Notes:

[1] BWRVIP-74-A Is Proprietary.

4.2.3 REACTOR PRESSURE VESSEL ADJUSTED REFERENCE TEMPERATURE (ART) ANALYSES

TLAA Description:

The Adjusted Reference Temperature (ART) of the limiting extended beltline materials is used to adjust the P-T limit curves to account for irradiation effects. Regulatory Guide 1.99, Revision 2 (Reference 4.8.23), provides the methodology for determining the ART of the limiting materials. The initial nil-ductility reference temperature, RT_{NDT}, is the temperature at which an unirradiated ferritic steel material changes in fracture characteristics from ductile to brittle behavior. RT_{NDT} is evaluated according to the procedures in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, Paragraph NB-2331. Neutron embrittlement increases the RT_{NDT} beyond its initial value.

10 CFR 50, Appendix G (Reference 4.8.7), defines the fracture toughness requirements for the life of the vessel. The shift in the initial RT_{NDT} (ΔRT_{NDT}) is evaluated as the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. This increase (ΔRT_{NDT}) determines how much higher the vessel temperature must be raised for the material to continue to act in a ductile manner. The ART is defined as: Initial RT_{NDT} + ΔRT_{NDT} + Margin. Since the ΔRT_{NDT} value is a function of 32 EFPY fluence in the current ART calculations associated with the 40-year current operating period, these ART analyses have been identified as TLAAs requiring evaluation for the period of extended operation.

TLAA Evaluation:

10 CFR 50, Appendix G, requires the determination of ART values for RPV extended beltline ferritic materials for the life of the station. The extended beltline plates, axial welds, and circumferential welds are fabricated from ferritic materials. The extended beltline also includes the N12 Water Level Instrument (WLI) nozzles and welds, which are partial penetration forgings fabricated from stainless steel with Inconel welds, thus not ferritic. The N12 nozzle penetrations have partial penetration welds, so the 1/4T location along the limiting pressure stress cross-section is located within the surrounding ferritic plate material, so it is appropriate to determine the ART value for these nozzles using the plate material properties. Therefore, the ART values for the N12 nozzles and welds have been determined using the fluence and the limiting material property values (chemistry and initial RT_{NDT}) for the surrounding ferritic plate material.

As described in Section 4.2.1, 52 EFPY fluence values have been determined for the extended beltline using the methodology specified in Regulatory Guide 1.99, Revision 2. The 1/4T fluence value for each location was derived from the inside surface (0T) fluence values based upon the fluence attenuation methods described in Regulatory Guide 1.99, Revision 2 (Reference 4.8.23).

- Table 4.2.3-1 provides the 52 EFPY ART results for the CPS extended beltline RPV shell plates and welds. All materials are shown to be acceptable with respect to the design limits.

- Table 4.2.3-2 provides the 52 EFPY ART results for the CPS extended beltline welds. All materials are shown to be acceptable with respect to the design limits.

- Table 4.2.3-3 provides the 52 EFPY ART results for the CPS extended beltline nozzles. All materials are shown to be acceptable with respect to the design limits.
- Table 4.2.3-4 provides the 52 EFPY ART results for the CPS extended beltline nozzle welds. All materials are shown to be acceptable with respect to the design limits.

The limiting location is listed below.

- The limiting ART value for the CPS RPV at 52 EFPY is 72.0 degrees F, which was computed for the girth weld between shell 1 and 2 (weld heat 76492).

The ART values of the limiting extended beltline locations at 52 EFPY remain below 200 degrees F, which is the Nil-Ductility Transition (RT_{NDT}) limit specified in NRC Regulatory Guide 1.99, Revision 2, Section 3.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The 52 EFPY RPV ART analyses have been satisfactorily projected through the period of extended operation.

Table 4.2.3-1
CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Plates and Welds

Extended Beltline I.D.	Heat No.	%Cu	%Ni	CF	Initial RT_{NDT} (ºF)	52 EFPY 1/4T Fluence (n/cm^2)	52 EFPY Δ RT_{NDT} (ºF)	Sigma-i	Sigma-Δ	Margin (ºF)	52 EFPY Shift (ºF)	52 EFPY ART (ºF)
CPS Shell 1 Plates:												
PC Mark 21-1-1	A2758-1	0.10	0.64	65	-10	8.17E+17	25	0	12	25	49	39
PC Mark 21-1-2	A2740-1	0.11	0.66	75	-30	8.17E+17	28	0	14	28	57	27
CPS Shell 2 Plates:												
PC Mark 22-1	C4363-2	0.06	0.62	37	-30	6.15E+18	32	0	16	32	64	34
PC Mark 22-3	C4380-2	0.07	0.63	44	-20	6.15E+18	38	0	17	34	72	52
PC Mark 22-4	C43203-2	0.05	0.64	31	-20	6.15E+18	27	0	13	27	54	34
CPS Shell 3 Plates:												
PC Mark 23-1-1	C4209-1	0.18	0.63	135	-20	2.80E+17	28	0	14	28	57	37
PC Mark 23-1-2	C4212-1	0.18	0.65	136	-20	2.80E+17	29	0	14	29	57	37
PC Mark 23-1-3	C4245-1	0.18	0.62	135	-30	2.80E+17	28	0	14	28	57	27

Table 4.2.3-2
CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Welds and Integrated Surveillance Program Plates and Welds [1]

Extended Beltline I.D.	Heat No.	%Cu	%Ni	CF	Initial RT_{NDT} (ºF)	52 EFPY 1/4T Fluence (n/cm^2)	52 EFPY ΔRT_{NDT} (ºF)	Sigma-i	Sigma-Δ	Margin (ºF)	52 EFPY Shift (ºF)	52 EFPY ART (ºF)
CPS Vertical Welds for Shell, Seam BA and BB:												
Seam BA and BB	432N1891/G415B27AF	0.02	0.99	27	-70	7.04E+17	9	0	5	9	19	-51
	07R458/G418B27AH	0.03	0.94	41	-60	7.04E+17	14	0	7	14	29	-31
	661N635/G410B27AE	0.03	1.02	41	-70	7.04E+17	14	0	7	14	29	-41
	494K2351/A404A27AD	0.04	1.10	54	-70	7.04E+17	19	0	9	19	38	-32
	3P4955/0342 (Single)	0.023	0.95	31	-20	7.04E+17	11	0	5	11	22	2
	3P4955/0342 (Tandem)	0.025	0.90	34	-20	7.04E+17	12	0	6	12	24	4
	3P4955/0951 (Single)	0.03	0.93	41	-50	7.04E+17	14	0	7	14	29	-21
	3P4955/0951 (Tandem)	0.03	0.89	41	-60	7.04E+17	14	0	7	14	29	-31
	5P6756	0.08	0.96	108	-60	7.04E+17	38	0	19	38	76	16
	623275/L121A27A	0.05	0.84	68	-70	7.04E+17	24	0	12	24	48	-22
	659N315/F414B27AF	0.04	1.00	54	-70	7.04E+17	19	0	9	19	38	-32
	624263/E204A27A	0.06	0.89	82	-70	7.04E+17	29	0	14	29	57	-13
CPS Vertical Welds for Shell, Seam BE, BF, and BG:												
	3P4955/0342 (Single)	0.023	0.95	31	-20	6.15E+18	27	0	13	27	54	34

Table 4.2.3-2
CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Welds and Integrated Surveillance Program Plates and Welds [1]

Extended Beltline I.D.	Heat No.	%Cu	%Ni	CF	Initial RT_{NDT} (ºF)	52 EFPY 1/4T Fluence (n/cm^2)	52 EFPY Δ RT_{NDT} (ºF)	Sigma-i	Sigma-Δ	Margin (ºF)	52 EFPY Shift (ºF)	52 EFPY ART (ºF)
BE, BF, and BG	3P4955/0342 (Tandem)	0.025	0.90	34	-20	6.15E+18	29	0	15	29	59	39
CPS Vertical Welds for Shell, Seam BJ, BK, and BM:												
BJ, BK, and BM:	432N1891/G415B27AF	0.02	0.99	27	-70	2.75E+17	6	0	3	6	11	-59
	07R458/G418B27AH	0.03	0.94	41	-60	2.75E+17	9	0	4	9	17	-43
	661N635/G410B27AE	0.03	1.02	41	-70	2.75E+17	9	0	4	9	17	-53
	494K2351/A404A27AD	0.04	1.10	54	-70	2.75E+17	11	0	6	11	23	-47
	3P4955/0342 (Single)	0.023	0.95	31	-20	2.75E+17	7	0	3	7	13	-7
	3P4955/0342 (Tandem)	0.025	0.90	34	-20	2.75E+17	7	0	4	7	14	-6
	3P4955/0951 (Single)	0.03	0.93	41	-50	2.75E+17	9	0	4	9	17	-33
	3P4955/0951 (Tandem)	0.03	0.89	41	-60	2.75E+17	9	0	4	9	17	-43
	5P6756	0.08	0.96	108	-60	2.75E+17	23	0	11	23	45	-15
	623275/L121A27A	0.05	0.84	68	-70	2.75E+17	14	0	7	14	28	-42
	659N315/F414B27AF	0.04	1.00	54	-70	2.75E+17	11	0	6	11	23	-47
	624263/E204A27A	0.06	0.89	82	-70	2.75E+17	17	0	9	17	34	-36

Table 4.2.3-2 CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Welds and Integrated Surveillance Program Plates and Welds [1]												
Extended Beltline I.D.	**Heat No.**	**%Cu**	**%Ni**	**CF**	**Initial RT_{NDT} (ºF)**	**52 EFPY 1/4T Fluence (n/cm^2)**	**52 EFPY ΔRT_{NDT} (ºF)**	**Sigma-i**	**Sigma-Δ**	**Margin (ºF)**	**52 EFPY Shift (ºF)**	**52 EFPY ART (ºF)**
ISP - Best-Estimate Chemistry												
ISP	3P4955/0342 (Single)	**[2]**	**[2]**	37	-20	6.15E+18	32	0	16	32	64	44
	3P4955/0342 (Tandem)	**[2]**	**[2]**	37	-20	6.15E+18	32	0	16	32	64	44
	3P4955/0951 (Single)	**[2]**	**[2]**	37	-50	7.04E+17	13	0	6	13	26	-24
	3P4955/0951 (Tandem)	**[2]**	**[2]**	37	-60	7.04E+17	13	0	6	13	26	-34
	5P6756	**[2]**	**[2]**	108	-60	7.04E+17	38	0	19	38	76	16
ISP – Representative Material												
ISP	5P6756 **[3]**	**[2]**	**[2]**	154	-60	7.04E+17	54	0	14	28	82	22
CPS Girth Welds Between Shells 1 and 2												
Girth Welds Between Shell 1 and 2	76492/L430B27AE	0.10	1.08	135	-30	8.17E+17	51	0	25	51	102	72
	76616/A506B27AF	0.02	0.98	27	-70	8.17E+17	10	0	5	10	20	-50
	431T1831/A626B27AG	0.03	0.98	41	-40	8.17E+17	15	0	8	15	31	-9
	661N635/G410B27AE	0.03	1.02	41	-70	8.17E+17	15	0	8	15	31	-39
	422P5621/L414B27AD	0.07	1.08	95	-60	8.17E+17	36	0	18	36	72	12
	401S0351/B511B27AG	0.03	0.98	41	-70	8.17E+17	15	0	8	15	31	-39

Table 4.2.3-2
CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Welds and Integrated Surveillance Program Plates and Welds [1]

Extended Beltline I.D.	Heat No.	%Cu	%Ni	CF	Initial RT_{NDT} (ºF)	52 EFPY 1/4T Fluence (n/cm^2)	52 EFPY ΔRT_{NDT} (ºF)	Sigma-i	Sigma-Δ	Margin (ºF)	52 EFPY Shift (ºF)	52 EFPY ART (ºF)
	3P4955/0951 (Single)	0.03	0.93	41	-50	8.17E+17	15	0	8	15	31	-19
	3P4955/0951 (Tandem)	0.03	0.89	41	-60	8.17E+17	15	0	8	15	31	-29
	5P6756	0.08	0.96	108	-60	8.17E+17	41	0	20	41	82	22
	623275/L121A27A	0.05	0.84	68	-70	8.17E+17	26	0	13	26	51	-19
	659N315/F414B27AF	0.04	1.00	54	-70	8.17E+17	20	0	10	20	41	-29
	624263/E204A27A	0.06	0.89	82	-70	8.17E+17	31	0	15	31	62	-8
CPS Girth Welds Between Shells 2 and 3												
Girth Welds Between Shell 2 and 3	76492/L430B27AE	0.10	1.08	135	-30	2.80E+17	28	0	14	28	57	27
	76616/A506B27AF	0.02	0.98	27	-70	2.80E+17	6	0	3	6	11	-59
	431T1831/A626B27AG	0.03	0.98	41	-40	2.80E+17	9	0	4	9	17	-23
	661N635/G410B27AE	0.03	1.02	41	-70	2.80E+17	9	0	4	9	17	-53
	422P5621/L414B27AD	0.07	1.08	95	-60	2.80E+17	20	0	10	20	40	-20
	401S0351/B511B27AG	0.03	0.98	41	-70	2.80E+17	9	0	4	9	17	-53
	3P4955/0951 (Single)	0.03	0.93	41	-50	2.80E+17	9	0	4	9	17	-33
	3P4955/0951 (Tandem)	0.03	0.89	41	-60	2.80E+17	9	0	4	9	17	-43

Table 4.2.3-2 CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Welds and Integrated Surveillance Program Plates and Welds [1]												
Extended Beltline I.D.	**Heat No.**	**%Cu**	**%Ni**	**CF**	**Initial RT_{NDT} (ºF)**	**52 EFPY 1/4T Fluence (n/cm^2)**	**52 EFPY Δ RT_{NDT} (ºF)**	**Sigma-i**	**Sigma-Δ**	**Margin (ºF)**	**52 EFPY Shift (ºF)**	**52 EFPY ART (ºF)**
	5P6756	0.08	0.96	108	-60	2.80E+17	23	0	11	23	46	-14
	623275/L121A27A	0.05	0.84	68	-70	2.80E+17	14	0	7	14	29	-41
	659N315/F414B27AF	0.04	1.00	54	-70	2.80E+17	11	0	6	11	23	-47
	624263/E204A27A	0.06	0.89	82	-70	2.80E+17	17	0	9	17	35	-35
ISP - Best-Estimate Chemistry												
ISP	3P4955/0951 (Single)	**[2]**	**[2]**	37	-50	8.17E+17	14	0	7	14	28	-22
ISP	3P4955/0951 (Tandem)	**[2]**	**[2]**	37	-60	8.17E+17	14	0	7	14	28	-32
ISP	5P6756	**[2]**	**[2]**	108	-60	8.17E+17	41	0	20	41	82	22
ISP – Representative Materials:												
ISP	5P6756 [3]	**[2]**	**[2]**	154	-60	8.17E+17	58	0	14	28	86	26

Notes:

[1] BWRVIP-74-A and BWRVIP-135 Revisions 4 are Proprietary**.**

[2] See Table D-1, D-16, and D-22 of BWRVIP-135, Revision 4.

[3] Adjusted CF = [CF (Vessel) / CF (ISP)] * CF (fitted) = [108/82] * 116.9 =154°F.

Table 4.2.3-3
CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Nozzles

Extended Beltline I.D.	Heat No.	%Cu	%Ni	CF	Initial RT_{NDT} (°F)	52 EFPY 1/4T Fluence (n/cm^2)	52 EFPY Δ RT_{NDT} (°F)	Sigma-i	Sigma-Δ	Margin (°F)	52 EFPY Shift (°F)	52 EFPY ART (°F)
CPS Extended Beltline Nozzle Forgings												
N1	Q2QL13W	0.17	0.85	133	-30	9.31E+16	14	0	7	14	28	-2
N2	Q2QL4W	0.11	0.84	77	-20	9.31E+16	8	0	4	8	16	-4
	Q2QL8QT	0.09	0.83	58	-30	9.31E+16	6	0	3	6	12	-18
	Q2QL8W	0.09	0.85	58	-20	9.31E+16	6	0	3	6	12	-8
N6	Q2QL8QT	0.17	0.83	133	-30	2.04E+17	23	0	12	23	46	16
	Q2QL19QT	0.10	0.80	67	-20	2.04E+17	12	0	6	12	23	3
N12 [1]	C4380-2	0.07	0.63	44	-20	2.24E+18	26	0	13	26	53	33

Notes:

[1] N12 nozzle material is stainless steel and weld material is Inconel. The limiting material for Shell #2 plate where N12 nozzles are welded is used.

Table 4.2.3-4
CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Nozzles Welds [1]

Extended Beltline I.D.	Heat No.	%Cu	%Ni	CF	Initial RT_{NDT} (ºF)	52 EFPY 1/4T Fluence (n/cm²)	52 EFPY Δ RT_{NDT} (ºF)	Sigma-i	Sigma-Δ	Margin (ºF)	52 EFPY Shift (ºF)	52 EFPY ART (ºF)
CPS Extended Beltline Nozzle Welds N1 and N2												
Extended Beltline Nozzle Welds N1 and N2	432N1891/G415B27AF	0.02	0.99	27	-70	9.31E+16	3	0	1	3	6	-64
	07R458/G418B27AH	0.03	0.94	41	-60	9.31E+16	4	0	2	4	9	-51
	661N635/G410B27AE	0.03	1.02	41	-70	9.31E+16	4	0	2	4	9	-61
	494K2351/A404A27AD	0.04	1.10	54	-70	9.31E+16	6	0	3	6	11	-59
	3P4955/0342 (Single)	0.023	0.95	31	-20	9.31E+16	3	0	2	3	7	-13
	3P4955/0342 (Tandem)	0.025	0.90	34	-20	9.31E+16	4	0	2	4	7	-13
	3P4955/3478 (Single)	0.02	0.97	27	-60	9.31E+16	3	0	1	3	6	-54
	3P4955/3478 (Tandem)	0.03	0.90	41	-60	9.31E+16	4	0	2	4	9	-51
	3P4955/0951 (Single)	0.03	0.93	41	-50	9.31E+16	4	0	2	4	9	-41
	3P4955/0951 (Tandem)	0.03	0.89	41	-60	9.31E+16	4	0	2	4	9	-51
	5P6756	0.08	0.96	108	-60	9.31E+16	11	0	6	11	23	-37
	623275/L121A27A	0.05	0.89	68	-70	9.31E+16	7	0	4	7	14	-56
	659N315/F414B27AF	0.04	1.00	54	-70	9.31E+16	6	0	3	6	11	-59
	624263/E204A27A	0.06	0.89	82	-70	9.31E+16	9	0	4	9	17	-53

Table 4.2.3-4 CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Nozzles Welds [1]												
Extended Beltline I.D.	**Heat No.**	**%Cu**	**%Ni**	**CF**	**Initial RT_{NDT} (ºF)**	**52 EFPY 1/4T Fluence (n/cm^2)**	**52 EFPY Δ RT_{NDT} (ºF)**	**Sigma-i**	**Sigma-Δ**	**Margin (ºF)**	**52 EFPY Shift (ºF)**	**52 EFPY ART (ºF)**
ISP Best Estimate Chemistry												
ISP	3P4955/0342 (Single)	**[2]**	**[2]**	37	-20	9.31E+16	4	0	2	4	8	-12
	3P4955/0342 (Tandem)	**[2]**	**[2]**	37	-20	9.31E+16	4	0	2	4	8	-12
	3P4955/3478 (Single)	**[2]**	**[2]**	37	-60	9.31E+16	4	0	2	4	8	-52
	3P4955/3478 (Tandem)	**[2]**	**[2]**	37	-60	9.31E+16	4	0	2	4	8	-52
	3P4955/0951 (Single)	**[2]**	**[2]**	37	-50	9.31E+16	4	0	2	4	8	-42
	3P4955/0951 (Tandem)	**[2]**	**[2]**	37	-60	9.31E+16	4	0	2	4	8	-52
	5P6756	**[2]**	**[2]**	108	-60	9.31E+16	11	0	6	11	23	-37
ISP Representative Material												
ISP	5P6756	**[2]**	**[2]**	154	-60	9.31E+16	16	0	8	16	32	-28
Extended Beltline Nozzle Welds N6												
Extended Beltline Nozzle Welds N6	432N1891/G415B27AF	0.02	0.99	27	-70	2.04E+17	5	0	2	5	9	-61
	07R458/G418B27AH	0.03	0.94	41	-60	2.04E+17	7	0	4	7	14	-46
	661N635/G410B27AE	0.03	1.02	41	-70	2.04E+17	7	0	4	7	14	-56
	494K2351/A404A27AD	0.04	1.10	54	-70	2.04E+17	9	0	5	9	19	-51

Table 4.2.3-4
CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Nozzles Welds [1]

Extended Beltline I.D.	Heat No.	%Cu	%Ni	CF	Initial RT_{NDT} (ºF)	52 EFPY 1/4T Fluence (n/cm^2)	52 EFPY Δ RT_{NDT} (ºF)	Sigma-i	Sigma-Δ	Margin (ºF)	52 EFPY Shift (ºF)	52 EFPY ART (ºF)
	3P4955/0342 (Single)	0.023	0.95	31	-20	2.04E+17	5	0	3	5	11	-9
	3P4955/0342 (Tandem)	0.025	0.90	34	-20	2.04E+17	6	0	3	6	12	-8
	3P4955/3478 (Single)	0.02	0.97	27	-60	2.04E+17	5	0	2	5	9	-51
	3P4955/3478 (Tandem)	0.03	0.90	41	-60	2.04E+17	7	0	4	7	14	-46
	3P4955/0951 (Single)	0.03	0.93	41	-50	2.04E+17	7	0	4	7	14	-36
	3P4955/0951(Tandem)	0.03	0.89	41	-60	2.04E+17	7	0	4	7	14	-46
	5P6756	0.08	0.96	108	-60	2.04E+17	19	0	9	19	38	-22
	623275/L121A27A	0.05	0.84	68	-70	2.04E+17	12	0	6	12	24	-46
	659N315/F414B27AF	0.04	1.00	54	-70	2.04E+17	9	0	5	9	19	-51
	624263/E204A27A	0.06	0.89	82	-70	2.04E+17	14	0	7	14	29	-41
ISP Best Estimate Chemistry												
ISP	3P4955/0342 (Single)	**[2]**	**[2]**	37	-20	2.04E+17	6	0	3	6	13	-7
	3P4955/0342 (Tandem)	**[2]**	**[2]**	37	-20	2.04E+17	6	0	3	6	13	-7
	3P4955/3478 (Single)	**[2]**	**[2]**	37	-60	2.04E+17	6	0	3	6	13	-47
	3P4955/3478 (Tandem)	**[2]**	**[2]**	37	-60	2.04E+17	6	0	3	6	13	-47

Table 4.2.3-4
CPS - 52 EFPY Adjusted Reference Temperature (ART) Values for Extended Beltline Nozzles Welds [1]

Extended Beltline I.D.	Heat No.	%Cu	%Ni	CF	Initial RT_{NDT} (ºF)	52 EFPY 1/4T Fluence (n/cm^2)	52 EFPY Δ RT_{NDT} (ºF)	Sigma-i	Sigma-Δ	Margin (ºF)	52 EFPY Shift (ºF)	52 EFPY ART (ºF)
	3P4955/0951 (Single)	**[2]**	**[2]**	37	-50	2.04E+17	6	0	3	6	13	-37
	3P4955/0951 (Tandem)	**[2]**	**[2]**	37	-60	2.04E+17	6	0	3	6	13	-47
	5P6756	**[2]**	**[2]**	108	-60	2.04E+17	19	0	9	19	38	-22
ISP Representative Materials												
ISP	5P6756 **[3]**	**[2]**	**[2]**	154	-60	2.04E+17	27	0	13	27	54	-6

Notes:

[1] BWRVIP-74-A and BWRVIP-135 Revision 4 are Proprietary.

[2] See Table D-1, D-16, and D-22 of BWRVIP-135, Revision 4.

[3] Adjusted CF = [CF (Vessel) / CF(ISP)] x CF (fitted) = [108 / 82] * 116.9 = 154°F.

4.2.4 REACTOR PRESSURE VESSEL PRESSURE-TEMPERATURE (P-T) LIMITS

TLAA Description:

10 CFR 50 Appendix G requires that the reactor pressure vessel is maintained within established pressure-temperature (P-T) limits, including heatup and cooldown operations. These limits specify the minimum acceptable reactor coolant temperature as a function of reactor pressure. As the reactor pressure vessel is exposed to increased neutron irradiation over time, its fracture toughness is reduced. The P-T limits must account for the change in material properties due to anticipated RPV fluence.

The current P-T limit curves are located in the CPS Technical Specifications and were developed for up to 32 EFPY at the EPU power level of 3473 MWt. Since the P-T curves are based on 32 EFPY projections for the current 40-year operating term, the P-T limit curves have been identified as TLAAs requiring evaluation for the period of extended operation.

TLAA Evaluation:

In accordance with NUREG-1800, Revision 2 (Reference 4.8.2), Section 4.2.2.1.3, for stations that have approved P-T limit reports, the P-T limits for the period of extended operation need not be submitted as part of the LRA since they are required to be updated through the 10 CFR 50.90 licensing process. It further states that for those stations that have approved P-T limit reports, the P-T limits for the period of extended operation will be updated at the appropriate time through the station’s Administrative Section of the Technical Specifications and the station’s PTLR process. In either case, the 10 CFR 50.90 or the PTLR process, whichever constitutes the current licensing basis, will ensure that the P-T limits for the period of extended operation will be updated prior to the expiration of the 32 EFPY P-T limit curves.

The CPS P-T limits are currently located in the Technical Specifications, but a PTLR may be submitted for NRC approval for the next P-T limit update, which must occur prior to 32 EFPY. Updated P-T limits will be approved for use prior to exceeding 32 EFPY. Maintenance of the P-T limits during the period of extended operation will be managed using the applicable process as described above.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) of the RPV will be adequately managed through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii). P-T limits will be updated prior to exceeding 32 EFPY as currently required by Technical Specifications or by the PTLR process and the station's Administrative Section of the Technical Specifications if a PTLR report has been approved at that time.

4.2.5 REACTOR PRESSURE VESSEL CIRCUMFERENTIAL WELD FAILURE PROBABILITY ANALYSES

TLAA Description:

CPS has previously applied for and been granted alternative relief examination requirements for RPV circumferential weld inspection, as described in the NRC Safety Evaluation dated December 30, 2009 (Reference 4.8.21).

The recommendations for inspection of reactor pressure vessel shell welds in BWRVIP-05 (Reference 4.8.28) include examination of 100 percent of the axial welds and inspection of the circumferential welds only at the intersection of these welds with the axial welds. Generic Letter 98-05 (Reference 4.8.30) informed BWR licensees that they may request such relief from the requirement to inspect circumferential welds by demonstrating that, at the expiration of their license, the circumferential welds will continue to satisfy the limiting conditional failure probability for circumferential welds in the NRC SER (Reference 4.8.29 and 4.8.31) that evaluated BWRVIP-05 (References 4.8.28). The weld failure frequency is dependent upon given assumptions of flaw density, distribution, location, and projected fluence. Since the current circumferential weld failure probability analysis for CPS, that was included in the 2009 request, is based upon 32 EFPY fluence values associated with the current 40-year operating term, it has been identified as a TLAA requiring evaluation for the period of extended operation.

TLAA Evaluation:

The NRC analysis provided in “Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report” (Reference 4.8.29) computed a circumferential weld failure probability of 1.78E-05 for a vessel fabricated by CB&I at 64 EFPY, which was deemed acceptable.

In order to evaluate the CPS reactor circumferential weld failure probability for 60 years, 52 EFPY fluence values have been projected for each circumferential weld, as described in Section 4.2.1.1. Using the inside surface (0T) fluence values for these welds, the CPS mean RT_{NDT} values have been determined for the circumferential (girth) welds within the extended beltline. There are two CPS reactor circumferential welds (between shell 1 and 2 and shell 2 and 3).

Table 4.2.5-1 provides comparisons between the NRC circumferential weld probability analysis at 64 EFPY and the CPS analysis at 52 EFPY for the limiting circumferential weld. Since the CPS mean RT_{NDT} value of 30.1 degrees F for the limiting circumferential weld (Heat 76492) at 52 EFPY is less than the NRC value of 70.6 degrees F for the CB&I vessel at 64 EFPY, the CPS RPV circumferential weld failure probability is bounded by the NRC failure probability of 1.78E-05, consistent with the requirements defined in GL 98-05.

Reapplication for relief from circumferential weld examination will be made in accordance with 10 CFR 50.55a(z)(1) for NRC review and approval prior to exceeding 32 EFPY. The station-specific information described above for 52 EFPY demonstrates that at the end of the period of extended operation, the circumferential extended beltline weld materials meet the limiting conditional failure probability for circumferential welds specified in the NRC’s Final Safety Evaluation Report of BWRVIP-05.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The CPS RPV circumferential weld failure probability analysis has been projected through the period of extended operation. Relief from inspection of circumferential welds will be requested through reapplication under the 10 CFR 50.55a process.

Table 4.2.5-1
CPS Circumferential Weld Failure Probability Analyses

Parameter	NRC Staff Analysis for 64 EFPY (Circumferential Welds) [1]	CPS Analysis for 52 EFPY (Circumferential Weld Heat 76492)
Copper Content (%)	0.10	0.10
Nickel Content (%)	0.99	1.08
Chemistry Factor (CF)	134.9	135
Fluence at 0T (n/cm^2)	1.02E+19	1.15E+18
Unirradiated Reference Temperature $RT_{NDT(U)}$ (ºF)	-65	-30
Shift in Reference Temperature ΔRT_{NDT} (ºF) (without margin) **[2]**	135.6	60.1
Mean RT_{NDT} (ºF)	70.6	30.1
Conditional Failure Probability	1.78E-05	**[3]**

NOTES:

[1] The NRC data is obtained from Table 2.6-5 of BWRVIP-05 Report, "Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report, July 28, 1998 (Reference 4.8.29), with corrected Chemistry Factors from the Supplement to the Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report, March 7, 2000 (Reference 4.8.31).

[2] $\Delta RT_{NDT} = CF * f^{(0.28 - 0.10 \log f)}$, where "f" is fluence in units of E+19 n/cm^2.

[3] Although a conditional failure probability has not been calculated, the fact that the CPS Mean RT_{NDT} at the end of the period of extended operation is less than the 64 EFPY value provided by the NRC, leads to the conclusion that the CPS RPV conditional failure probability is bounded by the NRC analysis, consistent with the requirements defined in GL 98-05.

4.2.6 REACTOR PRESSURE VESSEL AXIAL WELD FAILURE PROBABILITY ANALYSES

TLAA Description:

NRC SER to BWRVIP-74-A (Reference 4.8.22) documents the RPV axial weld failure probability for CPS at the end of 40 years of operations.

Since the current axial weld failure probability for CPS is included in this SER and is based upon 40 years of operation, this has been identified as a TLAA requiring evaluation for the period of extended operation.

In addition, Applicant Action Item 12 of this SER requires that license renewal applicants must evaluate axially oriented RPV welds to show that their failure frequency remains below the value calculated in the BWRVIP-74 SER Table 1.

TLAA Evaluation:

The NRC analysis provided in Table 3 of the Supplement to the Final Safety Evaluation of the BWRVIP-05 Report, dated March 7, 2000 (Reference 4.8.31) computed a RPV failure frequency of 5.02E-06 due to failure of limiting axial welds in the BWR fleet.

In order to evaluate axial weld failure probability for 60 years for the CPS reactor vessel, 52 EFPY fluence projections have been developed for the inside surface (0T) of the limiting axial welds, as described in Section 4.2.1.1. Using the bounding inside surface fluence value, the mean RT_{NDT} values have been determined for these welds, where the mean RT_{NDT} value does not include the margin term (M) described in RG 1.99, Revision 2, consistent with the evaluation methodology described in Section 2.1 of the March 7, 2000, supplement to the final safety evaluation (Reference 4.8.31). The results are shown in LRA Table 4.2.6-1.

LRA Table 4.2.6-1 provides a comparison of the limiting RPV axial weld mean RT_{NDT} value at 52 EFPY (without margin) to the mean RT_{NDT} value (without margin) determined for the limiting reactor in the March 7, 2000, supplement to the final safety evaluation. Since the mean RT_{NDT} value of 114 degrees F from the NRC analysis bounds the limiting CPS RPV mean RT_{NDT} value of 15.3 degrees F, the Staff failure probability of 5.02E-06 is bounding for the CPS RPV axial welds at 52 EFPY.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The CPS RPV axial weld failure probability analysis has been satisfactorily projected through the period of extended operation.

Table 4.2.6-1 CPS Axial Weld Failure Probability Analyses		
Parameter	**NRC BWRVIP-05 Supplement of SER (Mod 2)**	**CPS Bounding Analysis for 52 EFPY (Weld Heat 3P4955/0342) [1]**
Copper Content (%)	0.219	ISP Program Information BWRVIP-135 Revision 4 Table D-1 **[4]**
Nickel Content (%)	0.996	ISP Program Information BWRVIP-135 Revision 4 Table D-1 **[4]**
Chemistry Factor (CF)	231.1	36.8
Fluence at 0T (n/cm^2)	1.48E+18	8.65E+18
Unirradiated Reference Temperature $RT_{NDT(U)}$ (ºF)	-2	-20
Shift in Reference Temperature ΔRT_{NDT} (ºF) (without margin) **[2]**	116	35.3
Mean RT_{NDT} (ºF)	114	15.3
Vessel Failure Frequency	5.02E-06	**[3]**

NOTES:

[1] ISP best estimate chemistry is considered.

[2] $\Delta RT_{NDT} = CF * f^{(0.28 - 0.10 \log f)}$, where f is fluence in units of E+19 n/cm^2.

[3] Although a vessel failure frequency has not been calculated, the fact that the CPS Mean RT_{NDT} at the end of the period of extended operation is less than the 32 EFPY values provided by the NRC leads to the conclusion that the CPS RPV failure frequency is bounded by the NRC analysis, consistent with the requirements defined in BWRVIP-05.

[4] BWRVIP-135 Revision 4 is Proprietary.

4.2.7 REACTOR PRESSURE VESSEL REFLOOD THERMAL SHOCK ANALYSIS

TLAA Description:

10 CFR 50 Appendix A, General Design Criterion 31 requires that the reactor coolant pressure boundary of a light water reactor be designed such that it possesses adequate margin against non-ductile failure for all postulated conditions. USAR Section 3.1.2.4.2 documents that the CPS RPV conforms to this design requirement.

For Boiling Water Reactors (BWRs) designed by General Electric, this requirement was demonstrated both by development of P-T limit curves, which are addressed in LRA Section 4.2.4, and a generic fracture mechanics analysis (Reference 4.8.35) prepared in 1979 that evaluates the effects of the limiting Loss of Coolant Accident (LOCA) event. For clarity, the 1979 analysis will be described in this TLAA description section.

The purpose of the 1979 analysis was to assess the capability of General Electric BWR vessels to withstand the consequences of a design basis LOCA event without compromising the structural integrity of the vessel. In analyzing the LOCA event for a fracture evaluation, two types of pipe rupture can be postulated: a steam line break or a recirculation line break. Both events assume a guillotine rupture of the line when the reactor is operating at full power. Evaluation of heat transfer conditions and temperature gradients showed that the steam line break is more severe than the recirculation line break from the viewpoint of thermal stresses and brittle fracture. Therefore, the steam line break is the controlling design basis accident for the purpose of this evaluation.

Following the postulated guillotine rupture of the steam line, the reactor undergoes rapid depressurization during which two-phase flow with boiling occurs. Immediately following the break, the large increase in core void fraction due to depressurization causes a sharp reduction in reactor power and a control rod scram will be initiated in less than a second. Several Emergency Core Cooling Systems (ECCS) are activated following the break and there is rapid depressurization from 1050 psi to about 120 psi in approximately one minute. Following this there is a more gradual depressurization to ambient pressure at approximately 300 seconds after the pipe break. During the entire LOCA event, the water level in the vessel stays well above the top of the active fuel zone. Therefore, the extended beltline region that is being evaluated is surrounded by water on the inside surface.

Prior to the LOCA, the vessel wall was assumed to be in steady-state equilibrium with the reactor coolant at 550 degrees F. The analysis shows that at 300 seconds into the event, the applied stress intensity factor, $K_{I\text{-applied},}$ reaches a peak value of approximately 100 ksi$\sqrt{}$in, then slowly decreases. By this 300-second point in the event, the vessel wall temperature at the 1/4T depth from the inside surface is reduced from 550 degrees F to approximately 400 degrees F.

Immediately after the accident and before the vessel coolant is subcooled by the ECCS flow, the reactor undergoes rapid depressurization. Boiling occurs at the interface between the vessel wall and the reactor coolant. As a result, the heat transfer regime is forced two-phase convection with boiling for which the heat transfer coefficient is potentially as high as 10,000 BTU/hr-ft^2 ^{o}F.

Sometime after all ECCS systems are initiated, the coolant flow is sufficient to sub-cool the bulk liquid inventory, and the flow regime changes to forced convection of sub-cooled water over a metal surface, where a heat transfer coefficient of 500 BTU/hr-ft^2 ºF could be assumed. To add conservatism to the analysis, the higher heat transfer coefficient was assumed through the entire depressurization period (i.e., up to 300 seconds) after the pipe break when the pressure reaches ambient conditions. After 300 seconds, the lower heat transfer coefficient was assumed for the remainder of the LOCA event.

The acceptance criterion used in this fracture mechanics analysis is that the resulting maximum applied stress intensity factor, K_I, present during the bounding Emergency or Faulted condition (Service Level C and D), which is the crack driving force for postulated flaws in the reactor vessel, is less than the limiting material resistance to fracture, K_{Ic}, applicable during the event. Thermal analysis was performed using a finite element program and an axisymmetric finite element model. The maximum applied stress intensity factor was calculated as a function of crack depth for a postulated surface crack in the extended beltline region of the RPV wall for the combined thermal, pressure, and residual stresses. Temperature distributions through the wall thickness at different times during the event were determined. The maximum applied thermal stress intensity factor, K_I, was determined to be 100 ksi$\sqrt{in}$ at 300 seconds after the LOCA.

The available toughness, calculated as a function of crack tip temperature and fluence level, was determined (in accordance with ASME Section XI) to be beyond the highest available toughness in the code curves (200 ksi$\sqrt{in}$). Therefore, the maximum value of 200 ksi$\sqrt{in}$ on the curves was assumed. This value is significantly greater than the maximum applied stress intensity factor of 100 ksi$\sqrt{in}$ at all times during the transient. It was concluded that the RPV has considerable margin to failure by brittle fracture even in the presence of large postulated initial flaws. Since the material fracture toughness exceeds the maximum applied stress intensity factor at that point in the event by a significant margin, an existing flaw in the vessel would not propagate due to brittle fracture during a LOCA.

Since this generic analysis takes credit for available toughness which can be influenced by accumulated fluence over the operating life of the station, this analysis has been identified as a TLAA that requires evaluation for the period of extended operation.

TLAA Evaluation:

Updated 60-year fracture mechanics evaluations have been performed for the reflood thermal shock event using station-specific reactor pressure vessel data for the CPS reactor vessel. The limiting adjusted reference temperature (ART) values for the CPS RPV extended beltline materials, based upon 52 EFPY fluence projections, have been used in this fracture mechanics analysis. The ART is the RT_{NDT} value adjusted to account for increased fluence during the life of the component.

The analysis next determined if these limiting materials will have sufficient fracture toughness at 52 EFPY to resist the maximum applied stress intensity factor of 100 ksi$\sqrt{in}$ computed in the original analysis. This was done by determining the temperature required to achieve a fracture toughness of 200 ksi$\sqrt{in}$ when using the equation for fracture toughness stress intensity for crack initiation (K_{Ic}) presented in Appendix A of ASME Section XI.

By setting K_{IC} = 200 ksi√in, and using the limiting 52 EFPY ART value for the CPS extended beltline, the temperature at which K_{IC} reaches 200 ksi√in, was determined to be 176.25 degrees F. This is well below approximately 400 degrees F, which is the 1/4T temperature predicted for the thermal shock event at the time of peak stress intensity. Therefore, the analysis has been satisfactorily projected through the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The RPV reflood thermal shock analysis has been satisfactorily projected through the period of extended operation.

4.2.8 JET PUMP BEAM BOLTS AND CORE PLATE BOLTS PRELOAD RELAXATION ANALYSES

TLAA Description:

GEH design basis evaluations of RPV internal components considered preload relaxation due to accumulated fluence. For CPS this included the jet pump beam bolts and core plate bolts. The fluence values used as input to the jet pump beam bolts and core plate bolts evaluations for 40 years of operations are documented in proprietary reports. The evaluations demonstrated that preload relaxation for 40 years of operations would be acceptable. Since the neutron fluence values were assumed through the end of the current 40-year operating term, the design basis evaluations have been identified as TLAAs that require evaluation for the period of extended operation.

TLAA Evaluation:

CPS RPV internal components with preloaded joints were evaluated for preload relaxation after 60 years of service using fluence projections for 52 EFPY. These evaluations are documented in a GEH proprietary report. The evaluations used location specific fluence projections, at 52 EFPY, and GEH material data for the bolting components. The evaluation of the clamping loads, with relaxation, at 52 EFPY for the jet pump beam bolts and core plate bolts were calculated to be greater than the clamping loads necessary to meet the component design basis requirements.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The jet pump beam bolts and core plate bolts design evaluations for preload relaxation due to fluence accumulation have been satisfactorily projected through the period of extended operation.

4.2.9 CORE SHROUD REPAIR STABILIZER ASSEMBLY BRACKET PRELOAD RELAXATION ANALYSIS

TLAA Description:

In 2006, CPS pre-emptively installed core shroud stabilizer assembly brackets because of industry intergranular stress corrosion cracking (IGSCC) concerns documented in Generic Letter 94-03. These assemblies maintain the alignment of the core shroud to the reactor pressure vessel and the originally designed reactor flow partitions. This new configuration replaced the structural functions of the core shroud horizontal welds (H1 through H7). Each stabilizer assembly consists of a tie rod, an upper and lower stabilizer, an upper support, and other connecting members. The tie rod and upper support provide the vertical load restraint capability from the top of the shroud to the RPV shroud support plate, as well as positioning the new radial stabilizers.

The assembly design analysis evaluated loss of pre-load relaxation of the assembly tie rods. This evaluation, which was documented in a proprietary GEH report, demonstrated that the pre-load relaxation over the 40-year operating life of the station would not exceed design requirements.

Since this analysis evaluated fluence effects on tie rod relaxation over the 40-year operating life of CPS, this analysis has been identified as a TLAA that requires evaluation for the period of extended operation.

TLAA Evaluation:

The CPS RPV core shroud stabilizer assembly bracket tie rods were evaluated for pre-load relaxation after 60 years of service using fluence projections for 52 EFPY. This evaluation was documented in a GEH proprietary report, which demonstrated that the peak fluence projections at 52 EFPY are significantly less than the fluence assumed in the original design evaluation.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The core shroud stabilizer assembly brackets tie rod design evaluations for preload relaxation due to fluence accumulation have been satisfactorily evaluated through the period of extended operation.

4.2.10 REACTOR PRESSURE VESSEL CORE SUPPORT STRUCTURE STRAIN EVALUATION

TLAA Description:

CPS design specifications required calculated strain assessments of reactor core support structure components fabricated from 304, 304L, 308, and 308L austenitic stainless steels which exceeded specified fluence thresholds. These specified requirements were not required by ASME Section III. As a result, evaluations demonstrating that the specified criteria were met for the 40-year life of the station, were documented in the original component design stress reports.

Since the original stress reports evaluated fluence effects on material properties over the 40-year operating life of the station, these analyses have been identified as TLAAs that require evaluation for the period of extended operation.

TLAA Evaluation:

In support of the CPS License Renewal application, GEH evaluated core support structure components fabricated from austenitic stainless steels using 60-year fluence projections (52 EFPY). LRA Section 4.2.1.2 describes how the fluence projections were developed. This evaluation was documented in a proprietary report and demonstrated that core support structure components fabricated from applicable austenitic stainless steels, which exceed the specified fluence values, meet the design specification strain acceptance criteria. The report evaluated the following core support structure components: the shroud, shroud support, top guide, core plate, core plate wedges, orificed fuel support, peripheral fuel support, control rod guide tubes, and control rod housing.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – Core support structure components fabricated from 304, 304L, 308, and 308L austenitic stainless-steel materials have been satisfactorily evaluated for calculated strain, through the period of extended operation.

4.2.11 TOP GUIDE IASCC ANALYSIS

TLAA Description:

For periodic RPV Top Guide inspections, the BWR Vessel Internals aging management program (B.2.1.9) utilizes the recommendations provided in BWRVIP-26-A, "BWR Vessel and Internals Project, BWR Top Guide Inspection and Flaw Evaluation Guidelines," and BWRVIP-183, "BWR Vessel and Internals Project, Top Guide Grid Beam Inspection and Flaw Evaluation Guidelines." BWRVIP-183 documents a fluence threshold value of 5.0E+20 n/cm^2 beyond which Irradiation Assisted Stress Corrosion Cracking (IASCC) may occur in BWR vessel internal components.

Applicant Action Item Number 4 in the NRC SER to BWRVIP-26-A states that license renewal applicants referencing BWRVIP-26-A for aging management should identify and evaluate the projected neutron fluence which is compared to the inspection threshold as a potential TLAA. Therefore, the 60-year fluence projections used to assess top guide inspection requirements have been conservatively designated as a TLAA.

TLAA Evaluation:

60-year fluence values for the CPS RPV top guide are projected to exceed the threshold of 5.0E+20 n/cm^2. Therefore, the top guide will be inspected periodically for cracking during the period of extended operation in accordance with the BWR Vessel Internals aging management program (B.2.1.9) and recommendations in BWRVIP-26-A.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – Aging effects of IASCC of the RPV top guide will be managed by the BWR Vessel Internals aging management program (B.2.1.9) through the period of extended operation.

4.3 METAL FATIGUE ANALYSES

Fatigue analyses are performed on components designed to ASME, Section III, Class 1 and Class MC and CS requirements. In addition, certain other codes such as ASME Section III, Class 2 and 3, and USAS (ANSI) B31.1, may require a fatigue analysis or assume a stated number of full-range thermal and displacement transient cycles. Chapter 4.1, NUREG-1800, Revision 2, also provides examples of components that are likely to have fatigue TLAAs within the current licensing basis (CLB) that would require evaluation for the period of extended operation. Searches were performed to identify these and any other potential fatigue TLAAs within the CLB for Clinton Power Station (CPS). Each potential TLAA was evaluated against the six screening criteria specified in 10 CFR 54.3, as described in Section 4.1, above. Those that were identified as CPS fatigue TLAAs were evaluated using 60-year transient cycle and 60-year cumulative usage factor (CUF) projections. The results are summarized in the following subsections:

- Transient Cycle and Cumulative Usage Projections for 60 Years (Section 4.3.1)
- ASME Section III, Class 1 RPV and Piping Component Fatigue Analyses (Section 4.3.2.1)
- Environmentally Assisted Fatigue Analyses for Class 1 RPV and Piping (Section 4.3.2.2)
- ASME Section III Class 1 Components (Section 4.3.3)
- ASME Section III, Class 1 Fatigue Exemptions (Section 4.3.4)
- ASME Section III, Class 2, Class 3 and ANSI B31.1 Allowable Stress Analyses and Related HELB Selection Analyses (Section 4.3.5)
- High-Energy Line Break (HELB) Analyses Based on Cumulative Fatigue Usage (Section 4.3.6)
- Reactor Vessel Internals Fatigue Analyses (Section 4.3.7.1)

4.3.1 TRANSIENT CYCLE AND CUMULATIVE USAGE PROJECTIONS FOR 60 YEARS

Fatigue analyses are based upon explicit numbers (occurrences) and amplitudes of thermal and pressure transients usually described in design specifications. The intent of the design basis transient definitions is to bound a wide range of possible events with varying ranges of severity in temperature and pressure. The existing fatigue analyses are based upon the specified transient definitions and the number of transient occurrences postulated to bound 40 years of service.

Projections of transient occurrences through the period of extended operation were developed to determine whether the existing analyses remain valid for 60 years. These transients are documented in Table 4.3.1-1.

The second column of the table provides the transient description, and the third column lists the cumulative numbers of transient occurrences as of September 30, 2022. The fourth column documents 60-year projected occurrences based on station operating history, as described below. The fifth column documents the specified number of occurrences which were originally postulated to bound 40 years of service.

A review of Fatigue Monitoring (B.3.1.1) program data was performed to trend the number of cumulative occurrences for each transient on Table 4.3.1-1 that has occurred at CPS up to September 30, 2022. Since most nuclear power stations, including CPS, have experienced a significant declining trend in accumulation of transients over time, transient projections based on recent operating experience provides an accurate basis for future projections. Therefore, the extrapolated rates, for transients with current occurrences greater than zero, were weighted (by 75 percent) with the recent 10-year occurrence rate rather than the overall occurrence rate. CPS has not experienced transients 12, 22, 23, 24, 25, 26, 27, 31, 32, 39, and 41, many of which are Emergency or Faulted events. Therefore, to ensure conservative CUF projections the 60-year projected occurrences for each of these transients was assumed to be one occurrence over 60 years.

The 60-year projected number of occurrences were determined by adding the number of past occurrences up to September 30, 2022, to the number of predicted future occurrences.

For Normal, Upset, and Testing transients the 60-year projected occurrences are less than the specified transient occurrences originally postulated to bound 40 years of service, with two minor exceptions. The exceptions are the “Design Hydrostatic Test”, Turbine Roll”, and “Hot Zero Power Scram” transients, and will be discussed later in this section.

The CPS Fatigue Monitoring (B.3.1.1) program monitors the applicable station transients and transient occurrences, as specified in the underlying component fatigue analyses. The SI:FatiguePro™ software is used at CPS to determine the overall effect of the cumulative numbers of transient occurrences that have occurred at a given time and determines actual accumulated CUF and CUF_{en} values for all monitored component locations resulting from the combination of transient cycles that have occurred during the period.

The CPS SI:FatiguePro™ automated software uses temperature and pressure parameters, including the rates of changes of these parameters, to properly count and categorize transient occurrences and calculate CUF and CUF_{en} values for critical station components. The transient occurrences detected and saved by SI:FatiguePro™ are periodically reviewed to ensure all transient occurrences are correctly captured. This review also ensures that the transient severities used in the fatigue calculations remain bounding.

The fourth column of LRA Table 4.3.1-2 documents actual CUF values as of September 30, 2022, for the bounding components that will be monitored by SI:FatiguePro™ during the period of extended operation. The 60-year projected transient occurrence values shown in the fourth column of Table 4.3.1-1 were used as input to calculate projected 60-year CUF values for bounding Class 1 RPV and piping component locations not wetted by reactor coolant. These results are documented in the fifth column of Table 4.3.1-2.

The 60-year projected transient occurrence values shown in the fourth column of LRA Table 4.3.1-1 were also used to calculate CUF values adjusted for environmentally assisted fatigue (CUF_{en}) of bounding Class 1 RPV and piping component locations wetted by reactor coolant. These results are documented in the sixth column of Table 4.3.1-2.

The 60-year projected CUF and CUF_{en} values in Table 4.3.1-2 are compared to the appropriate acceptance criterion in the seventh column (e.g., 1.0 for component locations wetted or not wetted by reactor coolant or 0.1 for HELB component locations). All projected 60-year CUF and CUF_{en} values in Table 4.3.1-2 meet the appropriate acceptance criteria.

The assumed number of design transient occurrences for 40 years does not represent a final design limit; rather, the design limit is that the accumulated CUF or CUF_{en} value does not exceed a value of 1.0 or 0.1. Since the CUF or CUF_{en} value of a component is computed as a function of multiple thermal and pressure transients, increasing the number of transient occurrences for one transient type to a value greater than the number assumed in the fatigue analyses may not cause the actual accumulated CUF or CUF_{en} value to exceed the corresponding limit. For example, even though the “Design Hydrostatic Test”, “Turbine Roll” and “Hot Zero Power Scram” 60-year projected occurrences exceed the originally postulated number of occurrences, as shown on LRA Table 4.3.1-1, the resulting 60-year projected cumulative CUF or CUF_{en} values of the corresponding components remain below the ASME Section III limit of 1.0.

As explained in Section 4.3.2.2, for the license renewal application an environmentally assisted fatigue (EAF) screening evaluation was performed on CPS Class 1 RPV and piping component locations. The evaluation identified NUREG/CR-6260 component locations and other potentially more bounding component locations which will be monitored for EAF during the period of extended operation. As a result, the Fatigue Monitoring (B.3.3.1) program will be enhanced to monitor these components for EAF. The SI:FatiguePro™ software will be updated, for the period of extended operation, to calculate CUF_{en} values for component locations that are already monitored and wetted by reactor coolant. In addition, new component locations identified in the EAF screening evaluation will be added to the software for EAF monitoring.

Therefore, during the period of extended operation, as long as the CUF or CUF_{en} values do not exceed the applicable criteria, the design limits remain satisfied. If monitored incremental CUF or CUF_{en} values exceed 80 percent of the applicable limit, then the condition will be entered into the corrective action program and evaluated for corrective action to be taken prior to exceeding the applicable final design limit acceptance criterion.

The 60-year transient cycle projections provided in Table 4.3.1-1 and the 60-year CUF and CUF_{en} projections provided in Table 4.3.1-2, are used to evaluate the fatigue TLAAs in Sections 4.3.2 through 4.3.7, 4.6, and 4.7.

Table 4.3.1-1
CPS USAR Table 3.9-1 Transients (09/30/22) and 60-Year Projections

Transient Number (Note 1)	Transient Description	Cumulative Transient Cycles To-Date	60-Year Projected Transient Occurrences	Number of Design Transient Occurrences	USAR Sections and Tables
Normal, Upset, and Testing Conditions					
1	Boltup	24	41	123	USAR Table 3.9-1
2	Design Hydrostatic Test	27	44	40	USAR Table 3.9-1
3	Startup and Heatup (100ºF/hr. max)	63	101	120	USAR Table 3.9-1
4	Turbine Roll	79	123	120	USAR Table 3.9-1(a)
8	Turbine Trip with Steam Bypass (TBHL – Turbine Trip)	1	2	10	USAR Table 3.9-1(a)
9	Partial Feedwater Heater Bypass	13	15	70	USAR Table 3.9-1(a)
10	Scram – Turbine Generator Trip, Feedwater On, Isolation Valves Stay Open	60 (Note 2)	81 (Note 2)	180 (Note 2)	USAR Table 3.9-1
11	Scram – Other Scrams				USAR Table 3.9-1
12	OBE	0	1	1 (Note 3)	USAR Table 3.9-1
13	Reduction to 0% Power, Shutdown (100°F/hr. Cooldown Rate)	42	75	111	USAR Table 3.9-1
14	Hot Standby	44	53	111	USAR Table 3.9-1
15 and 17	Shutdown	61	98	111	USAR Table 3.9-1
16	Vessel Flooding	32	63	111	USAR Table 3.9-1(a)
18	Unbolt	23	40	123	USAR Table 3.9-1

Table 4.3.1-1 CPS USAR Table 3.9-1 Transients (09/30/22) and 60-Year Projections					
Transient Number (Note 1)	**Transient Description**	**Cumulative Transient Cycles To-Date**	**60-Year Projected Transient Occurrences**	**Number of Design Transient Occurrences**	**USAR Sections and Tables**
20	Composite Loss of Feedwater Pumps, Loss of Auxiliary Power and Turbine Generator Trip Without Bypass	2	5	10	USAR Table 3.9-1(a)
21	Turbine Bypass Single Relief or Safety Valve Blowdown	1	3	8	USAR Table 3.9-1
28	Single Loop Operation – each loop	7 Loop A 6 Loop B	9 Loop A 9 Loop B	50	USAR Table 3.9-1
29	HOTZERO – Hot Zero Power Scram	10	21	17	NA
30	HPCS Injection	4	7	40	NA
31	LPCI – LPCI Injection	0	1	10	NA
32	LPCS – LPCS Injection	0	1	10	NA
33	RCIC – RCIC Injection	31	38	123	NA
34	RHRRCIC – RHR RCIC Injection	34	53	111	NA
35	RWCU_LOSS – RWCU Cycles	74	93	400	NA
36	SDC – Shutdown Cooling in Service	56	87	111	NA
37	SRV Actuation (ALL)	260	300	1512	NA
38	SRV Actuation (Individual - Maximum - 51D)	26	30	NA	NA
Emergency and Faulted Conditions					
22	Scram – Reactor Overpressure with Delayed Scram, Feedwater Stays On, Isolation Valves Stay Open (Emergency)	0	1	1	USAR Table 3.9-1

Table 4.3.1-1
CPS USAR Table 3.9-1 Transients (09/30/22) and 60-Year Projections

Transient Number (Note 1)	Transient Description	Cumulative Transient Cycles To-Date	60-Year Projected Transient Occurrences	Number of Design Transient Occurrences	USAR Sections and Tables
23	Scram – Automatic Depressurizations (Blowdown) System Actuation (Emergency)	0	1	1	USAR Table 3.9-1
24	Sudden Start of Cold Recirculation Loop (Emergency)	0	1	1	USAR Table 3.9-1
25	Improper Start of Pump in Cold Recirculation Loop (Emergency)	0	1	1	USAR Table 3.9-1
26	Hot Standby – Drain Shutoff Pump Restart (Emergency)	0	1	1	USAR Table 3.9-1
27	Pipe Rupture and Blowdown (Faulted)	0	1	1	USAR Table 3.9-1
39	Safe Shutdown Earthquake (SSE) – Faulted	0	1	1	USAR Table 3.9-1
40	Leak Test	2	5	111	NA
41	Standby Liquid Control Injections	0	1	10	NA

Note 1: Transients 1 through 27 are based on the original GE thermal cycle diagrams for the reactor vessel. Transient 28 through 41 were added since they are associated with transients that contribute to fatigue usage on other components. Although transients 5, 6, and 7 of the GE thermal cycle diagrams are listed in USAR Table 3.9-1, these transients do not contribute to fatigue and therefore are not listed in this table. Transients 10 and 11 were combined in the CPS Thermal Fatigue Monitoring Program. Transient 19 in the original GE thermal cycle diagrams is Refuel. USAR Table 3.9.1(a) omits cycle limits for refuel cycles and therefore, this transient is not on this table.

Note 2: This total includes transients 10 and 11. The original GE cycle thermal cycle diagrams specified 40 occurrences of transient 10 and 140 occurrences of transient 11. For monitoring purposes these transients were combined. The GE cycle thermal cycle transient definitions of these two are similar.

Note 3: Per USAR Sections 3.9.1.1.13 and 3.7.3.2.1 and Tables 3.9-1 and 3.9-1(a), a minimum of one (1) OBE occurrence with 10 equivalent maximum stress cycles were assumed for Class 1 components.

Table 4.3.1-2 CPS – Bounding Component Locations and 60-Year Projected CUF and CUF_{en} Values						
No.	**Component Location Description**	**Currently Monitored Location**	**CUF as of 9/30/22**	**60-Year CUF**	**60-Year CUF_{en}**	**Acceptance Criterion**
1	Shroud Support (RPV_SHRDSPRT)	Yes	0.211	0.265	(Note 3)	1.0
2	10" Nozzle-Shell Junction Element 169 (RPV_RRINNOZ)	Yes	0.041	(Note 4)	0.104	1.0
3	Vibration Instrument nozzle-Shell Junction (RPV_VIBNOZ)	Yes	0.058	(Note 4)	0.201	1.0
4	Miscellaneous Bracket Element 340 (RPV_MISCBRKT)	No	0.039	(Note 4)	0.819	1.0
5	CRD HSR Nozzle-Vessel Junction Element 217 (RPV_CRDHSRNOZ)	No	0.096	(Note 4)	0.336	1.0
6	Vessel at CRD Penetration, E 504 (Note 1) (RPV_ATCRDPEN)	No	0.472	(Note 4)	0.483	1.0
7	FW Nozzle Safe End Element 228 (RPV_FWNSE-CS)	No	0.239	(Note 4)	0.372	1.0
8	Core Spray Nozzle Safe End Point 982 (Note 1) (RPV_CSNSE)	No	0.045	(Note 4)	0.211	1.0
9	Core Spray Nozzle Safe End Ext. Point 61 (Note 1) (RPV_CSNSE-E)	No	0.013	(Note 4)	0.046	1.0
10	Liquid Control/DP Nozzle Safe End Element 456 (RPV_LCDPNSE)	No	0.030	(Note 4)	0.124	1.0
11	RHR/LPCI Nozzle Safe End Element 221 (RPV_LPCINSE)	No	0.016	(Note 4)	0.037	1.0
12	RHR/LPCI Nozzle Element 42 (RPV_LPCINOZ)	No	0.015	(Note 4)	0.070	1.0
13	1FW-01/02 Node 140B (Note 1) (FW_140B)	Yes	0.230	(Note 4)	0.228	1.0
14	1FW-03A Piping Node 10 (Note 2) (FW_10)	Yes	0.017	0.025	(Note 5)	0.1
15	1FW-03A Node 187 (Note 2) (FW_187)	Yes	0.048	0.069	(Note 5)	0.1
16	1MS-05 Node 345 (MS_345)	Yes	0.185	(Note 4)	0.825	1.0
17	1MS-06 Node 325 (Note 2) (MS_325)	Yes	0.040	0.060	(Note 5)	0.1

Table 4.3.1-2
CPS – Bounding Component Locations and 60-Year Projected CUF and CUF_{en} Values

No.	Component Location Description	Currently Monitored Location	CUF as of 9/30/22	60-Year CUF	60-Year CUF_{en}	Acceptance Criterion
18	1MS-38A Node 450/460 at Valve 1B21-F067B (Note 2) (MS_460)	Yes	0.028	0.038	(Note 5)	0.1
19	1MS-38A Node 85 at Valve 1B21-F067C (MS_85)	No	0.090	(Note 4)	0.866	1.0
20	1RI-11 Node 160 Vent Side (RI_160)	Yes	0.110	(Note 4)	0.632	1.0
21	Node 735 RHR Tee to Valve (Note 1) (RR_735)	Yes	0.018	(Note 4)	0.035	1.0
22	Node 60 Recirc Suction Pipe (Note 1) (RR_60)	No	0.092	(Note 4)	0.528	1.0
23	1RR-32 Node 15 (RR_15)	Yes	0.086	(Note 4)	0.339	1.0
24	1RT-01 Section C/F Node B470 (RT_B470)	Yes	0.200	(Note 4)	0.364	1.0
25	RWCU Node 10 (Note 2) (RT_10)	Yes	0.028	0.043	(Note 5)	0.1
26	1RH-03 Node 5RPV (RH_5RPV)	No	0.021	(Note 4)	0.043	1.0
27	RHR/LPCI Penetration 1MC-17 (PEN_RHR)	No	0.092	(Note 4)	0.051	1.0
28	Shell/Closure Flanges (RPV_FLANGE)	Yes	0.249	0.380	(Note 3)	1.0
29	Closure Studs (RPV_STUDS)	Yes	0.396	0.636	(Note 3)	1.0
30	Support Skirt (RPV_SUPTSKT)	Yes	0.529	0.753	(Note 3)	1.0
31	CRD penetration (RPV_CRDPEN)	Yes	0.291	0.356	(Note 3)	1.0
32	Refueling Bellows Support (RPV_REFBEL)	Yes	0.173	0.267	(Note 3)	1.0
33	Stabilizer Bracket Element 113 (RPV_STABBRT)	Yes	0.154	0.237	(Note 3)	1.0
34	1RI-01 Node 55B (Note 2) (RI_55B)	Yes	0.013	0.016	(Note 5)	0.1
35	1RI-11 Node 15 Bolts (RI_15)	Yes	0.268	0.430	(Note 3)	1.0

Table 4.3.1-2 CPS – Bounding Component Locations and 60-Year Projected CUF and CUF_{en} Values						
No.	**Component Location Description**	**Currently Monitored Location**	**CUF as of 9/30/22**	**60-Year CUF**	**60-Year CUF_{en}**	**Acceptance Criterion**
36	1RI-11 Node 17 Bolts (RI_17)	Yes	0.275	0.447	(Note 3)	1.0
37	1SC-07 Node 455 (SC_455)	Yes	0.234	0.274	(Note 3)	1.0
38	FWNOZ_BR_N4AB	Yes	0.103	(Note 4)	0.436	1.0
39	FWNOZ_BR_N4CD	Yes	0.103	(Note 4)	0.436	1.0
40	FWNOZ_SE_N4AB (Note 1)	Yes	0.233	(Note 4)	0.941	1.0
41	FWNOZ_SE_N4CD (Note 1)	Yes	0.207	(Note 4)	0.752	1.0

NOTES:

Note 1: NUREG/CR-6260 component location.

Note 2: High Energy Line Break Exclusion Analysis Component Location (see Section 4.3.6).

Note 3: CUF_{en} is not applicable for this component location because it is not wetted by reactor coolant environment.

Note 4: The CUF value is not included in the table because it is bounded by the CUF_{en} value in column 6.

Note 5: CUF_{en} is not used for this component location for comparison to the HELB Exclusion criteria of 0.1.

4.3.2 ASME SECTION III, CLASS 1 AND ENVIROMENTALLY ASSISTED FATIGUE ANALYSES

4.3.2.1 ASME SECTION III, CLASS 1 RPV AND PIPING COMPONENT FATIGUE ANALYSES

TLAA Description:

The CPS reactor pressure vessel (RPV) was designed to Class 1 requirements in accordance with the ASME Code Section III, 1971 Edition including Addenda up to Summer 1973. As a result, the design analyses contained fatigue evaluations of Class 1 RPV components, such as the vessel nozzles.

In addition, CPS Class 1 piping systems were designed in accordance with the ASME Code Section III, 1974 Edition including Summer 1974 Addenda or Subsection NB, 1983 Edition with Addenda up to Winter 1984. As a result, the Class 1 piping design analyses contained fatigue evaluations.

These fatigue evaluations assumed explicit transients and transient occurrences that were specified for the 40-year design life of the station and demonstrated that the CUF of these component locations did not exceed the ASME Section III design limit of 1.0. Table 4.3.1-1 documents the transients that were assumed in these Class 1 fatigue evaluations.

These Class 1 fatigue evaluations have been identified as TLAAs that require evaluation for the period of extended operation.

TLAA Evaluation:

For license renewal, the original Class 1 fatigue evaluations were evaluated for a 60-year service life, as well as for environmentally assisted fatigue (EAF), as described in Section 4.3.2.2.

As described in Section 4.3.1, transient occurrences that were assumed in the Class 1 fatigue evaluations were projected for 60 years, based on CPS operating experience. The 60-year projected transient occurrence values shown in Table 4.3.1-1 were used as input to calculate, consistent with the original fatigue evaluations, projected 60-year CUF or CUF_{en} values for bounding Class 1 component locations. These results are documented in the 5th and 6th columns of Table 4.3.1-2. This table also documents, in the 4th column, accumulated CUF values as of September 30, 2022, for bounding component locations that are currently monitored by the SI:FatiguePro^{TM} software.

Table 4.3.1-2 demonstrates that the 60-year projected values of CUF for all bounding component locations will remain less than the ASME Section III limit of 1.0, through the period of extended operation.

To ensure the projected CUF values in Table 4.3.1-2 remain acceptable for the 60-year period of extended operation, the Fatigue Monitoring (B.3.1.1) program will monitor actual transient occurrences and compute associated accumulated CUF values for all limiting component locations. Corrective actions will be taken, if necessary, prior to exceeding the ASME Section III limit. The Fatigue Monitoring (B.3.1.1) program will continue to use SI:FatiguePro^{TM} to compute actual CUF values, for bounding component locations not wetted with reactor coolant. In addition, the

SI:FatiguePro™ software will be updated to compute CUF_{en} values for bounding component locations in contact with reactor coolant. Section 4.3.2.2 describes how these component locations were selected.

The Fatigue Monitoring program includes requirements that initiate corrective actions if any accumulated CUF value exceed 80 percent of the ASME Section III limit. Corrective actions may include revision of the affected Class 1 fatigue analysis, establishing an inspection program using an approach acceptable to the NRC (such as inspections performed in accordance with Appendix L of ASME Code Section XI), or repair or replacement of affected components prior to the CUF value exceeding the ASME Section III limit.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of fatigue on the intended functions of RPV and piping components analyzed in accordance with ASME Section III, Class 1 requirements will be managed by the Fatigue Monitoring (B.3.1.1) program through the period of extended operation.

4.3.2.2 ENVIRONMENTALLY ASSISTED FATIGUE ANALYSES FOR CLASS 1 RPV AND PIPING

TLAA Description:

NUREG-1801, Revision 2, Section X.M1, Fatigue Monitoring, provides guidance for evaluating the effects of the reactor water environment on the fatigue life of ASME Section III Class 1 components that are in contact with the reactor coolant. One acceptable method for satisfying this guidance is to assess the impact of the reactor coolant environment on a sample set of critical components. These critical components should include those listed in NUREG/CR-6260 for CPS's plant type and vintage. Additional component locations should also be considered if they are more limiting than those listed in NUREG/CR-6260, for CPS's plant type and vintage.

This assessment for EAF has been identified as a TLAA that requires evaluation.

TLAA Evaluation:

For the CPS license renewal application, EAF screening calculations were performed for all Class 1 RPV and piping component locations that have identified CUF values in a CLB stress report or evaluation, and are in contact with reactor water (wetted). In addition, environmental fatigue calculations were prepared in accordance with NUREG/CR-6909 Revision 1 for component locations listed in NUREG/CR-6260 for newer-vintage BWRs, and other potentially bounding component locations.

Consistent with NUREG-1801, Revision 2, Section X.M1, environmental effects were evaluated using the guidance in Regulatory Guide (RG) 1.207, Revision 1.

<u>Environmentally Assisted Fatigue (EAF) Screening</u>

The EAF screening calculation methodology is described below.

1) Class 1 RPV and piping component locations that have documented cumulative usage factors (CUFs) in the CLB were identified.

2) Each identified component location was categorized as to whether the location is in contact with reactor water (wetted). For "wetted" locations, a bounding 60-year F_{en} screening value ($F_{en60scr}$) and a bounding 60-year screening CUF_{en} value ($U_{en60scr}$) were determined. F_{en} screening values are based on the component material, maximum operating temperature, and bounding dissolved oxygen. Sulfur content is also an input for carbon and low alloy steels component F_{en} screening values.

3) Component locations in contact with the reactor coolant which are already monitored by SI:FatiguePro™, or are NUREG/CR-6260 component locations are "Screened In."

4) Component locations in contact with reactor coolant that are not already monitored by SI:FatiguePro™ were identified for further consideration per Step 5 below.

5) Components were grouped together into thermal zones. A "thermal zone" is defined as a collection of piping and/or vessel locations that undergo essentially the same thermal and pressure transients during plant operations. Within each material type in a thermal zone the following was performed:

a. The component location with the greatest 60-year screening CUF_{en} value was "Screened In."

b. The component location with the second highest CUF_{en} within each material type was "Screened In," only if the 60-year screening CUF_{en} value for this component location was within 25 percent of the highest CUF_{en} location in Step 5.a, above.

c. It was verified that component locations that were eliminated were originally evaluated to the same technical rigor as those component locations which were "Screened In."

This methodology "Screened In" 25 bounding component locations in which 12 component locations were already monitored by the SI:FatiguePro™ software and identified 13 component locations that will be added to the SI:FatiguePro™ software prior to the period of extended operation. Of these 25 component locations, eight are representative of the recommended NUREG/CR-6260 component locations.

The SI:FatiguePro™ software monitors an additional 10 component locations which are not wetted by reactor coolant and an additional six component locations are monitored as HELB Exclusion locations.

All 41 component locations are documented in Table 4.3.1-2.

<u>Environmentally Assisted Fatigue (EAF) Analyses</u>

Detailed EAF evaluations were performed on all the "Screened In" component locations as follows.

For all component locations, 60-year fatigue usage values were calculated using ASME Code methodology (NB-3222.4(e)) except that the applicable fatigue curves from NUREG/CR-6909 Revision 1 were used in addition to the applicable ASME Code fatigue curves. The allowable number of occurrences (N) were determined by interpolating the applicable fatigue curves. The projected 60-year cumulative usage values (CUFs) were then determined by dividing the 60-year occurrence projections (n) on Table 4.3.1-1 by the allowable number of occurrences (N), consistent with the underlying basis fatigue evaluations. The effects of extended power uprate (EPU), if any, were accounted for in the calculation.

For component locations that are wetted by reactor coolant, environmental fatigue correction factors (F_{ens}) were used to account for the effect of the reactor water in accordance with the methodology in NUREG/CR-6909 Revision 1. Projected 60-year usage values adjusted for environmental fatigue (CUF_{en}) were calculated by multiplying the projected 60-year usage values (CUF) by the environmental fatigue correction factors (F_{ens}).

All projected 60-year usage values (CUF) and projected 60-year usage values adjusted for environmental fatigue (CUF_{en}) are documented in Table 4.3.1-2.

The detailed environmental fatigue analyses described within this section will be incorporated into the CLB prior to the start of the period of extended operation. In addition, the SI:FatiguePro™ software will be updated prior to the period of extended operation with the EAF methodology described in the analyses.

The Fatigue Monitoring (B.3.1.1) program includes requirements that initiate corrective actions if any accumulated CUF_{en} value exceed 80 percent of the ASME Section III acceptance criterion. Corrective actions may include revision of the affected EAF analysis, establishing an inspection program using an approach acceptable to the NRC (such as inspections performed in accordance with Appendix L of ASME Code Section XI), or repair or replacement of affected components prior to the CUF_{en} value exceeding the ASME Section III limit.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of environmentally assisted fatigue on the intended functions of RPV and piping components will be managed by the Fatigue Monitoring (B.3.1.1) program through the period of extended operation.

4.3.3 ASME Section III, Class 1 Components

4.3.3.1 Main Steam System Transients

TLAA Description:

The CPS main steam system was designed as a Class 1 system in accordance with ASME Section III, 1974 Edition with Summer 1974 Addenda. USAR Section 3.9.1.1.5, "Main Steam Transients," documents the transients and transient occurrences considered in the design analysis of this piping system.

Table 4.3.3.1-1 documents the specified transients and transient occurrences from USAR Section 3.9.1.1.5. The resulting fatigue evaluations contained in the design analyses calculated various piping component CUF values. The maximum calculated design CUF values of bounding piping component locations were 0.41, 0.12, and 0.09 for 40 years.

Since the analyses resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, these analyses have been identified as TLAAs that must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.3.1-1 below documents 60-year transient projections taken from Table 4.3.1-1. This table illustrates that the projected occurrences are less than the assumed occurrences in the design analyses, with the minor exception of the Hydrostatic Test transient. The three main steam system bounding component locations discussed above, nodes MS_345, MS_325, and MS-460, are monitored by SI:FatiguePro™. Table 4.3.1-2 shows that the 60-year CUF and CUF_{en} projections for these component locations should not exceed the ASME Section III limit of 1.0 prior to the end of the period of extended operation. Therefore, even though the Hydrostatic Test transient 60-year projection of 44 exceeds the 40 occurrences assumed in the design analyses, the resulting projected CUF values for main steam components are significantly below the ASME Limit of 1.0.

The Fatigue Monitoring (B.3.1.1) program will continue to use SI:FatiguePro™ to compute actual cumulative CUF and CUF_{en} values for all monitored locations. With this approach, the original assumed number of transient occurrences are no longer limits; instead, the ASME Section III acceptance criteria are the limits for each monitored location.

The Fatigue Monitoring (B.3.1.1) program includes requirements that initiate corrective actions if any CUF or CUF_{en} values exceed 80 percent of the ASME Section III acceptance criteria. Corrective actions may include revision of the affected Class 1 fatigue analyses to address higher CUF or CUF_{en} values, establishing an inspection program using an approach acceptable to the NRC (such as inspections performed in accordance with Appendix L of ASME Code Section XI based on flaw tolerance analysis), or repair or replacement of affected components prior to the CUF or CUF_{en} values exceeding their allowed values.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of fatigue on the intended functions of main steam system piping components analyzed in accordance with

ASME Section III, Class 1 requirements will be managed by the Fatigue Monitoring (B.3.1.1) program through the period of extended operation.

Table 4.3.3.1-1 – Main Steam System Transients		
Specified Transients	**Specified Occurrences**	**60 Year Transient Projections**
Hydrotest	40	44
Leak Test	360	5
Startup	120	101
Turbine Trip (TBHL – Turbine Bypass)	10	2
Scram, Turbine Generator Trip, Feedwater on, Isolation Valves Open	40	81 (Note 1)
Scram, Other	140	
Shutdown	111	98
Composite Loss of Feedwater Pumps and Auxiliary Power, and Turbine Generator Trip Without Bypass	10	5
Turbine Bypass Single Relief or Safety (Blowdown)	8	3
Operating Basis Earthquake (OBE)	2 OBE events, each with 30 peaks	1
Turbine Stop Valve Closure	660	91
Relief Valves Lift (RLV)	5,433	300
Reactor Overpressure with Delayed Scram (Emergency)	1	1
Automatic Depressurization System Actuations (Emergency)	1	1

Note 1 - The original GE cycle thermal cycle diagrams specified 40 occurrences of the “Scram, Turbine Generator Trip, Feedwater on, Isolation Valves Open” transient and 140 occurrences of the “Scram, Other” transient 11. For monitoring purposes these transients were combined.

4.3.3.2 Main Steam Isolation Valve Transients

TLAA Description:

The CPS main steam isolation valves (MSIVs) were procured as Class 1 components in accordance with ASME Section III, Subsection NB, July 1974. USAR Section 3.9.1.1.8, “Main Steam Isolation Valve Transients,” documents specified transients and transient occurrences considered in the design of these valves.

Table 4.3.3.2-1 documents the specified transients and transient occurrences from USAR Section 3.9.1.1.8. The resulting fatigue evaluations contained in the MSIV design analysis calculated various valve subcomponent CUF values, all of which were less than 0.08 for 40 years.

Since the design analysis resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The design analysis evaluated fatigue in accordance with ASME Section III, Subsection NB-3500, “Valve Design,” and considered all the transients on Table 4.3.3.2-1 below. This table also documents the 60-year transient projections taken from Table 4.3.1-1. This table shows that the specified occurrences are greater than the transient projections, or the contribution of the specified transient occurrences is insignificant to fatigue, or the transient was excluded from the design analysis because it is a one time “Emergency or Faulted Event,” which is not expected to occur during the life of the station. In addition, the table demonstrates that the specified transient occurrences are conservative for an additional 20 years or the transient is not required to be evaluated for fatigue, per ASME Section III Subsection NB-3552.

Therefore, the transients and transient occurrences that were specified for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The specified transients and transient occurrences remain valid through the period of extended operation.

Table 4.3.3.2-1 – Main Steam Isolation Valves Transients		
Specified Transients	**Specified Occurrences**	**Comments**
Startup/Shutdown (100°F/ hr.)	300	Per Section III, NB-3552(d) the analysis assumed 2,000 occurrences of alternating stresses that bound normal Startup and Shutdown transients. 60-year projections, from Table 4.3.1-1, for these transients are 101 Startups and 98 Shutdowns.
Small Temperature Changes of 29°F Between 70°F and 552°F	600	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(b).
Small Temperature Changes of 50°F Between 70°F and 552°F (Step Change)	200	Approximately 9,000 occurrences will result in a CUF of 1.0, which is not credible.
Loss of Feedwater Pump/MSIV Closure	10	60-year projections, from Table 4.3.1-1, for these transients are 5 Loss of Feedwater Pump/MISV Closure.
Single Relief Valve Blowdown	8	Approximately 3,000 occurrences will result in a CUF of 1.0. 60-year projections, from Table 4.3.1-1, for this transient is 3 SRV Blowdowns.
Automatic Blowdown (Emergency)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c).
Pipe Rupture and Blowdown (Faulted)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c).
Reactor Overpressure with Delayed Scram (Emergency)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c).

4.3.3.3 Safety/Relief Valve Transients

TLAA Description:

The CPS safety/relief valves were procured as Class 1 components in accordance with ASME Section III, Subsection NB, July 1974 Edition with Addenda up to and including Summer 1976. USAR Section 3.9.1.1.9, “Safety/Relief Valve Transients,” documents the transients and transient occurrences considered in the design analysis of these valves.

Table 4.3.3.3-1 documents the specified transients and transient occurrences from USAR Section 3.9.1.1.9. The resulting fatigue evaluation contained in the design analysis calculated various valve subcomponent CUF values, all of which were less than 0.01 for 40 years.

Since the design analysis resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The design analysis evaluated fatigue in accordance with ASME Section III, Subsection NB-3500, “Valve Design,” and considered all the transients on Table 4.3.3.3-1 below. This table also documents the 60-year transient projections from Table 4.3.1-1. This table shows that the specified occurrences are greater than the transient projections, or the contribution of the specified transient occurrences is insignificant to fatigue, or the transient was excluded from the design analysis because it is a one time “Emergency or Faulted Event,” which is not expected to occur during the life of the station. In addition, the table demonstrates that the specified transient occurrences are conservative for an additional 20 years or the transient is not required to be evaluated for fatigue, per ASME Section III Subsection NB-3552.

Therefore, the transients and transient occurrences that were considered for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The specified transients and transient occurrences remain valid through the period of extended operation.

Table 4.3.3.3-1 – Safety/Relief Valve Transients		
Specified Transients	**Specified Occurrences**	**Comments**
Heat and Cooldown (Reactor Startup/Shutdown)	300	Per Section III, NB-3545.3 the analysis assumed 2,000 occurrences of alternating stresses that bound normal Startup and Shutdown transients. 60-year projections, from Table 4.3.1-1, for these transients are 101 Startups and 98 Shutdowns.
Small Temperature Changes of 29°F Between 70°F and 552°F	600	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(b). However, more than approximately 1,000,000 occurrences will result in a CUF of 1.0.
Small Temperature Changes of 50°F Between 70°F and 552°F	200	Approximately 1,000,000 occurrences will result in a CUF of 1.0.
Loss of feedwater pumps, isolation valve closure	10	Approximately 450,000 occurrences will result in a CUF of 1.0. 60-year projections, from Table 4.3.1-1, for this transient is 5 Loss of Feedwater pumps, isolation valve closure occurrences.
Turbine Bypass, Single Relief or Safety Valve Blowdown and Temperature Drops between 552 to 375 in 10 minutes	8	Approximately 8,000 occurrences will result in a CUF of 1.0. 60-year projections, from Table 4.3.1-1, for this transient is 3.
Hydrostatic Test to 1045 psig at 100°F	120	The temperature remains constant throughout the transient. Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(b) 60-year projections, from Table 4.3.1-1, for these transients are 44 Hydrostatic Tests.
Steam Line Flooding (Shutdown)	120	Temperature remains constant throughout the transient. Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(b) 60-year projections, from Table 4.3.1-1, for these transients are 101 Startups.
Reactor Overpressure with Delayed Scram (Emergency)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c)
Automatic Blowdown (Emergency)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c)
Pipe Rupture Blowdown (Faulted)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c)

4.3.3.4 Recirculation System Transients

TLAA Description:

The CPS recirculation system was designed as a Class 1 system in accordance with ASME Section III, Subsection NB, 1983 Edition with Addenda up to Winter 1984. USAR Section 3.9.1.1.6, “Recirculation System Transients,” documents the transients and transient occurrences considered in the design analysis of this piping system.

Table 4.3.3.4-1 documents the specified transients and transient occurrences from USAR Section 3.9.1.1.6. The resulting fatigue evaluations contained in the design analyses calculated various piping component CUF values. The calculated design CUF values of the bounding piping component locations for this system were 0.472 and 0.46 for 40 years.

Since the design analyses resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, these analyses have been identified as TLAAs that must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.3.4-1 also documents 60-year transient projections taken from Table 4.3.1-1. This table illustrates that the projected occurrences are less than the assumed occurrences in the design analyses, with the minor exception of the Hydrostatic Test transient. The two recirculation system bounding component locations discussed above, “nodes RR_735” and “RR_15,” are monitored by SI:FatiguePro™. Table 4.3.1-2 shows that the 60-year CUF and CUF_{en} projections for these component locations should not exceed the ASME Section III limit of 1.0 prior to the end of the period of extended operation. Therefore, even though the Hydrostatic Test transient 60-year projection of 44 exceeds the 40 occurrences assumed in the design analyses, the resulting projected CUF values for recirculation system components are significantly below the ASME limit of 1.0.

The Fatigue Monitoring (B.3.1.1) program will continue to use SI:FatiguePro™ to compute actual cumulative CUF and CUF_{en} values for all monitored locations. With this approach, the original assumed numbers of transient occurrences are no longer limits; instead, the ASME Section III acceptance criteria are the limit for each monitored location.

The Fatigue Monitoring (B.3.1.1) program includes requirements that initiate corrective actions if any CUF or CUF_{en} value exceeds 80 percent of the ASME Section III acceptance criteria. Corrective actions may include revision of the affected Class 1 fatigue analyses to address higher CUF or CUF_{en} values, establishing an inspection program using an approach acceptable to the NRC (such as inspections performed in accordance with Appendix L of ASME Code Section XI based on flaw tolerance analysis), or repair or replacement of affected components prior to the CUF or CUF_{en} values exceeding their allowed values.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of fatigue on the intended functions of recirculation system components analyzed in accordance with ASME Section III, Class 1 requirements will be managed by the Fatigue Monitoring (B.3.1.1) program through the period of extended operation.

Table 4.3.3.4-1 – Recirculation System Transients		
Specified Transients	**Specified Occurrences**	**60 Year Transient Projections**
Hydrotest	40	44
Startup	120	101
Turbine Trip (TBHL – Turbine Bypass)	10	2
Partial feedwater heater bypass	70	15
Turbine generator trip, F.W. on, isolation valves open	40	81
Scram	140	
Shutdown	111	98
Composite Loss of Feedwater Pumps and Auxiliary Power, and Turbine Generator Trip Without Bypass	10	5
Turbine bypass single SRV blowdown	8	3
Single Loop Operation	50	9 - A Loop 9 - B Loop
Operating Basis Earthquake (OBE)	10	1
Reactor Overpressure with Delayed Scram (Emergency)	1	1
Automatic Depressurization System Actuations (Emergency)	1	1

4.3.3.5 Recirculation Flow Control Valve Transients

TLAA Description:

The CPS recirculation system flow control valves were procured as Class 1 components in accordance with ASME Section III, Subsection NB, 1974 Edition with Addenda through Summer 1976. USAR Section 3.9.1.1.10, “Recirculation Flow Control Valve Transients,” documents transients and transient occurrences considered in the design analysis of these valves.

Table 4.3.3.5-1 documents the specified transients and transient occurrences from USAR Section 3.9.1.1.10. The resulting fatigue evaluations contained in the design analysis calculated various valve subcomponent CUF values, all of which were less than 0.002 for 40 years.

Since the design analysis resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The design analysis evaluated fatigue in accordance with ASME Section III, Subsection NB-3500, “Valve Design,” and considered all the transients on Table 4.3.3.5-1 below. This table also documents the 60-year transient projections taken from Table 4.3.1-1. This table shows that the specified occurrences are greater than the transient projections, or the contribution of the specified transient occurrence is insignificant to fatigue, or the transient was excluded from the design analysis because it is a one time “Emergency or Faulted Event,” which is not expected to occur during the life of the station. In addition, the table demonstrates that the specified transient occurrences are conservative for an additional 20 years or the transient is not required to be evaluated for fatigue, per ASME Section III Subsection NB-3552.

Therefore, the transients and transient occurrences that were specified for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The specified transients and transient occurrences remain valid through the period of extended operation.

Table 4.3.3.5-1 – Recirculation System Flow Control Valves		
Specified Transients	**Specified Occurrences**	**Comments**
Startup/Shutdown (100°F/hr.)	350	Per Section III, NB-3545.3 the analysis assumed 2,000 occurrences of alternating stresses that bound normal Startup and Shutdown transients. 60-year projections, from Table 4.3.1-1, for these transients are 101 Startups and 98 Shutdowns.
Small Temperature Changes of 29°F Between 70°F and 552°F	600	Effect on fatigue of cycles with less than 30°F are excluded from the design analysis per ASME Section III Subsection NB-3552(b).
Small Temperature Changes of 50°F Between 70°F and 552°F	200	Approximately 1,000,000 occurrences will result in a CUF of 1.0.
Safety/Relief Valve Blowdowns (single valve) 552°F to 375°F in 10 minutes	8	Approximately 130,000 occurrences will result in a CUF of 1.0. 60-year projections, from Table 4.3.1-1, for this transient is 3 Safety/Relief Valve Blowdowns.
Safety Valve Transient (110% of design pressure)	1	Approximately 900 occurrences will result in a CUF of 1.0.
Hydrostatic Test to 1300 psig at 100°F	130	Temperature remains constant throughout the transient. Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(b)
Hydrostatic Test to 1670 psig at 100°F	3	Temperature remains constant throughout the transient. Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(b)
Automatic blowdown 552°F to 375°F in 3.3 minutes and 375°F to 281°F in 19 minutes (Emergency)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c)
Improper start of pump in cold loop, 100°F to 552°F over a period of 15 seconds (Emergency)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c)

4.3.3.6 Recirculation Gate Valve Transients

TLAA Description:

The CPS recirculation system gate valves were procured as Class 1 components in accordance with ASME Section III, Subsection NB, 1971 Edition, up to and including Winter 1973 Addenda. USAR Section 3.9.1.1.12, “Recirculation Gate Valve Transients,” documents transients and transient occurrences considered in the design analysis of these valves.

Table 4.3.3.6-1 documents the specified transients and transient occurrences from USAR Section 3.9.1.1.12. The resulting fatigue evaluation contained in the design analysis calculated several subcomponent CUF values which were less than 0.005 for 40 years.

Since the design analysis resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The design analysis evaluated fatigue in accordance with ASME Section III, Subsection NB-3500, “Valve Design,” and considered the transients on Table 4.3.3.6-1 below. This table documents the 60-year transient projections taken from Table 4.3.1-1. This table shows that the specified occurrences are greater than the 60-year transient projections, or the contribution of the specified transient occurrences is insignificant to fatigue, or the transient was excluded from the design analysis because it is a one time “Emergency or Faulted Event,” which is not expected to occur during the life of the station. In addition, the table demonstrates that the specified transient occurrences are conservative for an additional 20 years or the transient is not required to be evaluated for fatigue, per ASME Section III Subsection NB-3552.

Therefore, the transients and transient occurrences that were specified for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The specified transients and transient occurrences remain valid through the period of extended operation.

Table 4.3.3.6-1 – Recirculation Gate Valve Transients		
Specified Transients	**Specified Occurrences**	**Comments**
Startup/Shutdown	350	Per Section III, NB-3545.3 the analysis assumed 2,000 occurrences of alternating stresses that bound normal Startup and Shutdown transients. 60-year projections, from Table 4.3.1-1, for these transients are 101 Startups and 98 Shutdowns.
Small Temperature Changes of 29°F Between 70°F and 552°F	600	Effect on fatigue of cycles with less than 30°F are excluded from the design analysis per ASME Section III Subsection NB-3552(b) However, this is a minor transient, and it would take more than 500,000 occurrences to exceed a CUF of 1.0.
Small Temperature Changes of 50°F Between 70°F and 552°F	200	Minor transient, 500,000 occurrences will result in a CUF of 1.0.
Safety/Relief Valve Blowdowns (single valve) 552°F to 375°F in 10 minutes	8	Minor transient, 14,000. occurrences will result in a CUF of 1.0. This number of occurrences is not credible over 60 years. 60-year projections, from Table 4.3.1-1, for this transient is 3 Safety/Relief Valve Blowdowns.
Safety Valve Transient (110% of design pressure)	1	Minor transient, 14,000 occurrences will result in a CUF of 1.0.
Hydrostatic Test to 1300 psig at 100°F	130	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(b). 60-year projections, from Table 4.3.1-1, for this transient is 44 Hydrostatic Tests.
Hydrostatic Test to 1670 psig at 100°F	3	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(b)
Automatic blowdown 552°F to 375°F in 3.3 minutes and 375°F to 281°F in 19 minutes (Emergency)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c)
Improper start of pump in cold loop 100°F to 552°F over a period of 15 seconds (Emergency)	1	Effect on fatigue is excluded from the design analysis per ASME Section III Subsection NB-3552(c)
Pipe Rupture and Blowdown (552°F to 281°F in 15 minutes (Faulted)	1	Minor transient, 5,500 occurrences will result in a CUF of 1.0. 60-year projections, from Table 4.3.1-1, for this transient is 1 Pipe Rupture and Blowdown.

4.3.3.7 Recirculation Pump Transients

TLAA Description:

The CPS recirculation system pumps were procured as Class 1 components in accordance with ASME Section III, Subsection NB, 1974 Edition with Summer Addenda.

Table 4.3.3.7-1 documents the assumed transients and transient occurrences in the design analysis, which calculated CUF values for various pump subcomponents. The maximum calculated CUF value was 0.254 for 40 years.

Since the design analysis resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The design analysis evaluated fatigue in accordance with ASME Section III, Subsection NB-3400, “Pump Design,” and considered all the transients on Table 4.3.3.7-1 below. This table also documents the 60-year transient projections taken from Table 4.3.1-1. This table shows that the specified occurrences are greater than the transient projections, or the contribution of the specified transient is insignificant to fatigue, or the transient was excluded from the design analysis because it is a one-time “Emergency or Faulted Event,” which is not expected to occur during the life of the station. In addition, the table demonstrates that the specified transient occurrences are conservative for an additional 20 years.

Therefore, the transients and transient occurrences that were specified for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The specified transients and transient occurrences for the Recirculation Pumps remain valid through the period of extended operation.

Table 4.3.3.7-1 – Recirculation Pump Transients		
Specified Transients	**Specified Occurrences**	**Comments**
Startup	120	60-year projections, from Table 4.3.1-1 are 101 Startups.
Shutdown	111	60-year projections, from Table 4.3.1-1 are 98 Shutdowns.
Small Temperature Changes	310	The effect on fatigue due to this transient is negligible. It would take approximately 1,000,000 occurrences to result in a CUF of 1.0.
Loss of Feedwater Pump	10	The effect on fatigue due to this transient is negligible. It would take approximately 1,000,000 occurrences to result in a CUF of 1.0.
Scrams	180	60-year projections, from Table 4.3.1-1, for this transient is 81 occurrences.
Safety/Relief Valve Blowdowns (single valve) 552°F to 375°F in 10 minutes	8	The effect on fatigue due to this transient is negligible. The contribution of these transients would take approximately 80,000 occurrences to result in a CUF of 1.0.
SSE	2	60-year projections, from Table 4.3.1-1, for these transients are no more than 1 SSE transient occurrences.
Automatic blowdown (Emergency)	1	This is a One-time Emergency Event and was not included in the fatigue evaluation.
Improper Start of Pump in Cold Loop, (Emergency)	1	This is a One-time Emergency Event and was not included in the fatigue evaluation.
Improper Startup with Reactor Drain Shut Off followed by a Turbine Roll (Emergency)	1	This is a One-time Emergency Event and was not included in the fatigue evaluation.
Pipe Rupture and Blowdown (Faulted)	1	This is a One-time Faulted Event and was not included in the fatigue evaluation.

4.3.3.8 Control Rod Drive System Transients

TLAA Description:

The CPS control rod drives (CRDs) were designed as Class 1 components in accordance with ASME Section III, 1974 edition and Winter 1975 Addenda.

The transients and transient occurrences documented in USAR Section 3.9.1.1.1 were specified for the design of the CRDs. The resulting fatigue evaluations contained in the design analysis calculated design CUF values for the following Class 1 CRD subcomponents: main flange, ring flange, indicator tubes, indicator tube base weld, indicator tube cap weld, lower and upper tube connection, lower piston tube threads, and flange plugs. All calculated design CUF values were 0.2 or less for 40 years.

In addition, USAR Section 3.9.1.1.2 documents transients and transient occurrences considered in the design of the CRD housings and in-core housings. These TLAAs are addressed in Section 4.3.4.

Since the design analysis resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, the analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The design analysis conservatively assumed 600 occurrences of “Scrams” with CRD cooling water off. This results in a more severe temperature transient on the CRD subcomponents. This assumption bounds the specified 140 “Scram Tests,” the 160 “Startup Scrams,” and 300 “Operational Scrams,” since the CRDs are designed with cooling water flow to mitigate CRD subcomponent temperature changes during power operation and scrams.

The analysis concluded that all other transients documented in USAR Section 3.9.1.1.1 have negligible contribution to fatigue on all Class 1 CRD subcomponents. For example, CRD cooling flow maintains CRD subcomponent temperatures relatively constant throughout “Startup and Shutdown” transients.

The contribution of the assumed 300 occurrences of “Operational Scrams” resulted in a CUF value of 0.2 on the most limiting Class 1 CRD subcomponent (lower piston tube threads). Comparison of the assumed 300 “Operational Scram” occurrences to Table 4.3.1-1 shows that CPS should only experience 91 scrams in 60 years of operation. Given these transient projections and the conservatism in the design analysis, CPS will not exceed the maximum calculated CUF of 0.2 prior to the end of the period of extended operation.

Therefore, the transients and transient occurrences that were specified for 40 years are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The specified transients and transient occurrences remain valid through the period of extended operation.

4.3.4 ASME SECTION III, CLASS 1 FATIGUE EXEMPTIONS

TLAA Description:

The RPV was designed for 40 years of service in accordance with the ASME Code Section III. Some design stress reports for Class 1 RPV components included "fatigue exemptions" in accordance with ASME Section III, Subsection NB-3222.4(d), thus demonstrating that these RPV components do not require explicit fatigue analyses.

These original stress reports that contained fatigue exemptions included assumptions for postulated numbers of temperature and pressure transients that were expected over the 40-year life of the station. In addition, the original fatigue exemptions evaluated significant load fluctuations expected over the 40-year life of the station.

Table 4.3.4-1 lists the Class 1 RPV components that satisfied these ASME Section III fatigue exemption requirements. Since ASME Section III, Subsection NB-3222.4(d), requires postulated cycle inputs for the intended operating life of the plant, these stress reports are TLAAs that must be evaluated for the period of extended operation.

Table 4.3.4-1
Class 1 RPV Components With ASME Section III Fatigue Exemptions

Component	Applicable Section III Subsection
Top Head Nozzle	NB-3222.4(d)
In-Core Housing	NB-3222.4(d)
Jet Pump Instrumentation Penetration Seals	NB-3222.4(d)
CRD Housings	NB-3222.4(d)
CRDH Flange	NB-3222.4(d)
Power Range Detector Dry Tubes	NB-3222.4(d)
IRM/SRM Dry Tubes	NB-3222.4(d)

TLAA Evaluation:

These fatigue exemptions have been re-evaluated for the period of extended operation using the 60-year projected transient occurrences in Table 4.3.1-1. The re-evaluation used the same ASME Section III, Subsection NB-3222.4(d) methodologies and acceptance criteria. Pressure and temperature ranges for assumed transients were adjusted for EPU operating conditions.

Table 4.3.4-2 summarizes results of the re-evaluations and illustrates that the criteria in ASME Section III, Subsection NB-3222.4(d) remain satisfied for the RPV components in Table 4.3.4-1 for the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The ASME Section III, Class 1 fatigue exemption criteria continue to be satisfied based on 60-year projected transient cycles through the period of extended operation.

Table 4.3.4-2 Transient Summary for Fatigue Wavier Re-evaluations					
NB-3222.4(d) Criteria	**Applicable Component**	**Number of Events Assumed**	**Applicable 60-Year Projections (Table 4.3.1-1)**	**NB-3222.4(d) Limit**	**Calculated or Input Value**
Criteria (d)(1) Atmospheric to Operating Conditions and Back	Top Head Nozzle	144	Startup 101 and Shutdowns- 98 Hydro Test - 44	Cycles < 1099	144 Cycles
	In-Core Housing			Cycles < 20602	144 Cycles
	Jet Pump Instrumentation Penetration Seal			Cycles < 45358	144 Cycles
	CRD Housing			Cycles < 20602	144 Cycles
	CRDH Flange			Cycles < 9341	144 Cycles
	Power Range Detector Dry Tubes			Cycles < 9341	144 Cycles
	IRM/SRM Dry Tubes			Cycles < 9341	144 Cycles
Criteria (d)(2) Normal Operation Pressure Fluctuations	Top Head Nozzle	447	SRV Blowdown - 3 Hydro Test - 44 Loss of FPs - 5 Scram – 81	Range < 1.72 ksi	Range = 1.33 ksi
	In-Core Housing	137		Range < 5.26 ksi	Range = 0.76 ksi
	Jet Pump Instrumentation Penetration Seal	137		Range < 6.15 ksi	Range = 1.33 ksi
	CRD Housing	137		Range < 8.41 ksi	Range = 1.26 ksi
	CRDH Flange	137		Range < 7.11 ksi	Range = 1.26 ksi
	Power Range Detector Dry Tubes	142		Range < 4.38 ksi	Range = 1.33 ksi
	IRM/SRM Dry Tubes	142		Range < 4.46 ksi	Range = 1.33 ksi
Criteria (d)(3) Startup and Shutdowns	Top Head Nozzle	120	Startup – 101 Shutdowns – 98	ΔT< 462.5°F	ΔT= 16°F
	In-Core Housing	120		ΔT< 422.9°F	ΔT= 400°F

Table 4.3.4-2 Transient Summary for Fatigue Wavier Re-evaluations					
NB-3222.4(d) Criteria	**Applicable Component**	**Number of Events Assumed**	**Applicable 60-Year Projections (Table 4.3.1-1)**	**NB-3222.4(d) Limit**	**Calculated or Input Value**
	Jet Pump Instrumentation Penetration Seal	300		ΔT< 303.2°F	ΔT= 23°F
	CRD Housing	120		ΔT< 424.9°F	ΔT= 188°F
	CRDH Flange	120		ΔT< 427.3°F	ΔT= 200°F
	Power Range Detector Dry Tubes	120		ΔT< 421.0°F	ΔT= 28.0°F
	IRM/SRM Dry Tubes	120		ΔT< 421.0°F	ΔT= 42.5°F
Criteria (d)(4) Significant Temperature Fluctuations	Top Head Nozzle	137	SRV Blowdown – 3 Hydro Test - 44 Loss of FP – 5 Scram - 81	ΔT< 442.1°F	ΔT= 32°F
	In-Core Housing	99	Loss of FP – 5 Scram – 81 Scram, Turbine Bypass – 2	ΔT< 454.6°F	ΔT= 150°F
	Jet Pump Instrumentation Penetration Seal	4	SRV Blowdown – 3	ΔT< 1220.6°F	ΔT= 113°F
	CRD Housing	137	SRV Blowdown – 3 Hydro Test - 44 Loss of FP – 5 Scram - 81	ΔT< 404.3°F	ΔT= 188°F
	CRDH Flange	93	SRV Blowdown – 3 Loss of FP – 5 Scram – 81	ΔT< 471.1°F	ΔT= 200°F
	Power Range Detector Dry Tubes	0	N/A	N/A	N/A
	IRM/SRM Dry Tubes	0	N/A	N/A	N/A

Table 4.3.4-2 Transient Summary for Fatigue Wavier Re-evaluations					
NB-3222.4(d) Criteria	**Applicable Component**	**Number of Events Assumed**	**Applicable 60-Year Projections (Table 4.3.1-1)**	**NB-3222.4(d) Limit**	**Calculated or Input Value**
Criteria (d)(5) ∆T– Dissimilar Materials	In-Core Housing	137	SRV Blowdown – 3 Hydro Test - 44 Loss of FP - 5 Scram – 81	∆T< 3752.3°F	∆T= 500°F
	CRD Housing	0	N/A	NA	NA
Criteria (d)(6) Significant Load Fluctuations	Top Head Nozzle	1E6	NA	Range < 12.5 ksi	Range = 11.1 ksi
	Jet Pump Instrumentation Penetration Seal	1E6	NA	Range < 26.0 ksi	Range = 14.35 ksi
	IRM/SRM Dry Tubes	10	NA	Range < 650.0 ksi	Range = 26.87 ksi

4.3.5 ASME SECTION III, CLASS 2, CLASS 3, AND ANSI B31.1 ALLOWABLE STRESS ANALYSES AND RELATED HELB SELECTION ANALYSES

TLAA Description:

The CPS mechanical system piping and components are classified as Quality Group A, B, C, or D as defined in Regulatory Guide 1.26. The piping and components in each Quality Group are designed and constructed in accordance with the codes listed in USAR Table 3.2-3. Quality Group A piping systems were originally designed and constructed in accordance with ASME Section III, Class 1 requirements and are addressed in Sections 4.3.1, 4.3.2, and 4.3.3. Quality Group B and C piping systems were originally designed and constructed in accordance with ASME Section III, Class 2 and Class 3, respectively. Quality Group D piping was originally designed and constructed in accordance with the ANSI B31.1 Power Piping Code (B31.1).

Piping systems designed in accordance with ASME Section III, Class 2, Class 3, and B31.1 design rules are not required to have an explicit analysis of cumulative fatigue usage, but rather cyclic loading is implicitly considered in a simplified manner in the design process. ASME Section III, Class 2, Class 3, and B31.1 design rules require a stress range reduction factor be used based on the number of thermal and pressure cycles expected during the component operating lifetime. If the total number of fatigue cycles is expected to be 7,000 or less, the stress range reduction factor of 1.0 is applied. For greater numbers of fatigue cycles, a stress range reduction factor of less than 1.0 is applied, which reduces the allowable stress range. The stress range reduction factors for piping designed to ASME Section III, Class 2, Class 3, and B31.1 requirements are shown in Table 4.3.5-1.

Industry guidance (Reference 4.8.18) shows that piping systems with operating temperatures less than 220 degrees F for carbon steel piping systems and 270 degrees F for austenitic stainless steel piping systems may be excluded from implicit fatigue concerns.

The evaluation for required stress range reduction factors performed as part of piping design per ASME Section III, Class 2, Class 3, and B31.1 are implicit fatigue analyses since they are based upon the number of fatigue cycles anticipated for the life of the component, therefore they are TLAAs requiring evaluation for the period of extended operation.

Table 4.3.5-1
Stress Range Reduction Factors for Piping Designed per ASME Section III Class 2 and Class 3 and ANSI B31.1 Piping Systems

Number of Equivalent Full Temperature Cycles	Stress Range Reduction Factor
7,000 and less	1.0
7,000 to 14,000	0.9
14,000 to 22,000	0.8
22,000 to 45,000	0.7
45,000 to 100,000	0.6
100,000 and over	0.5

In addition, as explained in Section 4.3.6, some Non ASME Class 1 (non-Class 1) high energy piping locations were selected for HELB analyses at nodes where calculated stresses for normal and upset plant conditions exceeded 0.8 (1.2 $S_h + S_a$), where S_h is the allowable stresses at maximum (hot) temperature and S_a is the allowable stress range for thermal expansion as defined in Article NC-3600 of the ASME Code, Section III. Non-Class 1 high energy piping locations that did not exceed this threshold were not selected for HELB analyses. The following License Renewal Systems contain non-Class 1 high energy piping segments that were evaluated to the above selection criteria: Reactor Feedwater System, Main Steam System (Including the Main Steam Drains and MSIV Leakage Control Sub Systems), RHR System, RCIC System, and the RWCU System.

If non-Class 1 high energy piping locations in these systems that were originally not selected for HELB analyses exceed 7,000 thermal cycles, then the stress range reduction factor would have to be applied (e.g., less than 1.0) and the selection methodology may require the addition of new piping locations for HELB analyses.

TLAA Evaluation:

Tables 3.x.2-y (see Section 3.0) identify piping located within piping systems that were designed in accordance with ASME Section III, Class 2 or Class 3, or B31.1 requirements and are associated with implicit fatigue analyses.

Portions of the following license renewal piping systems were designed in accordance with ASME Section III, Class 2, Class 3, or B31.1 requirements and are only affected by the same pressure and temperature transients as the Reactor Coolant System transients that are listed in Table 4.3.1-1: Main Steam System (including MS Drains and MSIV Leakage Control Subsystems), Reactor Core Isolation Cooling System, Reactor Feedwater System, and Residual Heat Removal System. In addition, some RPV and Level Monitoring Instrumentation piping and Process Sample System piping are only affected by the same pressure and temperature transients as the Reactor Coolant System.

Only a subset of the transients listed in Table 4.3.1-1 apply to the above Class 2, Class 3, and B31.1 piping systems. The summation of all 60-year transient cycle projections from Table 4.3.1-1 is less than 1,500 occurrences. Therefore, even if all operational Reactor Coolant System transients (transients 1 through 37) applied to each of these systems, the total number of projected 60-year occurrences is less than 25 percent of 7,000. Therefore, the stress range reduction factors originally applied for the components within these piping systems remain applicable and these implicit TLAAs remain valid through the period of extended operation.

Some systems or portions of systems designed in accordance with ASME Section III, Class 2, Class 3, or B31.1 requirements are affected by thermal and pressure transients that are different than the Reactor Coolant System transients that are listed in Table 4.3.1-1.

Table 4.3.5-2 documents these systems or portions of systems and provides descriptions of the transient cycles that result in thermal or pressure cycles for these piping systems. The table also documents very conservative 60-year projections of transient occurrences through the period of extended operation. In all cases the conservative 60-year projected number of occurrences is substantially less than 7,000. Therefore, the stress range reduction factors originally applied for the components within these piping systems remain applicable and these implicit TLAAs remain valid through the period of extended operation.

In addition, as explained in Section 4.3.6, the original high energy piping selection scope for HELB analyses remains valid through the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – All ASME Section III, Class 2, Class 3, and B31.1 allowable stress analyses and related HELB selection analyses remain valid through the period of extended operation.

Table 4.3.5-2 60-Year Transient Cycle Projections for Class 2, Class 3, and ANSI B31.1 Piping Systems Affected by Transients Other Than RCS Transients			
Piping System	**Description of Transient Cycles that Affects the Piping System**	**Conservative Assumptions Used in Projections**	**Total**
Class 2 Control Rod Drive System Piping	Reactor Startup and Shutdown (USAR Section 3.9.1.1.1)	120	860
	Vessel Pressure Test (USAR Section 3.9.1.1.1)	130	
	Vessel Over Pressure (USAR Section 3.9.1.1.1)	10	
	Scram Test (USAR Section 3.9.1.1.1)	140	
	Startup Scrams (USAR Section 3.9.1.1.1)	160	
	Operational Scrams 300 (USAR Section 3.9.1.1.1)	300	
Demineralized Water System - Laboratory and Control Room HVAC Boilers Piping.	Boiler is Started and Shutdown 20 times per year	1,200	2,400
	Boiler is secured 20 times per year for maintenance.	1,200	
Emergency Diesel Generator System Exhaust System Piping (Each Engine)	100 Diesel Startups/Shutdowns - Preoperational Testing	100	3,220
	Diesel are Tested Once Per Week for 60 years.	3,120	
Hydrogen Water Chemistry System Piping	System Heats Up and Cools Down With the RWCU System.	1,001	2,201
	System Maintenance - 20 Times Per Year.	1,200	
Fire Protection System Diesel Engine Exhaust System Piping (Each Engine)	100 Fire Diesel Startups/Shutdowns Preoperational Testing	100	2,620
	2 Startups/Shutdowns per Year - Intended Function	120	
	Surveillances - Startups/Shutdowns	2,400	
	Preoperational Testing - 25	25	956

Table 4.3.5-2
60-Year Transient Cycle Projections for Class 2, Class 3, and ANSI B31.1 Piping Systems Affected by Transients Other Than RCS Transients

Piping System	Description of Transient Cycles that Affects the Piping System	Conservative Assumptions Used in Projections	Total
Reactor Core Isolation Cooling System. (HELB System)	RCIC Injections During Startup (USAR Section 3.9.1.1.1)	120	
	RCIC Actuations (Table 4.3.1-1)	91	
	RCIC Starts After Maintenance – 2 Startups per Year	120	
	RCIC Starts – Surveillances – 10 Startup per Year	600	
Reactor Water Cleanup System (HELB System)	5 RWCU System Startups for each Station Startup on Table 4.3.1-1 – (101*5)	505	1,008
	Loss of RWCU System Table 4.3.1-1	93	
	RWCU Preoperational Testing	50	
	RWCU Pump Swap - 2 per Year	120	
	RWCU Pump Maintenance – 1 per Year	60	
	RWCU Heat Exchanger Swap – 2 per year	120	
	RWCU Heat Exchanger Maintenance - 1 per Year	60	
RHR Pump Effluent 1A/1B Sample Lines and RHR Heat Exchangers Sample Lines	Manual sampling during station shutdown to cold shutdown. Forty-five per station shutdown. 98 station shutdowns are projected for 60 years from Table 4.3.1-1.	4,410	4,530
	Transients resulting from system maintenance. Two per year	120	
The Recirculation System Sample Lines	This sample line is in service continuously during reactor power operations. Assume this sample line is placed in service 25 times during each station startup. 101 station Startups are projected for 60 years from Table 4.3.1-1.	2,525	2,645
	Transients resulting from system maintenance. Two per year.	120	

4.3.6 HIGH-ENERGY LINE BREAK (HELB) ANALYSES BASED ON CUMULATIVE FATIGUE USAGE

TLAA Description:

USAR Section 3.6.2.1.6, "Locations for Postulated Pipe Breaks and Leakage Cracks," evaluated CPS high energy system piping to identify postulated break locations in accordance with Branch Technical Position APCSB 3-1, Appendix B NRC Branch Technical Position MEB 3-1, and NUREG-1061, Volume 3. Postulated High Energy Line Break (HELB) locations were selected based on the following two methodologies.

<u>Class 1 HELB Exclusion</u>

CPS used calculated CUF values from the ASME Section III Class 1 fatigue analyses (described in Section 4.3.2) as input in determining which high energy piping locations could be excluded from HELB evaluations as described in USAR Section 3.6.2. This included Class 1 portions of the following systems: Reactor Recirculation System, Reactor Feedwater System, Main Steam System, HPCS System, LPCS System, RHR System, RCIC System, Standby Liquid Control System, RWCU System, and Reactor Coolant System.

Class 1 piping locations with calculated CUF values less than or equal to 0.1 do not require a break to be postulated. These are referred to as Class 1 HELB exclusion locations.

Six Class 1 HELB exclusion locations are identified as the bounding and most limiting of all the HELB exclusion locations. These locations, listed in Table 4.3.6-1, were added to the SI:FatiguePro™ software for monitoring against the CUF acceptance criterion of 0.1. Table 4.3.1-2 documents CUF values, as of September 30, 2022, for these six locations.

Since the HELB exclusion determinations are based on the Class 1 piping fatigue evaluations, they have been identified as TLAAs which must be evaluated for the period of extended operation.

<u>Non-Class 1 High Energy Piping Selection for HELB Analysis</u>

For CPS non-Class 1 high energy piping systems, some HELB locations were selected at nodes where calculated stresses for normal and upset plant conditions exceeded 0.8 $(1.2\ S_h + S_a)$. Where S_h is the allowable stresses at maximum (hot) temperature and S_a is the allowable stress range for thermal expansion as defined in Article NC-3600 of the ASME Code, Section III. Non-Class 1 high energy piping locations that did not exceed this threshold were not selected for HELB analyses.

The following non-Class 1 high-energy systems were evaluated using this methodology to identify the scope for HELB locations: Reactor Feedwater System, Main Steam System (including Main Steam Drains and MSIV Leakage Control Subsystems), RHR System, RCIC System, and RWCU System.

TLAA Evaluation:

Class 1 HELB Exclusion

The Fatigue Monitoring (B.3.1.1) program uses the SI:FatiguePro™ software to determine the overall effect of the cumulative numbers of transient cycles that have occurred at a given time and computes accumulated CUF values for bounding Class 1 HELB exclusion locations.

Table 4.3.1-2 shows that CUF values of the six bounding Class 1 HELB exclusion locations are projected to remain less than 0.1 through the end of the period of extended operation. Therefore, all original Class 1 HELB excluded locations will continue to meet the break exclusion criterion and there are no new break locations postulated for the period of extended operation.

The Fatigue Monitoring (B.3.1.1) program includes requirements that initiate corrective actions if a CUF value associated with a Class 1 HELB exclusion location exceeds 80 percent of the Class 1 HELB exclusion acceptance criteria. Corrective actions may include revision of the affected Class 1 fatigue analysis, evaluation of other excluded locations, establishing an inspection program using an approach acceptable to the NRC (such as inspections performed in accordance with Appendix L of ASME Code Section XI based on flaw tolerance analysis), and repair or replacement of affected components prior to the CUF values exceeding the acceptance criteria.

Non-Class 1 High Energy Piping Selection for HELB Analysis

Section 4.3.5 document 60-projections for non-Class 1 piping. This section documents that: the Reactor Feedwater System, Main Steam System, and RHR System are only affected by the same pressure and temperature transients as the Reactor Coolant System transients and these systems will experience thermal transients projected for 60 years of no more than 1,500 occurrences which is significantly less than 7,000. In addition, Table 4.3.5-2 documents that the RCIC and RWCU Systems are projected for 956 and 1,008 occurrences, respectively, for 60 years which are significantly less than 7,000. Therefore, the original scope selection for HELB analyses of non-Class 1 high energy piping remains valid for the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The Class 1 piping fatigue analyses used as input for Class 1 HELB exclusion determinations will be managed by the Fatigue Monitoring (B.3.1.1) program through the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The non-Class 1 piping stress analyses used to select the scope of HELB analyses are valid through the period of extended operation.

Table 4.3.6-1 High Energy Line Break (HELB) Locations	
Piping System	**Node**
Feedwater	Node 10
Feedwater	Node 187
Main Steam	Node 325
Main Steam	Node 460
Reactor Core Isolation Cooling	Node 55B
Reactor Water Clean-Up	Node 10

4.3.7 REACTOR VESSEL INTERNALS

The CPS reactor vessel Internal (RVI) components that support the core are designed in accordance with ASME Section III, Subsection NG, 1974 Edition with Addenda up to and including Summer 1976. These components are documented in USAR Section 3.9.5.1.a and repeated in Table 4.3.7-1.

Although not required, some additional RVI components which do not support the core were evaluated for fatigue, as part of the EPU power uprate project, per the guidance in the ASME Section III Code. These additional components are also documented in Table 4.3.7-1.

Since these components were evaluated for fatigue, the associated stress reports have been designated as TLAAs. Table 4.3.7-1 documents the LRA sections that describe, evaluate, and disposition these TLAAs for the period of extended operation.

Table 4.3.7-1, CPS Reactor Vessel Internals Designed to ASME III, Subsection NG

Component	LRA Section	Evaluation Method
Top Guide/Grid (Core Support Structure)	4.3.7.1	Fatigue Evaluation per ASME Section III Subsection NG.
Jet Pump Riser Brace	4.3.7.1	Fatigue Evaluation consistent with the Guidance in ASME Section III.
Core Spray Piping	4.3.7.1	Fatigue Evaluation consistent with the Guidance in ASME Section III.
Core Plate Stiffener to Skirt Weld (Core Support Structure)	4.3.7.1	Fatigue Evaluation consistent with the Guidance in ASME Section III.
Peripheral Fuel Support (Core Support Structure)	4.3.7.2	Fatigue Exemption per ASME Section III Subsection NG.
Orificed Fuel Supports (Core Support Structure)	4.3.7.2	Fatigue Exemption per ASME Section III Subsection NG.
Control Rod Guide Tubes (Core Support Structure)	4.3.7.2	Fatigue Exemption per ASME Section III Subsection NG.
Core Shroud Stabilizer Assembly (Core Support Structure)	4.3.7.3	Fatigue Evaluation per ASME Section III Subsection NG.
Core Shroud Support Structure (Core Support Structure)	4.3.7.3	Fatigue Evaluation per ASME Section III Subsection NG.

4.3.7.1 REACTOR VESSEL INTERNALS FATIGUE ANALYSIS

TLAA Description:

By Amendment Number 149, dated April 5, 2002, the NRC approved a 20 percent EPU that authorized an increase in the maximum thermal power level from 2,894 MWt to the licensed thermal power level of 3,473 MWt. To support this power uprate, GEH issued two analyses which evaluated impacted RVI components for fatigue using EPU operating conditions. The following RVI components, within the scope of license renewal, were evaluated in the two analyses: jet pump riser brace with a CUF of 0.976, core spray piping with a CUF of 0.688, core plate stiffener to skirt weld with a CUF of 0.84, and top guide/grid with a CUF of 0.521.

Since these analyses resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, these analyses have been identified as TLAAs that must be evaluated for the period of extended operation.

TLAA Evaluation:

For license renewal, GEH documented the basis for the fatigue evaluations of these four components in a proprietary report. The transients that were assumed for the fatigue evaluations are monitored by the Fatigue Monitoring (B.3.1.1) program and are documented in Table 4.3.1-1. The 60-year projections for these transients are less than the number of transient occurrences assumed in the proprietary report.

The disposition of these components is separated in two groupings as follows.

<u>Jet Pump Riser Brace and Core Spray Piping</u>

Although the projected 60-year transient occurrences assumed for the jet pump riser brace and core spray piping component fatigue evaluations are less than the assumed occurrences in the GEH fatigue evaluations, these two components are not currently monitored by SI:FatiguePro™ nor does SI:FatiguePro™ monitor other locations that are considered bounding for these two locations. Therefore, to ensure conservative fatigue management of these two components the Fatigue Monitoring (B.3.1.1) program procedure will be enhanced to add these components for cycle-based monitoring.

The Fatigue Monitoring (B.3.1.1) program includes requirements that initiate corrective actions if monitored accumulated transient occurrences exceed 80 percent of the transient occurrences assumed in the fatigue evaluations. Corrective actions may include revision of the affected fatigue analysis, establishing an inspection program using an approach acceptable to the NRC (such as inspections performed in accordance with Appendix L of ASME Code Section XI), or repair or replacement of affected components prior to exceeding the assumed number of transient occurrences.

<u>Core Plate Stiffener to Skirt Weld and Top Guide/Grid</u>

The projected 60-year transient occurrences assumed in the fatigue evaluation for the core plate stiffener to skirt weld and top guide/grid components are more than 30 times less than the assumed occurrences in the corresponding fatigue evaluations documented in the proprietary GEH report. Therefore, it is not credible that the calculated 40-year CUF values for these two components will be exceeded during the period of extended operation. For these two components the assumed transient occurrences for 40 years are valid for 60 years of operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of fatigue on the intended functions of the jet pump riser brace and core spray piping RVI components will be managed by the Fatigue Monitoring (B.3.1.1) program through the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – For the core plate stiffener to skirt weld and top guide/grid RVI components, the assumed transients and transient occurrences remain valid through the period of extended operation.

4.3.7.2 ASME SECTION III, CLASS CS FATIGUE EXEMPTIONS

TLAA Description:

The CPS RPV was designed for 40 years of service in accordance with the ASME Code Section III. Some design stress reports for Class CS RPV components included fatigue exemptions in accordance with ASME Section III, Winter 1973 Addenda, Subsection NG-3222.4(d), thus demonstrating that these RPV components did not require explicit fatigue analyses.

These original stress reports that contained fatigue exemptions included assumptions for postulated numbers of temperature and pressure transients that were expected over the 40-year life of the station. In addition, the original fatigue exemptions evaluated significant load fluctuations expected over the 40-year life of the station.

The following are RPV components that satisfied these ASME Section III fatigue exemption requirements: the control rod guide tubes, the peripheral fuel supports, and the orificed fuel supports.

Since the ASME Section III, Subsection NG-3222.4(d), fatigue exemption criteria require postulated transient occurrence inputs for the intended 40-year life of the station, these stress reports are TLAAs that must be evaluated for the period of extended operation.

TLAA Evaluation:

These fatigue exemptions have been reevaluated for the period of extended operation using the 60-year projected transient occurrences in Table 4.3.1-1 or the number of occurrences assumed in the original stress report, whichever are more conservative. The re-evaluation used the same ASME Section III, Subsection NG-3222.4(d) methodologies and acceptance criteria. Pressure and temperature ranges for assumed transients were adjusted for EPU operating conditions.

Table 4.3.7.2-1 summarizes the results of the re-evaluation and illustrates that the criteria in ASME Section III, Subsection NG-3222.4(d) remain satisfied.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The ASME Section III, Class CS fatigue exemption criterion have been satisfactorily evaluated based on 60-year projected transient cycles through the period of extended operation.

Table 4.3.7.2-1 Transient Summary for Class CS Fatigue Wavier Re-evaluations						
NG-3222.4(d) Criteria	**Applicable Component**	**Number of Events Assumed in Original Analysis**	**Number of Events in Re-evaluation for 60-Years**	**Applicable 60-Year Projections (Table 4.3.1-1)**	**NG-3222.4(d) Limit**	**60-year Calculated Value**
Criteria (d)(1) Startup and Shutdown	Control Rod Guide Tubes	771	771	258	< 224°F	96°F
	Peripheral Fuel Support	120	120	100	< 424.3°F	Insignificant
	Orificed Fuel Support	429	429	258	< 270.8°F	190.5°F
Criteria (d)(2) Significant Temperature Fluctuations	Control Rod Guide Tubes	301	338	251	< 292.7°F	268°F
	Peripheral Fuel Support	1,298	231	134	< 331.0°F	Insignificant
	Orificed Fuel Support	0	231	134	< 331.0°F	190.5°F
Criteria (d)(3) Dissimilar Materials	Control Rod Guide Tubes	NA	NA	NA	NA	NA
	Peripheral Fuel Support					
	Orificed Fuel Support					
Criteria (d)(4) Mechanical Loads	Control Rod Guide Tubes	0	0	NA	< 26 ksi	4.33 ksi
	Peripheral Fuel Support				< 26 ksi	12.68 ksi
	Orificed Fuel Support				< 26 ksi	21.23 ksi

4.3.7.3 CORE SHROUD SUPPORT AND STABILIZER ASSEMBLY BRACKETS

TLAA Description:

In 2006, CPS pre-emptively installed core shroud stabilizer assembly brackets because of industry IGSCC concerns documented in Generic Letter 94-03. These assemblies maintain the alignment of the core shroud to the RPV and the originally designed reactor flow partitions. This new configuration replaced the structural functions of the core shroud horizontal welds (H1 through H7). Each stabilizer assembly consists of a tie rod, an upper and lower stabilizer, an upper support, and other connecting members. The tie rod and upper support provide vertical load restraint capability from the top of the shroud to the RPV shroud support plate, as well as positioning the new radial stabilizers.

The modification altered the load path and produced additional loads on the core shroud support structure. Therefore, the design basis of these existing components was reanalyzed, in a proprietary report, in accordance with ASME Section III, 1974 Edition with Addenda up to and including Summer 1976. The basis analysis evaluated fatigue for various core shroud support structure sub-components assuming 10 normal and upset transients and an associated number of transient occurrences. The maximum usage factor of the core shroud support structure was determined to be 0.426 for 40 years at the core shroud support plate. The SRV actuation transient was the most significant contributor to fatigue.

In addition, the core shroud stabilizer assembly brackets were designed in accordance with ASME Section III, Subsection NG, 1998 Edition up to and including 2000 addenda. The basis stress analysis for the brackets, which is proprietary, evaluated fatigue for various assembly sub-components consistently with the core shroud support plate analysis. The maximum usage factors determined for the stabilizer assembly were determined to be significantly less than the core shroud support plate usage. Therefore, the core shroud support plate is the limiting component, with respect to fatigue, for the core shroud stabilizer assembly brackets and core shroud support structure.

Since these analyses evaluated fatigue over the 40-year operating life of CPS, these analyses have been identified as TLAAs that require evaluation for the period of extended operation.

TLAA Evaluation:

The core shroud stabilizer assembly bracket analysis and core shroud support structure were reevaluated for 60 years in a proprietary GEH report. The maximum usage value was determined to be 0.639 for 60 years at the core shroud support plate.

Table 4.3.1-1 documents, as of September 30, 2022, that CPS has experienced a total of 260 SRV actuations and is projected to experience 300 actuations in 60 years. These projections are approximately an order of magnitude less than the number of SRV actuations assumed to occur for 60 years in the proprietary report. Therefore, it is not credible that CPS will experience the assumed number of SRV actuations in 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The core shroud support structure and core shroud stabilizer assembly fatigue evaluations have been satisfactorily evaluated through the period of extended operation.

4.4 ENVIRONMENTAL QUALIFICATION OF ELECTRIC AND MECHANICAL EQUIPMENT

4.4.1 Environmental Qualification of Electric and Mechanical Equipment

TLAA Description:

Thermal, radiation, and cyclical aging analyses of plant electrical and mechanical components, developed to meet 10 CFR 50.49 requirements, have been identified as TLAAs for Clinton Power Station (CPS). The NRC has established nuclear station environmental qualification (EQ) requirements in 10 CFR 50.49 and 10 CFR 50, Appendix A, Criterion 4. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical and mechanical components located in harsh plant environments are qualified to perform their safety function in those harsh environments after the effects of in-service aging. Harsh environments are defined as those areas of the plant that could be subject to the harsh environmental effects of a loss-of-coolant accident (LOCA), high energy line break (HELB), or post-LOCA radiation. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification.

Environmental Qualification Program Background

The CPS Environmental Qualification (B.3.1.2) program meets the requirements of 10 CFR 50.49 for the applicable electrical and mechanical components important to safety. 10 CFR 50.49 defines the scope of components to be included in the program, requires the preparation and maintenance of a list of in-scope components, and requires the preparation and maintenance of a qualification file that includes component performance specifications, electrical and mechanical characteristics and the environmental conditions to which the components could be subjected.

10 CFR 50.49 contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. 10 CFR 50.49 also requires replacement or refurbishment of components not qualified for the current license term prior to the end of designated life, unless additional life is established through ongoing qualification. 10 CFR 50.49 establishes four methods of demonstrating qualification for aging and accident conditions. 10 CFR 50.49 permits different qualification criteria to apply based on plant and component vintage. This also includes recalculation or verification of environmental parameters (radiation, temperature, pressure, humidity) to ensure consistency with the guidelines in NUREG-0588, Revision 1, Category 1 requirements.

Compliance with 10 CFR 50.49 provides reasonable assurance that the component can perform its intended functions during accident conditions after experiencing the effects of in-service aging. The CPS EQ program manages component thermal, radiation, and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49 qualification methods. 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.

Although not required by 10 CFR 50.49, the CPS EQ program also includes safety-related mechanical equipment located in harsh environments.

Aging evaluations for components in the CPS EQ program that specify a qualification of at least 40 years are TLAAs for license renewal because the criteria contained in 10 CFR 54.3 are met.

TLAA Evaluation:

The CPS EQ program implements the requirements of 10 CFR 50.49, as further defined and clarified by NUREG-0588, Revision 1, and is viewed as an aging management program for license renewal under 10 CFR 54.21(c)(1)(iii). Reanalysis of an aging evaluation to extend the qualifications of components is performed on a routine basis as part of the CPS EQ 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). TLAA demonstration option (iii), which states that the effects of aging will be adequately managed for the period of extended operation, is chosen and the CPS EQ program will manage the aging effects of the components associated with the environmental qualification TLAA.

NUREG-1800, Revision 2 states that the staff evaluated the EQ program (10 CFR 50.49) and determined that it is an acceptable aging management program to address environmental qualification according to 10 CFR 54.21(c)(1)(iii). The evaluation referred to in the Standard Review Plan for License Renewal contains sections on “EQ Component Reanalysis Attributes, Evaluation, and Technical Basis” that is the basis of the description below.

<u>Component Reanalysis Attributes</u>

The reanalysis of an aging evaluation is normally performed to extend the qualification by reducing conservatism incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49 as part of the EQ program. While a component life-limiting condition may be due to thermal, radiation, or cyclical aging, the majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, unrealistically low activation energy, or in the application of a component (de-energized versus energized). The reanalysis of an aging evaluation is documented according to the CPS quality assurance program requirements, which require the verification of assumptions and conclusions. As previously noted, important attributes of a reanalysis include analytical methods, 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 Methods</u>

The CPS EQ program uses the same analytical models in the reanalysis of an aging evaluation 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, which is the 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. The result 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 & Reduction Methods

The chief method used for a reanalysis per the CPS EQ program is reduction of conservatism in the component service conditions used in the prior aging evaluation, including temperature, radiation, and cycles. Temperature data used in an aging evaluation is conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways, including monitors used for Technical Specification compliance, other installed monitors, measurements made by plant operators during rounds, and temperature sensors on large motors. A representative number of temperature measurements are 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 must be justified. Similar methods of reducing conservatism in the component service conditions used in prior aging evaluations can be used for radiation and cyclical aging.

Underlying Assumptions

CPS EQ program component aging evaluations contain 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 Action

Under the CPS EQ program, the reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, component is refurbished, replaced, or requalified prior to exceeding the period for which the current qualification remains valid. A reanalysis is to be performed in a timely manner such that time is available to refurbish, replace, or requalify the component if the reanalysis is unsuccessful.

The CPS EQ program has been demonstrated to be capable of programmatically managing the qualified lives of the components within the scope of the program for license renewal. The continued implementation of the CPS EQ program provides reasonable assurance that the aging effects will be managed and that EQ components will continue to perform their intended functions for the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be managed by the CPS EQ program for the period of extended operation.

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS ANALYSIS

4.5.1 Concrete Containment Tendon Prestress Analysis

The CPS containment does not have pre-stressed tendons. As such, this topic is not a TLAA.

4.6 PRIMARY CONTAIMENT FATIGUE ANALYSES

The analyses for the following Clinton Power Station (CPS) primary containment structures, penetrations, and associated components have been identified as TLAAs and require evaluation for the period of extended operation:

- Containment Class MC Mechanical Penetrations (Section 4.6.1)
- Containment Liner (Section 4.6.2)
- Suppression Pool Liner (4.6.3)
- Containment and Drywell Equipment Hatch and Personnel Locks, and Drywell Head Fatigue Assessment (Section 4.6.4)
- Inclined Fuel Transfer Tube Bellows (4.6.5)
- Refueling Bellows (Section 4.6.6)
- SRV X-Quenchers (Section 4.6.7)
- Containment/Drywell Penetrations High Energy Guard Pipe Bellows. (Section 4.6.8)
- Containment Liner Corrosion Assessment (4.6.9)
- Containment Electrical Penetrations (4.6.10)
- ECCS Suction Strainer Bellows (Section 4.6.11)

4.6.1 CONTAINMENT CLASS MC MECHANICAL PENETRATIONS

TLAA Description:

USAR Section 3.6.2.4, “Guard Pipe Assembly Design Criteria,” documents that containment mechanical penetrations are designed as Class MC components in accordance with ASME Section III, 1974 Edition, through Summer of 1974 Addenda. Therefore, design calculations, which contained fatigue evaluations in accordance with ASME Section III, Subsection NE 3222.4 were developed for each in service mechanical penetration.

Each fatigue evaluation assumed various transients and transient occurrences projected over 40 years. All calculations demonstrated that the design CUF values for each in service containment mechanical penetration was less than the ASME Section III limit of 1.0. In general, the calculated CUF values were substantially less than the limit. These penetrations are documented in USAR Table 3.8-5.

Since these containment components were evaluated for fatigue based on transients and transient occurrences assumed to occur over 40 years, the associated calculations are TLAAs that must be evaluated for the period of extended operation.

TLAA Evaluation:

The fatigue calculations of all 121 in service containment Class MC mechanical penetrations were assessed for an additional 20 years of operation. The assessment is summarized below in three groupings.

<u>Calculations That Assumed Only Monitored Transients</u>

The calculations for 95 of the 121 Class MC penetrations assumed only transients that are shown on Table 4.3.1-1 or transients that specified no temperature or pressure changes (i.e., steady state conditions). As explained in Section 4.3.1, the transients on Table 4.3.1-1 are transients monitored by the Fatigue Monitoring (B.3.1.1) program. Table 4.6.1-1 below documents these transients, the occurrences assumed in the calculations, the number of calculations that assumed the transient, and the 60-year projections of the transients taken from Table 4.3.1-1.

All of these 95 penetrations have CUF values less than or equal to 0.414; with the vast majority having CUF values less than 0.1.

Table 4.6.1-1 shows that except for two transients, the projected 60-year occurrences are significantly less than the occurrences assumed in the 95 calculations. The two exceptions are the “Hydro Test” transient and the “Misc. Head Spray” transient. The impact on fatigue due to these two transients is concluded to be negligible and more than compensated by other transients on Table 4.6.1-1 in which the projected 60-year number of occurrences are much less than the assumed occurrences in the calculations.

Therefore, these 95 design calculations remain valid for 60 years of operation in accordance with 10 CFR 54.21(c)(1)(i).

<u>Calculations That Assumed Some Unmonitored Transients</u>

The calculations of 24 of the 121 penetrations assumed some transients not in Table 4.3.1-1 and are not monitored by the Fatigue Monitoring (B.3.1.1) program. These calculations postulated specific transients for the process piping contained in the associated penetration, transients that are shown on Table 4.3.1-1, and transients that specified no temperature or pressure changes (i.e., steady state conditions). These 24 calculations computed CUF values that were less than or equal to 0.19. Review of these calculations showed that the assumed number of unmonitored transient occurrences used as input are more than the projected number of occurrences expected to occur in 60 years. Therefore, these 24 design calculations remain valid for 60 years of operation in accordance with 10 CFR 54.21(c)(1)(i). Table 4.6.1-2 provides a summary of these 24 calculations.

<u>Calculations In Which An Assumed Number of Unmonitored Transients Were Revised</u>

For the two remaining penetrations, 1MC-64 and 1MC-65, the associated calculations assumed unmonitored transient occurrences which could be less than the number of occurrences expected in 60 years.

For penetration 1MC-64, among other transients, the associated calculation assumed 20 occurrences in which the redundant not in service RWCU heat exchanger train is placed into service ("swapped") while the station is at power. Although this transient occurs rarely during power operation (e.g., once per year), 20 occurrences could be exceeded in 60 years. Assuming the RWCU heat exchangers are "swapped" while at power 10 times per year for 60 years, the CUF value increases to approximately 0.272, which is significantly less than the limit of 1.0.

For penetration 1MC-65, among other transients, the associated calculation assumed 2,450 "backwash" occurrences in 40 years (once every six days) resulting in a calculated CUF value of 0.01245. Operating experience shows that this "backwash" transient occurs more often, as frequently as once per day. Conservatively assuming the "backwash" transient occurs 10 times per day for 60 years results in an increase in the CUF value to approximately 0.11, which is significantly less than the limit of 1.0.

Therefore, for these two design calculations some assumed transient occurrences have been successfully revised for 60 years of operation in accordance with 10 CFR 54.21(c)(1)(ii).

A technical, but conservative error was identified in 10 of the 121 calculations. The inputs to each of these 10 calculations included a steady state transient in which temperature and pressure were specified not to change throughout the transient. Therefore, the contribution of this transient to the overall CUF values are expected to be negligible. However, each calculation computed large CUF contributions for this steady state transient, which is considered not credible. The correction of the error will result in design CUF values of less than 0.1 for each of the 10 penetrations. This condition has been entered into the corrective action program for resolution. Nine of the 10 calculations assumed only monitored transients and transients that specified no temperature or pressure changes and are included in the above discussion for "monitored" transients, while the remaining one calculation assumed an unmonitored transient and is included in the above discussion for "unmonitored" transients.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – 119 of the existing 121 containment penetration fatigue evaluations remain valid through the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – Two of the existing 121 containment penetration fatigue evaluations have been successfully projected through the period of extended operation.

Table 4.6.1-1 – Comparison of Assumed Transients in Penetration Calculations that Assumed Only Monitored Transients and 60-year Projections

Transient	Occurrences Assumed	60 Year Projections	Number of Calculations Which Assumed This Transient	Comments
Boltup	123	41	87	Valid for 60 years.
Hydro Test	40	44	18	The contribution of these additional occurrences is negligible
Leak Test	360	5	18	Valid for 60 years.
Startup	120	101	18	Valid for 60 years.
Turbine Trip Scrams	40	81	18	Valid for 60 years.
Other Scrams	140			
Partial Feedwater Hear Bypass	70	15	6	Valid for 60 years.
Reductions to 0 Percent - Hot Standby	111	53	10	Valid for 60 years.
Safety Valve Blowdown	8	3	17	Valid for 60 years.
Composite Loss of Pump	10	5	16	Valid for 60 years.
Shutdown	111	98	22	Valid for 60 years.
Unbolt	123	40	85	Valid for 60 years.
Turbine Trips with Steam Bypass	10	3	2	Valid for 60 years.

Table 4.6.1-1 – Comparison of Assumed Transients in Penetration Calculations that Assumed Only Monitored Transients and 60-year Projections				
Transient	**Occurrences Assumed**	**60 Year Projections**	**Number of Calculations Which Assumed This Transient**	**Comments**
HPCS Injection	10	7	1	Valid for 60 years.
RCIC Injections	40	38	1	Valid for 60 years.
RT System Trips	400	93	1	Valid for 60 years.
Misc. Head Spray	40	53	2	The contribution of these additional occurrences is negligible
Refuels	40	40	12	Valid for 60 years.

Table 4.6.1-2 – Comparison of Assumed Unmonitored Transients with 60-Year Projections			
Penetrations	**Calculated CUF Values**	**Assumed Unmonitored Transients**	**Projected Occurrences In 60 Years**
1MC-11, 1MC-12, 1MC-13, 1MC-18, 1MC-19, 1MC-20	0.002 to 0.011	480 “RHR Pump Operation” transients	340
		480 “RHR Cooldown” transients	340
1MC-15, 1MC-16,	0.002 and 0.01	222 “Pump Operation” Transients	100
1MC-24, 1MC-26	0.0106 and 0.0108	40 Relief Valve Actuations	Significantly less than 40
1MC-56, 1MC-81, 1MC-82	0.06 to 0.191	11,000 Relief Valve Actuations	4,992
1MC-52, 1MC-53.	0.0002 to 0.386	40 Refueling Outages	34
1MC-34, 1MC-79	0.0128 and 0.0142	2,080, Suppression Pool Cleanup System Placed in Service	600

Table 4.6.1-2 – Comparison of Assumed Unmonitored Transients with 60-Year Projections			
Penetrations	**Calculated CUF Values**	**Assumed Unmonitored Transients**	**Projected Occurrences In 60 Years**
1MC-69, 1MC-70	0.0735 and 0.0495	657,000 “Drywell and Containment Equipment Sump Drain Downs”	607,129
		350,400 “Drywell and Containment Floor Sump Drain Downs”	197,100
1MC-32,	0.00073	480 LPCS System Tests	300
1MC-38	0.0004	40 “Relief Valves Actuation”	Significantly less than 40
1MC-31	0.0004	40 “Relief Valves Actuation”	Significantly less than 40
1MC-33	0.00622	40 “HPCS System Test” Transients	37
		40 “Relief Valve Blow Downs”	Significantly less than 40
1MC-74	0.0094	800 Transients	680

4.6.2 CONTAINMENT LINER

TLAA Description:

The containment liner was designed in accordance with ASME Section III, Division 2, Article CC-3300 (1973). When subject to SRV discharge loads, the liner plates are also designed in accordance with ASME Section III, Subsection NE.

The fatigue evaluation contained in the design analysis calculated a CUF value of 0.016 for the liner plates and 0.036 for the liner welds; assuming 1,948 SRV actuations during the 40-year life of the station.

Since this containment component was evaluated for fatigue based on transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.1-1 documents that the maximum number of projected actuations for all SRVs is 300 for 60 years. This value is well within the original design analysis of 1,948 SRV actuations. Therefore, exceeding 1,948 SRV actuations in 60 years is not credible.

Therefore, the transients and transient occurrences that were assumed for 40 years are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the containment liner remain valid through the period of extended operation.

4.6.3 SUPPRESSION POOL LINER

TLAA Description:

The suppression pool liner was designed in accordance with ASME Section III, Division 1, Subsection NE, 1974 Edition with winter 1975 Addenda. The GEH design guidance specified 1,800 SRV actuations to analyze liner fatigue.

The design analysis evaluated fatigue for the suppression pool floor liner in accordance with ASME Section III, Subsection NE-3222.4(d). The evaluation successfully addressed the six criteria in NE-3222.4(d) assuming 1,000 SRV actuations during the 40-year life of the station.

Also, the design analysis evaluated fatigue for the suppression pool wall liner in accordance with ASME Section III, Subsection NE-3222.4(e). The evaluation calculated a CUF value of 0.0144 assuming 1,800 SRV actuations during the 40-year life of the station.

Since these containment components were evaluated based on transients and transient occurrences assumed to occur over 40 years, these analyses have been identified as TLAAs that must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.1-1 documents that the maximum number of projected actuations for all SRVs is 300 for 60 years. Therefore, exceeding 1,000 SRV actuations in 60 years is not credible.

Therefore, the transients and transient occurrences that were assumed for 40 years are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the suppression pool liner remain valid through the period of extended operation.

4.6.4 CONTAINMENT AND DRYWELL EQUIPMENT HATCH AND PERSONNEL LOCKS, AND DRYWELL HEAD FATIGUE ASSESSMENT

TLAA Description:

The containment equipment access hatch and personnel airlock were designed to meet all requirements of Subsection NE, ASME Section III, 1971 Edition and Addenda up to and including the Summer 1973 Addenda. The drywell equipment access hatch, personnel airlock, and head are designed in accordance with ASME Section III, Subsection NE, 1974 Edition with Summer 1976 Addenda. Therefore, these components were required to be evaluated for fatigue in accordance with ASME Section III Subsection NE-3222.4.

The methodology specified in ASME Section III, NE-3222.4 states that fatigue evaluations for cyclic operation is not required if all the criteria in NE-3222.4(d) are satisfied.

The containment components were specified with an operating temperature of 104 degrees F and an operating pressure differential of 4.0 psid, as well as a design pressure differential of 18.3 psid. The drywell components were specified with an operating temperature of 150 degrees F and an operating pressure differential of 4.0 psid, as well as a design pressure differential of 30.0 psid.

Based on the specified design and operating temperatures and pressures, specified component materials, and a very conservative projection of at least 2,500 occurrences in which the component experiences a temperature and pressure increase from ambient to operating temperature and pressure, these five components were demonstrated to meet the six criteria in NE-3222.4(d) and, therefore, a more comprehensive fatigue evaluation in accordance with NE-3222.4(e) is not required.

Since these containment and drywell components were evaluated for fatigue based on transients and transient occurrences assumed to occur over 40 years, this has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.1-1 documents that the maximum number of projected startup and shutdown transient occurrences is approximately 100 for 60 years. Therefore, exceeding the assumed 2,500 startup and shutdown occurrences over 60 years is not credible.

Therefore, the transients and transient occurrences that were assumed for 40 years are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the containment and drywell equipment hatch and personnel locks, and drywell head fatigue assessments remain valid through the period of extended operation.

4.6.5 INCLINED FUEL TRANSFER TUBE BELLOWS

TLAA Description:

The CPS inclined fuel transfer tube bellows were designed as a Class MC component in accordance with ASME Section III, Subsection NC, 1974 Edition.

The design analysis for these bellows certified that they could accommodate displacements for:

1. 150 occurrences of "Normal Operation" where pressure and temperature changes from ambient conditions to the design temperature and pressure of 185 degrees F and 20 psig; respectively,

2. 30 occurrences of "Upset Conditions" where pressure and temperature changes from ambient conditions to the design temperature and pressure of 185 degrees F and 20 psig; respectively, concurrent with OBE conditions, and

3. One occurrence of "Faulted Conditions" where pressure and temperature changes from ambient conditions to the design temperature and pressure of 185 degrees F and 20 psig; respectively, concurrent with SSE conditions.

Since these bellows were analyzed based on transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The inclined fuel transfer tube bellows serve a containment integrity intended function. The CPS containment design temperature and pressure are 185 degrees F and 15 psig; respectively, which bounds the postulated design basis accident peak temperature and pressure. Therefore, the qualification analysis assumed 150 "normal" occurrences of temperature and pressure changes that were greater than temperature and pressure changes that are postulated to occur during a design basis accident. These bellows were also analyzed assuming 30 additional occurrences in which the temperature and pressure changes are greater than accident temperature and pressure changes, concurrent with 30 OBE displacements, as well as one with SSE displacement. Since these qualification parameters are within the values analyzed for 40 years, and no such occurrences have yet been experienced, it is not credible that CPS will experience this number of transient occurrences over a 60-year service life.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the inclined fuel transfer tube bellows remain valid through the period of extended operation.

4.6.6 REFUELING BELLOWS

TLAA Description:

The refueling bellows were designed in accordance with ASME Section III, Subsection NE, 1977 Edition with Winter 1977 Addenda. The refueling bellows along with the refueling bulkhead are designed to allow flooding of the drywell head cavity during refueling. The bellows accommodate thermal displacement between the refueling bulkhead and the RPV during startups and shutdowns.

The bellows were specified for a minimum of 360 occurrences of axial compression corresponding to the thermal expansion of the RPV during normal operational startups and shutdowns, and three cycles of axial compression corresponding to the thermal expansion of the RPV during accident conditions. They were also specified for a minimum of 30 OBE and 30 SSE seismic cycles of horizontal and vertical movement.

Since these bellows are qualified based on transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The specified 360 startup and shutdown transient occurrences are conservative when considering that CPS is projected to startup and shutdown approximately 100 times in 60 years (see Table 4.3.1-1). The 30 OBE and 30 SSE cycles are also extremely conservative.

Therefore, the transients and transient occurrences that were specified for 40 years are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the refueling bellows remain valid through the period of extended operation.

4.6.7 SRV X-QUENCHERS

TLAA Description:

The CPS safety relief valve (SRV) X-Quenchers were originally analyzed according to the requirements of the ASME Code, Section III, Subsection ND-3600 as Class 3 components. However, the NRC expressed a concern about the fatigue life of the X-Quencher due to thermal gradient and local bending stresses. Although ND-3600 does not require a detailed fatigue evaluation, it was decided to reanalyze four critical locations on the X-Quencher, to the requirements of Section III, Subsection NB-3600 of the ASME Code, 1983 Edition, to address the concern. The result of the reanalysis is documented in USAR Attachment B3.9.

The reanalysis assumed 11,600 SRV actuations, five OBEs, and one SSE over 40 years, consistent with the original design specification, and concluded a maximum CUF value of 0.84.

Since the SRV X-Quenchers were analyzed based on transients and transient occurrences assumed to occur over 40 years and the results are documented in the USAR, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.1-1 documents that the maximum number of projected actuations of any individual SRV for 60 years is 30 and the total number of projected actuations for all SRVs is 300 for 60 years. These projected actuations are well within the analyses of the SRV X-Quenchers of 11,600 SRV actuations for any one individual SRV over 60 years.

Therefore, the transients and transient occurrences that were assumed for 40 years in the reanalysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the SRV X-Quenchers remain valid through the period of extended operation.

4.6.8 CONTAINMENT/DRYWELL PENETRATION HIGH ENERGY GUARD PIPE BELLOWS

TLAA Description:

The design of the CPS high energy lines from the RPV include penetration guard pipe bellows as they transition from the drywell into containment. The intended function of these components is to seal normal drywell environment conditions from containment. These bellows do not serve a primary containment function. These bellows were designed to withstand a 30 psid internal pressure, a 17 psid external pressure, a 330 degrees F temperature, and the corresponding required axial and lateral movements resulting from a transient in which the bellows experienced temperature and pressure changes from ambient to these design conditions.

In 1984, CPS identified minor damage to 10 of the 11 bellows during installation. The analysis of the repairs credited qualification testing. The testing included 10,000 cycles of the originally specified axial and lateral movements. The bellows were repaired in late 1984 consistent with the repair analysis.

Since the basis for the repairs are based on transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The repair analysis of the bellows credited prototype testing that used replicated bellows that were purposely damaged in a manner that duplicated the existing damaged bellows. The prototype bellows were successfully tested by imposing greater than 10,000 cycles of the required axial and lateral movements.

The CPS drywell design temperature and pressure is 330 degrees F and 30 psig which bounds postulated drywell design basis accident peak temperatures and pressures. Therefore, the qualification testing essentially replicated 10,000 occurrences of axial and lateral movements corresponding to temperature and pressure changes greater than those postulated to occur during a design basis accident. It is not credible that CPS will experience this number of transient occurrences over a 60-year service life.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the penetration guard pipe bellows remain valid through the period of extended operation.

4.6.9 CONTAINMENT LINER CORROSION ASSESSMENT

TLAA Description:

At CPS, the containment liner welds are covered by leak test channels which were intended to support initial pressure testing of the liner welds. Threaded female test connections were included in the test channel configuration to connect a pressure source during the initial testing. During Integrated Leak Rate Testing (ILRT), the male threaded plugs that normally seal the test connections are removed to ensure that the liner surfaces under the test channels are tested. Over the years the male plugs were not reinstalled after ILRT. With the male plugs removed, the liner surfaces under the channel, which are not coated, are subject to the containment environment. Liner surfaces outside the test channels are coated.

In 1991, CPS issued a calculation to determine if the absence of the male plugs could result in detrimental corrosion on the uncoated liner surfaces under the test channels. The calculation conservatively assumed that the air that enters the test channels through the open test connections from containment and surrounds the uncoated surfaces was consistent with an industrial marine environment containing corrosive salt and relative humidity of 90 percent. The 90 percent relative humidity assumption was based on the qualification requirements for EQ components in containment and not on the performance capabilities of the CPS primary containment ventilation system. The calculation then selected conservative corrosion rates for the assumed environment from industry corrosion handbooks. The resulting material loss over 40 years was compared to acceptance criteria based on a 15 percent thickness margin assumed in the original containment liner stress analysis. The calculation concluded that the estimated conservative material loss over 40 years was less than the acceptance criteria.

Since the calculation is based on a material loss assumption for 40 years of operation, this calculation has been identified as a TLAA that requires evaluation for the period of extended operation.

TLAA Evaluation:

For license renewal, the original liner thickness acceptance criteria was reevaluated for the specific configuration of the liner under the test channels using a finite element analysis. The reevaluation concluded that the liner under the 3-inch wide test channels can accommodate local thinning up to 125 mils and the liner would still perform its safety related functions.

The test channels from elevation 735 to 757-foot cover surfaces of carbon steel liner plates and carbon steel welds. The uncoated surfaces under these test channels may potentially experience general corrosion due to an oxidizing air environment.

The test channels at elevation 735-foot cover bimetallic welds which attach carbon steel liner plates to stainless steel liner plates. The uncoated carbon steel surfaces under these test channels may potentially experience galvanic corrosion and general corrosion.

The test channels below elevation 735-foot, cover surfaces of stainless-steel liner plates and stainless-steel welds. No corrosion mechanism is expected for this configuration.

The basis for the 1991 assumption, that the air environment surrounding the uncoated surfaces is consistent with an industrial marine environment with relative humidity values of 90 percent, was thoroughly evaluated. The evaluation included a review of the design capabilities of the primary containment ventilation system and containment temperature trends over a two-year period which included summer and winter conditions. It was concluded that the CPS containment ventilation system maintains low humidity of 5 to 60 percent through-out the year and the air does not contain salt. This evaluation concluded that containment air temperatures remain well above the dew point throughout the year and during outages. Therefore, the environmental assumptions used in the original 1991 evaluation were very conservative.

For the uncoated carbon steel surfaces under the test channels above elevation 735-foot, more accurate corrosion rates were identified based on the parabolic behavior of exposed carbon steel surfaces which are not disturbed in an air environment with 60 percent relative humidity. If a carbon steel surface is exposed to an oxidizing atmosphere, the stable oxides that are formed on the surface gradually diminish oxygen diffusion to the metallic surface. Since the test channels protect the liner surfaces from disturbances, such as air or water flow, this parabolic corrosion rate behavior is applicable to this situation. The overall effect is a parabolic reduction in corrosion rates over time. For example, corrosion rates change from 0.5 mpy over the first six months of exposure to 0.018 mpy after only nine years of exposure. Therefore, a total material loss of 3.5 mils is estimated for carbon steel surfaces for 60 years of exposure in this environment. Clearly this amount of material loss is significantly less than the acceptance criteria of 125 mils of local thinning under the test channels.

Since the containment environment has a relative humidity of 5 to 60 percent and temperature remains well above the dew point throughout the year, condensation will not occur on uncoated carbon steel surfaces in contact with stainless steel under the test channels at elevation 735-foot. Thus, without the presence of an electrolyte on the carbon steel surfaces, no measurable galvanic corrosion would be anticipated and only the general corrosion of the carbon steel is applicable for these surfaces.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii) – The containment liner corrosion assessment has been successfully projected through the period of extended operation.

4.6.10 CONTAINMENT ELECTRICAL PENETRATIONS

TLAA Description:

CPS electrical containment penetrations were designed and qualified to IEEE 317-1976. In addition, portions of the penetration assembly primary header plates, associated modules, and weld neck flanges are designated as Class MC components in accordance with ASME Section III Subsection NE, 1974 Edition with Summer 1976 Addenda. These penetrations are listed in USAR Table 3.8-5.

For electrical penetrations, the fatigue requirements were met through qualification testing as is allowed by ASME Section III, Subsection NE 3222.4(a). The testing qualified the electrical penetrations to 120 startups and shutdowns in which penetration temperature was increased from ambient to 150 degrees F and back down to ambient. These test conditions are more conservative than the containment normal operating temperatures which in general areas is 104 degrees F and in some closed compartments is 122 degrees F. The penetrations were also qualified to required seismic loads and design basis accident temperatures and pressures.

Since these containment components were qualified for fatigue, based on transients and transient occurrences assumed to occur over 40 years, the associated documents have been identified as TLAAs that must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.1-1 projects approximately 101 startup and 98 shutdown occurrences over 60 years which is less than the 120 tests performed during the qualification testing. In addition, the qualification testing subjected the penetrations to test temperatures that exceed expected normal containment operating temperatures.

To ensure that the original fatigue qualification testing remains valid for 60 years, the Fatigue Monitoring (B.3.1.1) program procedure will be enhanced to perform cycle-based monitoring of these components. This will ensure that the original assumed number of 120 startup/shutdown transient occurrences remains valid for 60 years of operation.

The Fatigue Monitoring program includes requirements that initiate corrective actions if monitored accumulated transient occurrences exceed 80 percent of the transient occurrences assumed in the fatigue evaluations or qualification testing. Corrective actions may include revision or replacement of the affected fatigue analysis or qualification testing, establishing an inspection program using an approach acceptable to the NRC (such as inspections performed in accordance with Appendix L of ASME Code Section XI), or repair or replacement of affected components prior to exceeding the assumed number of transient occurrences.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii) – The effect of fatigue on the intended function of the containment electrical penetrations will be managed by the Fatigue Monitoring (B.3.1.1) program through the period of extended operation.

4.6.11 ECCS SUCTION STRAINER BELLOWS

TLAA Description:

In response to NRC Bulletin 96-03, CPS installed large passive suction strainers on the ECCS and reactor core isolation cooling (RCIC) pump suction piping in the suppression pool. The replacement ECCS and RCIC system suction strainers were designed as Class 2 components in accordance with ASME Section III, Subsections NC, and NF 1977 Edition with Winter 1977 Addenda. These new strainer assemblies included expansion bellows as the attached piping penetrates the suppression pool walls.

These bellows were specified to be qualified for a minimum of 12,600 occurrences of axial and lateral movements which bounded displacements corresponding to: thermal, seismic, SRV actuations, and LOCA transients.

Since these bellows are qualified based on transients and transient occurrences assumed to occur over 40 years, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The specified 12,600 transient occurrences are conservative when considering that CPS is projected for approximately 300 SRV actuations, seven HPSC injections, one LPSC injection, and 91 RCIC and RHR/RCIC injections in 60 years (see Table 4.3.1-1).

Therefore, the transients and transient occurrences that were specified for 40 years are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the ECCS suction strainer bellows remain valid through the period of extended operation.

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

This section evaluates:

- Clinton Power Station Crane Cyclic Loading Analyses (Section 4.7.1)
- Main Steam Line Flow Restrictor Erosion Analysis (Section 4.7.2)
- Generic Letter 81-11 Crack Growth Analysis to Demonstrate Conformance to the Intent of NUREG-0619 (Section 4.7.3)
- Reactor Shield Wall Fluence (Section 4.7.4)
- Hydraulic Control Units (Section 4.7.5)
- Fuel Pool Storage Rack Fatigue Analysis (Section 4.7.6)
- Refueling Bulkhead Ring Flaw Evaluation (Section 4.7.7)
- Fuel Pool Cleanup System, Flow Control Valves (Section 4.7.8)

4.7.1 CLINTON POWER STATION CRANE CYCLIC LOADING ANALYSES

TLAA Description:

A review of the Clinton Power Station (CPS) Current Licensing Basis (CLB) for cranes within the scope of license renewal identified that the containment polar crane and fuel building crane were designed or meet the intent of Crane Manufacturers Association of America (CMAA) Specification 70.

CMAA Specification 70 includes considerations for frequency of operation and expected load sizes relative to their maximum load capacity. Based on these considerations, cranes are designed for a given service class with an expected maximum number of design load cycles over their life, which also correlates to a number of load cycles on structural members.

Since the maximum number of load cycles over the life of the cranes, specified in CMAA Specification 70, provides a basis for acceptability for fatigue over the life of these cranes, the underlying basis is considered a TLAA that must be re-evaluated for the period of extended operation.

TLAA Evaluation:

<u>Containment Polar Crane</u>

The main purpose of the containment polar crane, which has a capacity of 100 tons, is the handling of heavy loads such as the: drywell head, reactor vessel head, steam separator, steam dryer, and shroud head, during refueling operations. This crane was constructed so that it could also be used for the erection of major equipment during the plant's construction phase. It is designed as Seismic Category I equipment, and consists primarily of two girders, a trolley, and associated components.

This crane was designed consistent with the guidance in CMAA Specification 70, and is considered a Class A, crane experiencing "irregular occasional use followed by long idle periods." For this designation, the specification allows between 20,000 and 100,000 load cycles. Therefore, 20,000 load cycles is a conservative threshold. Load cycles that lift less than 50 percent of the crane design capacity (i.e., 50 tons) result in minimal fatigue on the crane. Therefore, conservatively, load cycles that lift 39 tons or more were evaluated for this TLAA.

Table 4.7.1-1 provides 60-year heavy lift projections for the containment polar crane. The number of heavy lift cycles projected for 60 years of operation is 1,040 cycles which is approximately 5.2 percent of the 20,000-cycle conservative threshold. Therefore, the fatigue analysis for the containment polar crane remains valid for 60 years of plant operation.

<u>Fuel Building Crane</u>

The main purpose of this crane, with a design capacity of 125 tons, is to manipulate the dry casks for the ISFSI Facility and low level radwaste casks.

The crane meets the design requirements in ASME NOG-1-2004 and CMAA Specification 70, and is considered a Class A, crane experiencing "irregular occasional use followed by long idle periods." For this designation, the specification allows between 20,000 and 100,000 load cycles. Therefore, 20,000 load cycles is a conservative threshold. Load cycles that lift less than 50 percent of the crane design capacity (i.e., 62.5 tons) result in minimal fatigue on the crane. Therefore, conservatively, only loads greater than or equal to 40 tons were evaluated.

Table 4.7.1-2 provides 60-year heavy lift projections for the fuel building crane. The number of heavy lift cycles projected for 60 years of operation is 1,720 cycles which is approximately 8.6 percent of the 20,000-cycle conservative threshold. Therefore, the fatigue analysis for the fuel building Crane remains valid for 60 years of plant operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The projected number of load cycles associated with the containment polar crane and fuel building crane are considerably less than the specified acceptance criteria. Therefore, these TLAAs remain valid through the period of extended operation.

Table 4.7.1-1
Clinton Containment Polar Crane Load Cycles

Heavy Load Description	Frequency	Number of Years	Number of Lifts over 60 years
Plant Construction Cycles	NA	NA	200
Drywell head (93 Tons)	2/year	60	120
Reactor Vessel Head (91 Tons)	2/year	60	120
Steam Separator (51 Tons)	2/year	60	120
Steam Dryer (39 Tons)	2/year	60	120
Shroud Head (44.5 Tons)	2/year	60	120
Miscellaneous	4/year	60	240
Total for 60 Years			1,040
Minimum Design Limit			20,000
Percent of Load Cycle Limit			5.2%

Note 1: Frequencies conservatively assume an annual refueling outage.

Table 4.7.1-2 Clinton Fuel Building Crane Load Cycles			
Heavy Load Description	**Frequency**	**Number of Years**	**Number of Lifts over 60 years**
Plant Construction/ Deconstruction Cycles	NA	NA	400
Planned ISFSI Casks (120Tons) (Through the year 2047 - 6 Lifts Per Cask)	100 Casks, 6 Cycles per Cask over 60 years	NA	600
Low Level Waste Cask (120 Tons) Cycles 6 Lifts per Cask - 20 Casks over 60 Years	20, 6 Cycles per Cask over 60 years	NA	120
Miscellaneous	10/year	60	600
Total for 60 Years			1,720
Minimum Design Limit			20,000
Percent of Load Cycle Limit:			8.6%

4.7.2 MAIN STEAM LINE FLOW RESTRICTOR EROSION ANALYSIS

TLAA Description:

USAR Section 5.4.4 describes the design functions of the main steam line flow restrictors. In the event of a main steam line break outside of primary containment the flow restrictors will limit main steam line flow to less than 135 percent of rated flow prior to main steam isolation valve (MSIV) closure. This design function will limit reactor coolant loss, maintain core cooling, and limit the release of radiological materials to the environment to within allowable regulatory limits.

USAR Section 5.4.4 documents that erosion of the stainless-steel flow restrictor elements is expected to be very slow, and even if a conservative corrosion rate of 0.004 inches per year is assumed over 40 years the resulting increase in choked flow rate would be no more than 5 percent.

Since the erosion evaluation was based on 40 years of operation, erosion of the main steam line flow restrictors has been identified as a TLAA that requires evaluation for the period of extended operation.

TLAA Evaluation:

The main steam line flow restrictors are welded into each main steam line between the main steam relief valves and the inboard MSIVs. The flow restrictor assemblies consist of stainless-steel venturi-type nozzles welded into the carbon steel main steam line piping. The resistance of stainless steel to erosion has been substantiated by turbine inspections at another BWR plant that revealed no noticeable effects from erosion on the stainless-steel nozzle partitions at similar steam velocities.

The main steam line break analysis for CPS indicates that the calculated integrated mass of coolant leaving the reactor through the main steam line, prior to MSIV closure, is 96,250 lbs. The CPS main steam line break analysis applied an acceptance threshold of 140,000 lbs. release, as provided in the Standard Review Plan Section 15.6.4 for a GESSAR-251 plant. A postulated erosion rate resulting in an increase of an additional 5 percent choked flow during the period of extended operation (for a total of 10 percent over 60 years) would increase choked flow to 105,875 lbs., which is less than the acceptance threshold. Therefore, the potential loss of material due to erosion, remains within previously analyzed limits and remains valid for the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The main steam line flow restrictor erosion analysis remains valid for the period of extended operation.

4.7.3 GENERIC LETTER 81-11 CRACK GROWTH ANALYSIS TO DEMONSTRATE CONFORMANCE TO THE INTENT OF NUREG-0619

TLAA Description:

NUREG-0619 (Reference 4.8.20) was issued by the NRC per Generic Letter (GL) 81-11 in February 1981 (Reference 4.8.37) because of observed cracking on the inside surfaces of feedwater nozzles in some BWR plants. NUREG-0619 did not identify CPS as a plant which experienced these conditions. The observed cracking in other BWRs was caused by thermal feedwater sparger sleeve leakage which caused rapid thermal cycling, on the order of a cycle per second, driven by convective instability due to the leakage. The cracks initiated by this rapid thermal cycling fatigue mechanism were shallow, because the induced thermal stresses have steep gradients and shallow depth. These small internal cracks could potentially propagate to larger cracks by low cycle fatigue due to normal plant transients such as heatup, cooldown, and feedwater transients. These normal operational transients produce larger, through wall, stress cycles in the nozzle wall, and in time could drive the smaller internal cracks, already formed by the rapid thermal cycling fatigue mechanism, to continue to grow to depths for which vessel fracture mechanics analyses would predict further growth through the nozzle wall.

USAR Section 5.3.3.1.4.5 documents features implemented at CPS that comply with the NRC's recommendations in NUREG-0619 for the feedwater nozzles and spargers. These include:

1. The installation of improved triple-sleeve, double-seal, interference-fit feedwater spargers,

2. The installation of a qualified feedwater control system,

3. No cladding on the feedwater nozzles, and

4. A CPS specific fracture mechanics analysis.

In addition, the control rod drive return line nozzles have been capped to eliminate this same concerns raised in NUREG-0619.

In May 2002, GEH reevaluated, in a proprietary report, the CPS specific fracture mechanics analysis to account for EPU conditions. The purpose of the analysis was to justify the 10-year feedwater nozzle inspection frequency. The analysis evaluated the potential growth of a crack with an initial depth of 0.25 inches, over a 40-year plant life. The analysis assumed a number of startup and shutdown occurrences and scram occurrences that bound the 40-year operating period. The analysis concluded that the crack would not exceed the Section XI acceptance criteria, which complies with NUREG-0619 as amended by Generic Letter 81-11.

Since the plant-specific fracture mechanics analysis assumed thermal transient cycle occurrences over the 40-year life of the plant, this analysis is considered a TLAA and must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.1-1 shows that the number of startup and shutdown transient occurrences projected for 60 years are approximately 100 and the number of scram transient occurrences projected for 60 years are 89. These 60-year projections are significantly less than 2.5 times the number of occurrences assumed in the GEH evaluation. Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the crack growth evaluation remain valid through the period of extended operation.

4.7.4 REACTOR SHIELD WALL FLUENCE

TLAA Description:

USAR Section 3.8.3.6, “Materials, Quality Control, and Special Construction Techniques,” documents that there is no danger of radiation damage to the steel plates of the reactor shield wall, because damage occurs at a neutron fluence of approximately $10x10^{22}$ n/cm^2 (E>1MeV). This USAR section documents that the inside face of the shield wall will experience a neutron fluence of less than $5x10^{17}$n/cm^2 (E>1MeV) in the 40-year life expectancy of the station.

Since this USAR section documents a fluence value projected over the 40-year life of the plant it has been identified as a TLAA that requires evaluation for the period of extended operation.

TLAA Evaluation:

In order to determine if fluence will meet the $10x10^{22}$ n/cm^2 threshold through 60 years of operation, neutron fluence was projected at the inside face of the reactor shield wall for 52 EFPY using the DORT fluence methodology described in Section 4.2.1. The 52 EFPY fluence projection, which is documented in a proprietary report, is significantly less (by an order of magnitude) than the $10x10^{22}$ n/cm^2 threshold.

Therefore, the radiation damage assessment of the reactor shield wall remains valid through the period of extended operation.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The radiation damage assessment of the reactor shield wall remains valid through the period of extended operation.

4.7.5 HYDRAULIC CONTROL UNITS

TLAA Description

USAR Table 3.2-1, “Classification of Systems, Components and Structures,” documents that components on the hydraulic control units (HCUs) are Safety Class 2.

The subcomponents on the CPS HCUs were designed as follows:

1. The accumulator and nitrogen tank meet the requirements of ASME Section VIII.

2. The insert, withdrawal, and discharge riser lines meet the requirements of ASME Section III for Class 2 components.

3. The remaining pressure retaining components on the HCUs meet the requirements of ANSI B31.1.0.

4. The HCU’s were qualified, through testing, for seismic and hydrodynamic loads.

As such, associated design calculations and reports are not required to explicitly evaluate HCU components for fatigue in accordance with ASME Section III requirements for Class 1 components. However, since pressure retaining components on the HCUs, excluding the Section VIII tanks, were designed in accordance with ANSI B31.1.0 Code requirements or Section III requirements for Class 2 components, these components are qualified to 7,000 cycles in which the components are heated and pressurized to the design temperature and pressure.

In addition, USAR Section 3.9.2.2.1.6.4 “Hydraulic Control Unit (HCU),” documents that the HCUs were analyzed for faulted conditions including the effects of seismic and hydrodynamic loads. This design adequacy was determined by testing and analysis. The qualification testing included vibration testing equivalent to 1,800 SRV actuations, one OBE, and one SSE.

USAR Section 3.9.1.1.3, “Hydraulic Control Unit Transients,” documents the transients and transient occurrences that were considered in the design of the HCUs. The total number of startup, shutdown, and scram transient occurrences documented on this table are significantly less than 7,000 thermal and pressure cycles, one OBE, and one SSE transient occurrences.

The “Shim/Drive Cycle” and “Jog Cycle” transients documented in USAR Section 3.9.1.1.3 result in a negligible contribution to fatigue. The “Scram with Stuck Discharge Valve” transient is a one-time emergency transient which is not required, by ASME Section III, to be assumed in fatigue evaluations. Therefore, the transients and transient occurrences documented in USAR Section 3.9.1.1.3 are bounded by ANSI B31.1.0 Code requirements, Section III requirements for Class 2 components, and the qualification testing.

Since the design analysis and qualification testing assumed transient occurrences over 40 years, these have been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

Comparison of Table 4.3.1-1 clearly shows that the number of 60-year projected transient occurrences for startup, shutdown, and scrams are significantly less than 7,000 occurrences. In addition, it is not credible that CPS will experience 1,800 SRV actuations, one OBE, and one SSE transient occurrences in the 60-year life of the plant. Also, the “Shim/Drive Cycle” and “Jog Cycle” transients documented in USAR Section 3.9.1.1.3 result in a negligible contribution to fatigue.

Therefore, the transients and transient occurrences that were assumed for 40 years are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed HCU transients and transient occurrences remain valid through the period of extended operation.

4.7.6 FUEL POOL STORAGE RACK FATIGUE ANALYSIS

TLAA Description:

The CPS spent fuel pool storage capacity was expanded in the mid 2000's and new fuel storage racks were installed. Although not required by ASME Section III, the new fuel storage racks were evaluated for fatigue consistently with ASME Section III, Subsection NB-3222.4.

The fatigue evaluation assumed 20 OBEs and one SSE. The resulting fatigue evaluation calculated a CUF value of 0.104.

Since the evaluation resulted in a calculated CUF value using transients and transient occurrences assumed over the 40-year life of the plant, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.1-1 documents 60-year transient projections for OBE and SSE events. To date, CPS has not experienced any OBEs or SSEs, and experiencing 20 OBEs and one SSE during the period of extended operation is not credible.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the spent fuel pool racks remain valid through the period of extended operation.

4.7.7 REFUELING BULKHEAD RING FLAW EVALUATION

TLAA Description:

In 1982 and 1983, CPS evaluated a number of crack indications in the weldments of the refueling bulkhead ring plates. The crack indications were detected by ultrasonic examination and were evaluated in two calculations using fracture mechanics methodology guidelines per ASME Section XI, Winter 1975 Edition. This methodology included a fracture mechanics stability evaluation which assessed the influences of fatigue-type loadings (cyclic in nature) on crack propagation.

The calculations concluded that based on the fracture toughness of the weldment materials, the cracks will not propagate as long as they experience 500 or fewer thermal transient occurrences.

Since the calculations concluded that the cracks would not propagate prior to 500 thermal transient occurrences assumed over the 40-year life of the plant, these calculations have been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

The calculations assumed that the refueling bellow ring plate weldments experience 500 thermal occurrences where the weldment material temperature increases from ambient to 350 degrees F. The CPS drywell is designed to a temperature of 330 degrees F which corresponds to the maximum calculated accident temperature.

The refueling bulkhead is located approximately at elevation 800 foot in the drywell. Review of Environmental Qualification program specifications show that temperature in this area of the drywell is approximately 235 degrees F during normal power operations. In addition, operators are required to scram the plant when drywell bulk temperature reaches 330 degrees F. Therefore, the assumption that these weldments will experience 500 transient occurrences from ambient to 350 degrees F, is extremely conservative when considering that CPS is projected to startup and shutdown approximately 100 times in 60 years (see Table 4.3.1-1) and typical temperatures of the refueling bellow ring plate weldments during normal operations is approximately 235 degrees F.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original evaluations are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences in the refueling bulkhead ring plate fracture mechanics stability evaluation remain valid through the period of extended operation.

4.7.8 FUEL POOL CLEANUP SYSTEM, FLOW CONTROL VALVES

TLAA Description:

The CPS fuel pool cleanup system flow control valves (1FC004A and B) regulate flow through the system demineralizers. These valves are ASME Class 3 components. However, an existing CLB design analysis evaluated these valves for fatigue.

The fatigue evaluation in the analysis assumed 87,600 operational loads, 14,790 SRV lifts, five OBEs, and one SSE. The resulting fatigue evaluation calculated various valve subcomponent CUF values, all of which were less than or equal to a value of 0.092.

Since the design analysis resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, and these valves are in scope for license renewal, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

TLAA Evaluation:

Table 4.3.1-1 documents 60-year transient projections for SRV lift, OBE, and SSE transient occurrences. This table illustrates that the projected occurrences are significantly less than the assumed occurrences for these transients.

The 87,600 operational load transient occurrences are based on an assumption that each valve is in service and operated six times a day for 40 years. The contribution to usage from these occurrences is a CUF value of 0.077. Review of the system operating procedures shows that this assumption is extremely conservative. For example, 1FC004A and B are redundant valves and during normal operation only one valve controls flow while the other is placed out of service by shutting the valve. These valves are swapped in service quarterly. This factor by itself effectively reduces the original assumption of six occurrences each day for 40 years in half.

Also, when these diaphragm valves are in service the valve position will only slightly modulate to maintain flow to the system demineralizer. Resulting stresses on valve elements are minor and would not contribute to fatigue. Larger operating stresses will result when the valve experiences a significant position change (e.g., the valve is placed in and out of service), the control band is significantly changed, or the demineralizer pressure drop increases or decreases. These events occur significantly less than six times a day. This conservative assessment indicates no more than 65,700 cycle occurrences would result in 60 years.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis are valid for 60 years.

TLAA Disposition: 10 CFR 54.21(c)(1)(i) – The assumed transients and transient occurrences for the fuel pool cleanup system flow control valves remain valid through the period of extended operation.

4.8 REFERENCES

4.8.1 *10 CFR 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants (Section 4.1)*

4.8.2 *NUREG-1800, Revision 2, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP) (Section 4.1 and 4.2.4)*

4.8.3 *NUREG-1801, Revision 2, Generic Aging Lessons Learned (GALL) Report (Section 4.1)*

4.8.4 *NEI 95-10, Revision 6, Industry Guideline for Implementing the Requirements of 10 CFR 54, the License Renewal Rule (Section 4.1)*

4.8.5 *Clinton Scientech Exemptions Search (Section 4.1)*

4.8.6 *10 CFR 50.60, Acceptance Criteria for Fracture Prevention Measures for Lightwater Nuclear Power Reactors for Normal Operation (Section 4.2)*

4.8.7 *10 CFR 50, Appendix G, Fracture Toughness Requirements (Sections 4.2, 4.2.2, and 4.2.3)*

4.8.8 *10 CFR 50, Appendix H, Reactor Vessel Material Surveillance Program Requirements (Section 4.2)*

4.8.9 *NEDC-32983P-A, Revision 2, Licensing Topical Report, General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluations, January 2006 (Sections 4.2.1 and 4.2.1.2) (ML072480121)*

4.8.10 *Crane Manufacturers Association of America, Specification No. 70 (Section 4.7.1)*

4.8.11 *Illinois Power Company (IPC) Letter Submitted to the NRC on February 21, 1985, Clinton Power Station Unit 1, Control of Heavy Loads (NUREG-0612) (Section 4.7.1) (ML20107G305)*

4.8.12 *IPC Letter Submitted to the NRC on June 22, 1981, Control of Heavy Loads (NUREG-0612) (Section 4.7.1) (ML20005A467)*

4.8.13 *USNRC Regulatory Guide 1.190, Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence, March 2001 (Section 4.2.1)*

4.8.14 *AmerGen Letter Submitted to the NRC on March 15, 2005, Reactor Core Shroud Repair Relief Request (Section 4.2.9) Proprietary (ML050820278)*

4.8.15 *Limerick UFSAR Section 9.1.5.2 (Section 4.7.1)*

4.8.16 *EPRI Technical Report 3002018262, Revision 1. Environmentally Assisted Fatigue Screening Methods Proprietary (Section 4.3.2)*

4.8.17 *USNRC Regulatory Guide 1.207, Revision 1, June 2018, Guidelines for Evaluating the Effects of Light-Water Reactors Water Environments in Fatigue Analyses of Metal Components (Section 4.3.2)*

4.8.18 *EPRI Technical Report 1010639, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4 (Section 4.3.5)*

4.8.19 *Reference Not Used*

4.8.20 *NUREG-0169, Revision 1, BWR Feedwater Nozzle and Control Rid Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10 (Technical Report). (Section 4.7.3)*

4.8.21 *NRC Letter dated December 30, 2009, Clinton Power Station Unit No.1 – Request For Alternative 4215 For Class 1 Reactor Vessel Circumferential Shell Welds (TAC No. ME0407) (Section 4.2.5) (ML093640023)*

4.8.22 *BWRVIP-74-A, BWR Vessel and Internals Project – BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal, June 2003, Proprietary (Sections 4.2.2 and 4.2.6)*

4.8.23 *USNRC Regulatory Guide 1.99, Radiation Embrittlement of Reactor Vessel Materials, Revision 2, May 1988 (Section 4.2.3)*

4.8.24 *BWRVIP-135, BWR Vessel and Internals Project, Integrated Surveillance Program (ISP) Data Source Book and Plant Evaluations, Revision 4 (Sections 4.2.2 and 4.2.3)*

4.8.25 *NRC Letter dated April 5, 2002, Clinton Power Stations, Unit 1 – Issuance of Amendment (TAC. No. MB2210) (Section 4.2.1 and 4.2.4) (ML021650636)*

4.8.26 *Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 149 to Facility Operating License No. NPF-62, Amergen Energy Company, LLC, Clinton Power Station, Unit 1, Docket No. 50-461 (Section 4.2.1) (ML021650543)*

4.8.27 *Clinton Technical Specification 3.4.11, RCS Pressure and Temperature (P/T) Limits (Section 4.2.4)*

4.8.28 *BWRVIP-05, BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05), September 1995 (Sections 4.2.5 and 4.2.6)*

4.8.29 *BWRVIP-05 SER (Final), USNRC letter from Gus C. Lainas to Carl Terry, Niagara Mohawk Power Company, BWRVIP Chairman, Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report, (TAC No. M93925), July 28, 1998 (Sections 4.2.5 and 4.2.6)*

4.8.30 *USNRC Generic Letter 98-05, Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief From Augmented Examination Requirements on Reactor Pressure Vessel Circumferential Shell Welds, November 10, 1998 (Section 4.2.5)*

4.8.31 *Supplement To Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report (TAC NO. MA3395), March 7, 2000 (Sections 4.2.5 and 4.2.6)*

4.8.32 *Illinois Power Company Letter Submitted to James Keppler (NRC) on October 31, 1984, Damage to Guard Pipe Bellows Assemblies (Section 4.6.8) (ML20099E051)*

4.8.33 *Illinois Power Company Letter Submitted to James Keppler (NRC) on December 21, 1984, Damage to Guard Pipe Bellows Assemblies (Section 4.6.8) (ML20112B682)*

4.8.34 *NRC Letter dated September 27, 1983, Use of ASME Code Case N-315 for Clinton Power Station, Unit 1 (Section 4.6.8) (ML20080N445)*

4.8.35 *Ranganath, S., Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident, Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, August 1979, Paper Gi/5 (Section 4.2.7)*

4.8.36 *BWRVIP-183, BWR Vessel and Internals Project, Top Guide Grid Beam Inspections and Flaw Evaluations Guidelines (Section 4.2.11)*

4.8.37 *Generic Letter (GL) 81-11, BWR Feedwater Nozzle and Control Rid Drive Return Line Nozzle Cracking (Section 4.7.3)*

4.8.38 *Reference Not Used*

4.8.39 *NUREG/CR-6260, Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components, March 1995 (Sections 4.3.1 and 4.3.2)*

4.8.40 *NUREG/CR-6909, Revision1 Effect of LWR Coolant Environments on Fatigue Life of Reactor Materials, Final Report, May 2014 (Section 4.3.2) (ML16319A004)*

APPENDIX A UPDATED SAFETY ANALYSIS REPORT SUPPLEMENT
TABLE OF CONTENTS

A.1.0 Introduction

The application for a renewed operating license is required by 10 CFR 54.21(d) to include a USAR Supplement. This appendix, which includes the following sections, comprises the USAR Supplement:

- Section A.1.1 contains a listing of the aging management programs that correspond to NUREG-1801 Chapter XI programs, including the status of the programs at the time the License Renewal Application was submitted.
- Section A.1.2 contains a listing of the plant-specific aging management programs, including the status of the programs at the time the License Renewal Application was submitted.
- Section A.1.3 contains a listing of aging management programs that correspond to NUREG-1801 Chapter X programs associated with Time-Limited Aging Analyses, including the status of the programs at the time the License Renewal Application was submitted.
- Section A.1.4 contains a listing of the Time-Limited Aging Analyses summaries (TLAAs).
- Section A.1.5 contains a discussion of the Quality Assurance Program and Administrative Controls.
- Section A.1.6 contains a discussion of the Operating Experience.
- Section A.2 contains a summarized description of the aging management programs.
- Section A.2.1 contains a summarized description of the NUREG-1801 Chapter XI programs for managing the effects of aging.
- Section A.2.2 contains a summarized description of the plant-specific programs for managing the effects of aging.
- Section A.3 contains a summarized description of the NUREG-1801 Chapter X programs that support the TLAAs.
- Section A.4 contains a summarized description of the TLAAs applicable to the period of extended operation.
- Section A.5 contains the License Renewal Commitment List.

The integrated plant assessment for license renewal identified new and existing aging management programs necessary to provide reasonable assurance that systems, structures, and components within the scope of license renewal will continue to perform their intended functions consistent with the Current Licensing Basis (CLB) for the period of extended operation. The period of extended operation is defined as 20 years from the unit's current operating license expiration date.

A.1.1 NUREG-1801 Chapter XI Aging Management Programs

The NUREG-1801 Chapter XI Aging Management Programs (AMPs) are described in the following sections. The AMPs are either consistent with generally accepted industry methods as discussed in NUREG-1801 or require enhancements.

The following list reflects the status of these programs at the time of the License Renewal Application (LRA) submittal. Commitments for program additions and enhancements are identified in the Appendix A.5 License Renewal Commitment List.

1. ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (Section A.2.1.1) [Existing]
2. Water Chemistry (Section A.2.1.2) [Existing]
3. Reactor Head Closure Stud Bolting (Section A.2.1.3) [Existing]
4. BWR Vessel ID Attachment Welds (Section A.2.1.4) [Existing]
5. BWR Feedwater Nozzle (Section A.2.1.5) [Existing]
6. BWR Control Rod Drive Return Line Nozzle (Section A.2.1.6) [Existing]
7. BWR Stress Corrosion Cracking (Section A.2.1.7) [Existing]
8. BWR Penetrations (Section A.2.1.8) [Existing]
9. BWR Vessel Internals (Section A.2.1.9) [Existing]
10. Flow-Accelerated Corrosion (Section A.2.1.10) [Existing]
11. Bolting Integrity (Section A.2.1.11) [Existing - Requires Enhancement]
12. Open-Cycle Cooling Water System (Section A.2.1.12) [Existing]
13. Closed Treated Water Systems (Section A.2.1.13) [Existing - Requires Enhancement]
14. Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (Section A.2.1.14) [Existing – Requires Enhancement]
15. Compressed Air Monitoring (Section A.2.1.15) [Existing – Requires Enhancement]
16. Fire Protection (Section A.2.1.16) [Existing – Requires Enhancement]
17. Fire Water System (Section A.2.1.17) [Existing – Requires Enhancement]
18. Aboveground Metallic Tanks (Section A.2.1.18) [New]
19. Fuel Oil Chemistry (Section A.2.1.19) [Existing – Requires Enhancement]
20. Reactor Vessel Surveillance (Section A.2.1.20) [Existing]
21. One-Time Inspection (Section A.2.1.21) [New]

22. Selective Leaching (Section A.2.1.22) [New]
23. One-time Inspection of ASME Code Class 1 Small-Bore Piping (Section A.2.1.23) [New]
24. External Surfaces Monitoring of Mechanical Components (Section A.2.1.24) [New]
25. Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section A.2.1.25) [New]
26. Lubricating Oil Analysis (Section A.2.1.26) [Existing – Requires Enhancement]
27. Monitoring of Neutron-Absorbing Materials Other Than Boraflex (Section A.2.1.27) [Existing – Requires Enhancement]
28. Buried and Underground Piping and Tanks (Section A.2.1.28) [Existing – Requires Enhancement]
29. ASME Section XI, Subsection IWE (Section A.2.1.29) [Existing – Requires Enhancement]
30. ASME Section XI, Subsection IWL (Section A.2.1.30) [Existing]
31. ASME Section XI, Subsection IWF (Section A.2.1.31) [Existing – Requires Enhancement]
32. 10 CFR Part 50, Appendix J (Section A.2.1.32) [Existing]
33. Masonry Walls (Section A.2.1.33) [Existing]
34. Structures Monitoring (Section A.2.1.34) [Existing – Requires Enhancement]
35. RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (Section A.2.1.35) [Existing – Requires Enhancement]
36. Protective Coating Monitoring and Maintenance Program (Section A.2.1.36) [Existing]
37. Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section A.2.1.37) [New]
38. Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (Section A.2.1.38) [New]
39. Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section A.2.1.39) [New]

40. Metal Enclosed Bus (Section A.2.1.40) [Existing]

41. Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section A.2.1.41) [New]

42. Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (Section A.2.1.42) [New]

A.1.2 Plant-Specific Aging Management Programs

None. The Clinton Power Station, Unit 1 License Renewal Application does not include plant-specific aging management programs.

A.1.3 NUREG-1801 Chapter X Aging Management Programs

The NUREG-1801 Chapter X Aging Management Programs (AMP) associated with Time-Limited Aging Analyses are described in the following sections. The AMPs are either consistent with generally accepted industry methods as discussed in NUREG-1801 Chapter X or require enhancements. The following list reflects the status of these programs at the time of the License Renewal Application (LRA) submittal. Commitments for program additions and enhancements are identified in Appendix A.5 License Renewal Commitment List.

1. Fatigue Monitoring (Section A.3.1.1) [Existing - Requires Enhancement]

2. Environmental Qualification (EQ) of Electric Components (Section A.3.1.2) [Existing]

A.1.4 Time-Limited Aging Analyses

Summaries of the Time-Limited Aging Analyses applicable to the period of extended operation are included in the following sections:

1. Reactor Vessel and Internals Neutron Embrittlement Analyses (Section A.4.2)

2. Reactor Pressure Vessel and Internals Neutron Fluence Analyses (Section A.4.2.1)

3. Reactor Pressure Vessel Neutron Fluence Analyses (Section A.4.2.1.1)

4. Reactor Pressure Vessel Internals Neutron Fluence Analyses (A.4.2.1.2)

5. Reactor Pressure Vessel Upper-Shelf Energy (USE) Analyses (Section A.4.2.2)

6. Reactor Pressure Vessel Adjusted Reference Temperature (ART) Analyses (Section A.4.2.3)

7. Reactor Pressure Vessel Pressure-Temperature (P-T) Limits (Section A.4.2.4)

8. Reactor Pressure Vessel Circumferential Weld Failure Probability Analyses (Section A.4.2.5)

9. Reactor Pressure Vessel Axial Weld Failure Probability Analyses (Section A.4.2.6)

10. Reactor Pressure Vessel Reflood Thermal Shock Analysis (Section A.4.2.7)

11. Jet Pump Beam Bolts and Core Plate Bolts Preload Relaxation Analyses (Section A.4.2.8)

12. Core Shroud Repair Stabilizer Assembly Bracket Preload Relaxation Analysis (Section A.4.2.9)

13. Reactor Pressure Vessel Core Support Structure Strain Evaluation (Section A.4.2.10)

14. Top Guide Irradiation Assisted Stress Corrosion Cracking (IASCC) Analysis (Section A.4.2.11)

15. Metal Fatigue Analysis (Section A.4.3)

16. Transient Cycle and Cumulative Usage Projections for 60 Years (Section A.4.3.1)

17. ASME Section III, Class 1 RPV and Piping and Piping Component Fatigue Analysis (Section A.4.3.2.1)

18. Environmentally Assisted Fatigue Analyses for Class 1 RPV and Piping (Section A.4.3.2.2)

19. Main Steam System Transients (Section A.4.3.3.1)

20. Main Steam Isolation Valve Transients (Section A.4.3.3.2)

21. Safety/Relief Valve Transients (Section A.4.3.3.3)

22. Recirculation System Transients (Section A.4.3.3.4)

23. Recirculation Flow Control Valve Transients (Section A.4.3.3.5)

24. Recirculation Gate Valve Transients (Section A.4.3.3.6)

25. Recirculation Pump Transients (Section A.4.3.3.7)

26. Control Rod Drive System Transients (Section A.4.3.3.8)

27. ASME Section III, Class 1 Fatigue Exemptions (Section A.4.3.4)

28. ASME Section III, Class 2, Class 3, and ANSI B31.1 Allowable Stress Analyses and Related HELB Selection Analyses (Section A.4.3.5)

29. High Energy Line Break (HELB) Analyses Based on Cumulative Fatigue Usage (Section A.4.3.6)

30. Reactor Vessel Internals (Section A.4.3.7)

31. Reactor Vessel Internals Fatigue Analyses (Section A.4.3.7.1)
32. ASME Section III, Class CS Fatigue Exemptions (Section A.4.3.7.2)
33. Core Shroud Support and Stabilizer Assembly Brackets (Section A.4.3.7.3)
34. Environmental Qualification of Electric and Mechanical Equipment (Section A.4.4.1)
35. Concrete Containment Tendon Prestress Analyses (A.4.5.1)
36. Containment Class MC Mechanical Penetrations (Section A.4.6.1)
37. Containment Liner (Section A.4.6.2)
38. Suppression Pool Liner (Section A.4.6.3)
39. Containment and Drywell Equipment Hatch and Personnel Locks, and Drywell Head Fatigue Assessment (Section A.4.6.4)
40. Inclined Fuel Transfer Tube Bellows (Section A.4.6.5)
41. Refueling Bellows (Section A.4.6.6)
42. SRV X-Quenchers (Section A.4.6.7)
43. Containment/Drywell Penetration High Energy Guard Pipe Bellows (Section 4.6.8)
44. Containment Liner Corrosion Assessment (Section A.4.6.9)
45. Containment Electrical Penetrations (Section A.4.6.10)
46. ECCS Suction Strainer Bellows (Section A.4.6.11)
47. Clinton Power Station Cranes Cyclic Loading Analyses (Section A.4.7.1)
48. Main Steam Line Flow Restrictor Erosion Analysis (Section A.4.7.2)
49. Generic Letter 81-11 Crack Growth Analysis to Demonstrate Conformance to the Intent of NUREG-0619 (Section A.4.7.3)
50. Reactor Shield Wall Fluence (Section A.4.7.4)
51. Hydraulic Control Units (Section A.4.7.5)
52. Fuel Pool Storage Rack Fatigue Analysis (Section A.4.7.6)
53. Refueling Bulkhead Ring Flaw Evaluation (Section A.4.7.7)
54. Fuel Pool Cleanup System, Flow Control Valves (Section A.4.7.8)

A.1.5 Quality Assurance Program and Administrative Controls

The Quality Assurance Program implements the requirements of 10 CFR 50, Appendix B, and is consistent with the summary in Appendix A.2, "Quality Assurance For Aging Management Programs (Branch Technical Position IQMB-1)" of NUREG-1800. The Quality Assurance Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to the safety-related and nonsafety-related systems, structures, and components (SSCs) that are subject to Aging Management Review (AMR). In many cases, existing activities were found adequate for managing aging effects during the period of extended operation.

A.1.6 Operating Experience

Operating experience from plant-specific and industry sources is captured and systematically reviewed on an ongoing basis in accordance with the quality assurance program, which meets the requirements of 10 CFR Part 50, Appendix B, and the operating experience program, which meets the requirements of NUREG-0737, "Clarification of TMI Action Plan Requirements," Item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff." The operating experience program interfaces with and relies on active participation in the Institute of Nuclear Power Operations' operating experience program, as endorsed by the NRC. The Constellation fleet operating experience program that is implemented at Clinton Power Station conforms to the recommendations of LR-ISG-2011-05, "Ongoing Review of Operating Experience." In accordance with this program, all incoming operating experience items are screened to determine whether they may involve age-related degradation or aging management impacts. Items so identified are further evaluated and the AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined through these evaluations that the effects of aging may not be adequately managed. Training on age-related degradation and aging management is provided, commensurate with their role in the process, to those personnel responsible for implementing the AMPs and who may submit, screen, assign, evaluate, or otherwise process plant-specific and industry operating experience. Plant-specific operating experience associated with aging management and age-related degradation is reported to the industry in accordance with guidelines established in the operating experience program.

A.2.0 Aging Management Programs

A.2.1 NUREG-1801 Chapter XI Aging Management Programs

This section provides summaries of the NUREG-1801 programs credited for managing the effects of aging.

A.2.1.1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management program is an existing condition monitoring program that consists of periodic volumetric, surface, and visual examinations of ASME Class 1, 2, and 3 components including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting for assessment, identification of signs of degradation, and establishment of corrective actions. The inspections will be implemented in accordance with 10 CFR 50.55(a) and ASME Code, Section XI Subsections IWB, IWC, and IWD. These activities include examinations, evaluations, and monitoring and trending of results to confirm that effects of cracking, loss of material, and loss of fracture toughness are managed effectively during the period of extended operation.

A.2.1.2 Water Chemistry

The Water Chemistry aging management program is an existing mitigative program whose activities consist of monitoring and control of water chemistry to mitigate aging effects of loss of material due to corrosion, cracking due to stress corrosion cracking (SCC) and related mechanisms, and reduction of heat transfer due to fouling in components that are exposed to treated water. Major component types managed by the program include the reactor vessel, reactor internals, piping, piping elements and piping components, heat exchangers, and tanks. The Water Chemistry program keeps peak levels of various impurities such as chlorides, fluorides, and sulfates, below system specific limits based on the industry recognized guidelines of the Boiling Water Reactor Vessel and Internals Project (BWRVIP 190, Revision 1, Electric Power Research Institute - 3002002623) for the mitigation of loss of material, reduction of heat transfer and cracking aging effects. In addition, the Water Chemistry program is also credited for mitigating loss of material and cracking for components exposed to sodium pentaborate, steam and reactor coolant environments. Chemistry programs are used to control water chemistry for impurities that accelerate corrosion to mitigate aging effects on component surfaces.

A.2.1.3 Reactor Head Closure Stud Bolting

The Reactor Head Closure Stud Bolting aging management program is an existing condition monitoring and preventive program that manages reactor head closure studs and associated nuts and washers for cracking and loss of material. The program is implemented through station procedures based on the examination requirements specified in ASME Code, Section XI, Subsection IWB, Table IWB-2500-1 and preventive measures to mitigate cracking as delineated in NRC Regulatory Guide (RG) 1.65, “Materials and Inspections for Reactor Vessel Closure Studs,” and NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants.”

A.2.1.4 BWR Vessel ID Attachment Welds

The BWR Vessel ID Attachment Welds aging management program is an existing condition monitoring program that includes the inspection and evaluation recommendations within BWRVIP-48-A and the requirements of ASME Code, Section XI, Subsection IWB and the Water Chemistry (A.2.1.2) program. The program is implemented through station procedures that provide for mitigation of cracking of reactor vessel internal components through management of reactor water chemistry and monitoring for cracking through in-vessel examinations of the reactor vessel internal attachment welds.

A.2.1.5 BWR Feedwater Nozzle

The BWR Feedwater Nozzle aging management program is an existing condition monitoring program that manages the effects of cracking in the feedwater nozzles by augmented inservice inspection (ISI) in accordance with the requirements of the ASME Code, Section XI, Subsection IWB, Table IWB-2500-1 and the recommendations provided within BWROG Licensing Topical Report, GE-NE-523-A71-0594-A, Revision 1, "Alternate BWR Feedwater Nozzle Inspection Requirements." The program includes periodic ultrasonic inspection of critical regions of the reactor vessel feedwater nozzles.

A.2.1.6 BWR Control Rod Drive Return Line Nozzle

The BWR Control Rod Drive Return Line (CRDRL) Nozzle aging management program is an existing condition monitoring program that manages the effects of cracking in the CRDRL reactor pressure vessel nozzle. Prior to initial plant operation, the CRDRL nozzle was capped to mitigate thermal fatigue cracking, and the CRD return flow was not rerouted to the reactor vessel. Therefore, augmented inspections in accordance with NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10," and NRC Generic Letter 80-95, "Generic Activity A-10," are not required. The program includes inservice inspection (ISI) examinations in accordance with ASME Code, Section XI, Subsection IWB, Table IWB-2500-1. The nozzle, cap, and associated welds are included in the visual inspection (VT-2) during the reactor pressure test performed each refueling outage.

A.2.1.7 BWR Stress Corrosion Cracking

The BWR Stress Corrosion Cracking aging management program is an existing condition monitoring and mitigative program that manages intergranular stress corrosion cracking (IGSCC) in relevant piping and piping welds made of stainless steel and nickel-based alloy by augmented inservice inspections, regardless of code classification, as delineated in NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," and NRC Generic Letter 88-01, "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping," and its Supplement 1. The program includes preventive measures to mitigate IGSCC, and inspection and flaw evaluation to monitor IGSCC and its effects. The schedule and extent of the inspections are performed in accordance with NRC staff-approved BWRVIP-75-A, "BWR Vessel and Internals Project Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules," and staff-approved EPRI Topical Report TR-112657, Revision B-A, Final Report, "Risk-Informed Inservice Inspection Evaluation Procedure," December 1999.

A.2.1.8 BWR Penetrations

The BWR Penetrations aging management program is an existing condition monitoring program that manages the effects of cracking of reactor vessel instrumentation penetrations, CRD housing and incore-monitoring housing penetrations, and standby liquid control/core plate differential pressure penetrations exposed to reactor coolant through water chemistry controls and inservice inspections. In addition to the requirements of ASME Code, Section XI, Subsection IWB, the BWR Penetrations program incorporates the inspection and evaluation recommendations of BWRVIP-49-A, "Instrument Penetration Inspection and Flaw Evaluation Guidelines," BWRVIP-47-A, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines," and the water chemistry recommendations described in the Water Chemistry (A.2.1.2) program. Per BWRVIP-27-A, “BWR Standby Liquid Control System/Core Plate Delta-P Inspection and Flaw Evaluation Guidelines,” as the Clinton standby liquid control system injects boron through the high pressure core spray sparger, the inspection and evaluation guidelines are not applicable.

A.2.1.9 BWR Vessel Internals

The BWR Vessel Internals aging management program is an existing condition monitoring and mitigative program that includes inspections and flaw evaluations in conformance with the guidelines of applicable NRC-approved BWRVIP documents, and provides reasonable assurance of the long-term integrity and safe operation of BWR vessel internal components that are fabricated of X-750 and nickel alloy, stainless steel including martensitic stainless steel (not used in CPS reactor vessel internals), cast austenitic stainless steel (CASS), and associated welds. The program also mitigates these aging effects by managing water chemistry per the Water Chemistry (A.2.1.2) program.

The program performs inspections for cracking and loss of material in accordance with the guidelines of applicable NRC-approved BWRVIP documents and the requirements of ASME Code, Section XI, Table IWB-2500-1. For example, cracking and loss of material due to wear in the steam dryer are managed by performing visual inspections in accordance with applicable NRC-approved BWRVIP documents. This program also manages loss of preload by performing visual inspections or stress analyses for adequate structural integrity.

Evaluations of reactor vessel internal components determined that supplemental inspections in addition to the existing BWRVIP examination guidelines are not necessary during the period of extended operation to manage loss of fracture toughness due to thermal aging embrittlement or neutron irradiation embrittlement and the synergistic effect of thermal aging and neutron irradiation as well as cracking due to irradiation assisted stress corrosion cracking (IASCC). This determination is based on neutron fluence, cracking susceptibility, fracture toughness, and consequences of cracking or failure of the reactor vessel internal components. The impact of loss of fracture toughness on component integrity is indirectly managed by using visual or volumetric examination techniques to monitor for cracking in the components.

A.2.1.10 Flow-Accelerated Corrosion

The Flow-Accelerated Corrosion aging management program is an existing condition monitoring program that manages wall thinning caused by flow-accelerated corrosion (FAC). The program is based on commitments made in response to NRC Generic Letter 89-08, “Erosion/Corrosion Induced Pipe Wall Thinning,” and relies on implementation of the Electric Power Research Institute (EPRI) guidelines in the Nuclear Safety Analysis Center (NSAC)-202L-R4, “Recommendations for an Effective Flow-Accelerated Corrosion Program,” for an effective FAC program.

CHECWORKS™ is used to predict component wear rates and remaining service life in the systems susceptible to FAC which provides reasonable assurance that structural integrity will be maintained between inspections. The model is revised if any changes in operating conditions or other factors that affect FAC (e.g., plant chemistry, power uprate) have occurred since the CHECWORKS™ model was last updated. Changes may also result from plant modifications that effect FAC behavior such as material changes, the addition of piping systems, piping system configuration changes, and the addition or replacement of in-line components. The CHECWORKS™ model is also refined by importing actual volumetric inspection data thickness measurements and re-running wear rate analyses. This improves the predictive capability of the model to ensure that intended functions are maintained.

The program also manages wall thinning caused by mechanisms other than FAC in situations where periodic monitoring is used in lieu of eliminating the cause of various erosion mechanisms.

The program includes: (a) identifying all susceptible piping systems and components; (b) developing FAC predictive models to reflect component geometries, materials, and operating parameters; (c) performing analysis of FAC models and, with consideration of operating experience, selecting a sample of components for inspections; (d) inspecting components; (e) evaluating inspection data against acceptance criteria to determine the need for corrective actions including inspection sample expansion, repairs, or replacements, and to schedule future inspections; and (f) incorporating inspection data to refine FAC models.

A.2.1.11 Bolting Integrity

The Bolting Integrity aging management program is an existing condition monitoring program. The program manages loss of preload, cracking, and loss of material due to corrosion of closure bolting on pressure-retaining joints within the scope of license renewal. The Bolting Integrity program incorporates NRC and industry recommendations delineated in NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants,” EPRI NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” and EPRI TR-104213, “Bolted Joint Maintenance & Applications Guide.”

The program credits visual inspection of pressure-retaining bolted joints in ASME Class 1, 2, and 3 systems for leakage and age-related degradation during system pressure tests performed in accordance with ASME Section XI, Subsections IWB, IWC, and IWD. In addition, the Bolting Integrity program credits volumetric, surface, and visual inspections of ASME Class 1, 2, and 3 bolts, nuts, washers, and associated bolting components performed in accordance with ASME Section XI. The integrity of pressure-retaining bolted joints in non-ASME Class 1, 2, 3 and MC systems is monitored by detection of visible leakage, evidence of past leakage, or other age-related degradation during maintenance activities and walkdowns in plant areas that contain systems within scope of license renewal. Closure bolting that is submerged or located in piping systems that contain air or gas for which leakage is difficult to detect, is inspected or tested by alternative means. Inspection activities of closure bolting on pressure-retaining joints within the scope of license renewal in submerged environments will also be performed in conjunction with associated component maintenance and testing activities. The Bolting Integrity program includes preventive measures to preclude or minimize loss of preload and cracking in pressure-retaining bolted joints.

The Bolting Integrity aging management program is supplemented by ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (A.2.1.1) aging management program for inspection of safety-related and nonsafety-related closure bolting on pressure-retaining joints. Inspection activities for closure bolting on pressure-retaining joints in buried and underground environments are performed by the Buried and Underground Piping and Tanks (A.2.1.28) aging management program when closure bolting on pressure-retaining joints are exposed by excavation.

The Primary Containment (MC) pressure bolting is managed as part of ASME Section XI, Subsection IWE (A.2.1.29) aging management program. The ASME Section XI, Subsection IWF (A.2.1.31) aging management program manages ASME Class 1, 2, 3 and MC piping and component supports bolting. Structural bolting, other than ASME Class 1, 2, 3, and MC piping and component supports is managed as part of the Structures Monitoring (A.2.1.34) aging management program and R.G. 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (A.2.1.35) aging management program. Crane and hoist bolting is managed by the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (A.2.1.14) aging management program. Reactor head closure bolting is managed by the Reactor Head Closure Stud Bolting (A.2.1.3) aging management program. The above bolting is not included in the Bolting Integrity aging management program.

The Bolting Integrity aging management program will be enhanced to:

1. Perform shutdown service water (SX) pump inspection with specific instructions to inspect the condition of all closure bolting for evidence of cracking, loss of material, or loss of preload.

This enhancement will be implemented no later than six months prior to the period of extended operation.

A.2.1.12 Open-Cycle Cooling Water System

The Open-Cycle Cooling Water System (OCCWS) aging management program is an existing preventive, mitigative, condition monitoring, and performance monitoring program based on the implementation of NRC Generic Letter (GL) 89-13, “Service Water System Problems Affecting Safety-Related Equipment,” which includes (a) surveillance and control of bio-fouling, (b) tests to verify heat transfer, (c) routine inspection and maintenance program, (d) system walkdown inspection, and (e) review of maintenance , operating, and training practices and procedures. The OCCWS program applies to components constructed of various materials, including carbon steel, stainless steel, galvanized steel, nickel alloys, copper alloys, and PVC.

The OCCWS aging management program manages heat exchangers, piping, piping elements, and piping components in safety-related and nonsafety-related raw water systems that are exposed to a raw water environment for loss of material, wall thinning due to erosion, reduction of heat transfer, and flow blockage. The guidelines of NRC GL 89-13 are implemented through the site GL 89-13 activities for heat exchangers and piping segments, and the Raw Water Piping Integrity program for additional piping segments. System and component testing, visual inspections, non-destructive examination, cleaning, and chemical injection are conducted to ensure that identified aging effects are managed such that system and component intended functions and integrity are maintained.

A.2.1.13 Closed Treated Water Systems

The Closed Treated Water Systems program is an existing mitigative and condition monitoring program that manages the loss of material, wall thinning due to erosion, cracking, and reduction of heat transfer in flexible connections, heat exchangers, piping, piping components, pump casing, tanks, and valve bodies exposed to a closed cycle cooling water environment. The aging management program includes monitoring for microbiological organisms and features water treatment to modify the chemical composition of the water such that the function of the equipment is maintained and such that the effects of corrosion are minimized. Specifically, the program includes (a) a pure water program without chemical additives; (b) an iron corrosion inhibitor with additional additives for copper corrosion inhibition, pH buffering, and a dispersant; (c) chemical testing of the water to ensure that the water treatment program maintains the water chemistry within acceptable guidelines; and (d) inspections to determine the presence or extent of corrosion, stress corrosion cracking, or reduction of heat transfer. The inspections consist of existing visual and non-destructive inspections of the internal surface of the components performed whenever the system boundary is opened as well as new periodic inspections as described in the enhancement below.

The Closed Treated Water Systems aging management program will be enhanced to:

1. Perform condition monitoring, including periodic visual inspections and non-destructive examinations to verify the effectiveness of water chemistry control in mitigating aging effects. It will provide for the development of the criteria for identifying a representative sample of piping and components for visual and

non-destructive inspections. A minimum of 25 inspections will be performed, with at least two samples of each material type, distributed evenly among the three different closed cooling water chemistries. Inspections will be scheduled at intervals not to exceed 10 years. As applicable, these inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, or other plant-specific inspection guidance by qualified personnel using procedures that are capable of detecting loss of material, wall thinning due to erosion, reduction of heat transfer, or cracking. If visual examination identifies adverse conditions, then additional examinations, including ultrasonic testing, will be conducted. Components inspected will be those with the highest likelihood of corrosion, reduction of heat transfer due to fouling, or cracking. The selection of susceptible locations will also consider plant specific operating experience wherein internal or even recurring internal corrosion has occurred in accordance with LR-ISG-2012-02 “Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation.” Locations identified as being susceptible to wall thinning due to erosion based upon plant specific operating experience will also be inspected.

This enhancement will be implemented no later than six months prior to the period of extended operation.

A.2.1.14 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program is an existing condition monitoring program that manages the effects of loss of material on the bridge, bridge rails, bolting and trolley structural components for those cranes, hoists, and rigging beams that are within the scope of license renewal. The program evaluates the effectiveness of the maintenance monitoring program and the effects of past and future usage on the structural reliability of cranes and hoists. Rails and girders are visually inspected on a routine basis for degradation; functional tests are performed to assure their integrity. The program also manages loss of preload of associated bolted connections. These cranes must also comply with the maintenance rule requirements provided in 10 CFR 50.65. Procedures and controls implement the guidance on the control of overhead heavy load cranes specified in NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants.” The program utilizes periodic inspections as described in the ASME B30 series of standards for inspection, monitoring, and detection of aging effects.

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program will be enhanced to:

1. Provide additional guidance to include inspection of structural components, rails, and bolting for loss of material due to corrosion; rails for loss of material due to wear; and bolted connections for loss of preload.

This enhancement will be implemented no later than six months prior to the period of extended operation.

A.2.1.15 Compressed Air Monitoring

The Compressed Air Monitoring aging management program is an existing condition monitoring program that manages loss of material on piping and components in the compressed air systems. The Compressed Air Monitoring program includes monitoring of air moisture content and contaminants such that specified limits are maintained, and inspection of components for indications of loss of material due to corrosion.

This program is based on the Clinton Power Station response to NRC GL 88--14, “Instrument Air Supply Problems,” and utilizes guidance and standards provided by ANSI/ISA-S7.3, “Quality Standard for Instrument Air,” INPO’s Significant Operating Experience Report (SOER) 88-01, “Instrument Air System Failures,” and ASME OM-S/G-1998, Part 17, “Performance Testing of Instrument Air Systems in Light-Water Reactor Power Plants.” The Compressed Air Monitoring program activities implement the moisture content and contaminant criteria of ANSI/ISA-S7.3 (incorporated into ISA-S7.0.1-1996). Program activities include air quality checks at various locations to ensure that dew point, particulates, and hydrocarbons are maintained within the specified limits, and inspections of the internal surfaces of select compressed air system components for signs of loss of material due to corrosion.

The Compressed Air Monitoring aging management program will be enhanced to:

1. Perform periodic inspections of the internal surfaces of system filters, compressors and internal coolers, and opportunistic inspections of other system components for signs of corrosion and corrosion products. Document unacceptable conditions in the corrective action program.

This enhancement will be implemented no later than six months prior to the period of extended operation.

A.2.1.16 Fire Protection

The Fire Protection aging management program is an existing condition monitoring and performance monitoring program that includes visual inspections of fire barriers and wraps, fireproofing, fire rated doors, fire dampers, and visual inspections and functional tests of halon and low-pressure carbon dioxide systems to manage the identified aging effects. The fire barrier inspection program requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, floors, and other materials that perform a fire barrier function. Periodic visual inspection and functional testing of the fire rated doors and visual inspection of fire rated dampers is performed to ensure that their functionality is maintained. The program also includes visual inspections and periodic operability tests of the halon and low-pressure carbon dioxide fire suppression systems using the National Fire Protection Association Codes and Standards for guidance.

The Fire Protection aging management program will be enhanced to:

1. Enhance the fire barrier inspection program to perform periodic visual inspection of combustible liquid spill retaining curbs for signs of cracking, spalling, or loss of material that could impede the functionality of the curb.

2. Enhance halon and carbon dioxide tests to perform periodic visual piping inspections for identification of corrosion that may lead to loss of material on the external surfaces of the halon and low-pressure carbon dioxide fire suppression systems.

3. Provide additional inspection guidance to identify aging effects as follows:

   a. Fire barrier walls, ceilings, and floors degradation from spalling and loss of material that may be caused by freeze-thaw, chemical attack, and reaction with aggregates.

   b. Elastomeric fire barrier material degradation such as increased hardness, shrinkage, and loss of strength.

   c. Grout fire barrier material degradation such as concrete cracking and spalling.

   d. Silicates and subliming compound fire barrier degradation such as change in material properties, cracking and delamination, loss of material, and separation.

These enhancements will be implemented no later than six months prior to the period of extended operation.

A.2.1.17 Fire Water System

The Fire Water System aging management program is an enhanced condition monitoring, performance monitoring, and preventive program that manages loss of material due to corrosion, including microbiologically influenced corrosion (MIC), fouling, and flow blockage. The program manages these aging effects by monitoring system pressure, flushing the system header, flow testing the buried ring header, performance testing the fire pumps, full flow flushing and flow verification the fire hydrants, flushing and flow testing sprinkler and deluge systems, and visually inspecting systems using the guidance of NFPA 25, 2011 Edition, “Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.”

The program applies to water-based fire protection systems that consist of sprinklers, fittings, valves, hydrants, hose stations, standpipes, pumps, and aboveground and buried piping and components. The program manages aging of fire protection system components exposed to raw water. Aging of the external surfaces of buried fire main piping is managed as described in the Buried and Underground Piping and Tanks (A.2.1.28) aging management program. Fire water system components subject to selective leaching are evaluated as described in the Selective Leaching (A.2.1.22) aging management program.

Testing or replacement of sprinklers that have been in place for 50 years is performed using the guidance of NFPA 25, 2011 Edition.

The water-based fire protection system is normally maintained at required operating pressure and is monitored such that loss of system pressure is immediately detected and corrective actions initiated.

The Fire Water System aging management program will be enhanced to:

1. Perform external visual inspections of in scope sprinkler piping and sprinklers for corrosion, loss of material, leaks, and proper sprinkler orientation. External visual inspections of the accessible in scope sprinklers and system piping will be performed annually. Guidance will direct the inspection for corrosion, loss of material, leaks, and proper sprinkler orientation. Corroded, leaking, or damaged sprinklers shall be replaced.

2. Perform external visual inspections of the in scope above ground fire main supply piping every two years to identify excessive corrosion, loss of material, leaks, and physical damage.

3. Perform internal visual inspections of sprinkler and deluge system piping to identify internal corrosion, foreign material, and obstructions to flow. Follow-up volumetric wall thickness examinations will be performed if internal visual inspections detect an unexpected level of degradation due to corrosion and corrosion product deposition. If organic material, foreign material, or internal flow blockage that could result in failure of system function is identified, then an obstruction investigation will be performed within the corrective action program. The obstruction investigation includes the removal of the material, an extent of condition determination, a review for increased inspection frequencies, follow-up examinations, and a flush consistent with the guidance provided in NFPA 25 Annex D.5, Flushing Procedures.

   The internal visual inspections will consist of the following:

   a. Wet pipe sprinkler systems - 50 percent of the wet pipe sprinkler systems in scope for license renewal will have internal visual inspections of piping by removing a hydraulically remote sprinkler, performed every five years, consistent with NFPA 25, 2011 Edition, Section 14.2. During the next five-year inspection period, the alternate systems previously not inspected shall be inspected.

   b. Preaction sprinkler systems - preaction sprinkler systems in scope for license renewal will have internal visual inspections of piping by removing a hydraulically remote nozzle, performed every five years, consistent with NFPA 25, 2011 Edition, Section 14.2.

   c. Deluge systems - perform an external visual inspection on a refueling outage frequency of the accessible piping and spray spargers inside the filter plenums to assure they are in their proper position and spray patterns are not obstructed. This will be in addition to the air flow tests that are currently performed to ensure there is no flow blockage. In addition, the program will be enhanced to include internal visual inspections of piping around the flanged spool piece during air flow testing.

4. Perform a minimum flow duration of one minute after the hydrant valve is fully open during the fire hydrant inspection and flush test to remove all foreign material.

5. Utilize the corrective action program to determine an increased test frequency when established test criteria are not met or when significant degraded trends that could adversely affect system intended function are identified during the underground fire main flow test. When test results pass the established test criteria, the test frequency may be extended to a five-year frequency in accordance with NFPA 25 and allowed by NEIL and site specific procedures.

6. Perform flow tests for hose stations at the hydraulically most limiting locations for each zone of the system on a five-year frequency to demonstrate the capability to provide the design pressure at required flow.

7. Perform volumetric testing of the pipe when unexpected levels of degradation and irregularities are detected during visual inspection.

8. Improve restoration procedure guidance for the in scope preaction systems to ensure piping is completely drained after actuation.

9. Prior to 50 years of service and every 10 years after, remove a representative sample of sprinklers and submit for testing to a recognized laboratory.

These enhancements will be implemented no later than six months prior to the period of extended operation.

A.2.1.18 Aboveground Metallic Tanks

The Aboveground Metallic Tanks aging management program is a new condition monitoring program that manages aging effects associated with in-scope outdoor aboveground metallic tanks constructed on concrete and sand. The reactor core isolation cooling (RCIC) storage tank is the only tank in the scope of this program. The RCIC storage tank is fabricated from aluminum alloy plates that are not coated and are not susceptible to cracking. The internal environment of the tank is treated water and condensation. Insulation is installed on the exterior shell of the tank. The program includes caulking/sealant at the tank interface with the tank foundation as a preventive measure to mitigate corrosion.

The program manages loss of material by conducting periodic internal and external visual and volumetric inspections each 10-year period including the pre-PEO period. Cracking is not a predicted aging effect due to the aluminum alloy construction. Visual inspections of sealant and caulking will be supplemented with physical manipulation to detect degradation. Thickness measurements of tank bottoms are conducted to ensure that significant degradation is not occurring, and the component intended function will be maintained during the period of extended operation. Visual and volumetric examinations of the tank walls and roof are performed to inspect for loss of material. Inspections are conducted in accordance with plant-specific procedures for visual and ultrasonic inspection techniques.

Inspections required during the period of extended operation will be based on the results of the initial inspections occurring during the 10-year period prior to period of extended operation in accordance with NUREG-1801 AMP XI.M29, as modified by LR-ISG 2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation," Table 4a. The initial inspection will be completed no later than six months prior to the period of extended operation.

These inspections and examinations will ensure that significant degradation is not occurring and that the intended function of the RCIC Storage Tank is maintained during the period of extended operation. This new program will be implemented no later than six months prior to the period of extended operation.

A.2.1.19 Fuel Oil Chemistry

The Fuel Oil Chemistry aging management program is an existing mitigative and condition monitoring program that includes activities which provide assurance that contaminants are maintained at acceptable levels in fuel oil for systems and components within the scope of license renewal. The Fuel Oil Chemistry program manages loss of material in piping, piping elements, piping components and tanks in a fuel oil environment. The fuel oil tanks within the scope of license renewal are maintained by monitoring and controlling fuel oil contaminants in accordance with the Technical Specifications and the guidelines of the American Society for Testing Materials (ASTM) Standards D4057-95, D1298-99, D0975-06b, D4176-93, and D6217-98. Fuel oil sampling and analysis is performed in accordance with approved procedures for new fuel oil and stored fuel oil. Fuel oil tanks are periodically drained of accumulated water and sediment, cleaned, and internally inspected. These activities effectively manage the effects of aging by maintaining potentially harmful contaminants at low concentrations.

The Fuel Oil Chemistry aging management program will be enhanced to:

1. Enhance diesel fuel sampling procedures to include adding biocides to stored fuel when periodic sampling identifies the presence of microbiological activity in a fuel storage tank.

2. Perform periodic (quarterly) sampling and analysis for the levels of microbiological organisms for diesel fire pump fuel oil day tanks 0DO01TA and 0DO01TB. This enhances the sampling and analysis scope of these tanks which currently checks for water, sediment content, and particulate concentration.

3. Perform periodic (quarterly) sampling and analysis for water and sediment content, particulate concentration, and the levels of microbiological organisms for diesel generator fuel oil day tanks 1DG01TA, 1DG01TB, and 1DG01TC.

4. Perform periodic (quarterly) sampling and analysis for the levels of microbiological organisms and for water and sediment content for diesel fuel oil storage tanks 1DO01TA, 1DO01TB, and 1DO01TC. This enhances the sampling and analysis scope of these tanks which currently checks for water and sediment content yearly and particulate concentration monthly.

5. Perform periodic internal inspections of diesel fire pump fuel oil day tanks 0DO01TA and 0DO01TB, diesel generator fuel oil day tanks 1DG01TA, 1DG01TB, and 1DG01TC, diesel fuel oil storage tanks 1DO01TA, 1DO01TB, and 1DO01TC at least once during the 10-year period prior to the period of extended operation, and at least once every 10 years during the period of extended operation. Each diesel fuel tank will be drained and cleaned, the internal surfaces visually inspected (if physically possible), and, if evidence of degradation is observed during inspections, or if visual inspection is not possible, these diesel fuel tanks will be volumetrically inspected.

6. Perform periodic (quarterly) trending of water and sediment content, particulate contamination concentrations, and the levels of microbiological organisms for stored fuel oil in all fuel oil tanks within the scope of the program.

These enhancements will be implemented no later than six months prior to the period of extended operation. Inspections that are to be completed prior to the period of extended operation will also be completed no later than six months prior to the period of extended operation.

A.2.1.20 Reactor Vessel Surveillance

The Reactor Vessel Surveillance aging management program is an existing condition monitoring program that manages the loss of fracture toughness due to neutron irradiation embrittlement of the reactor vessel beltline materials. Embrittlement evaluations are performed in accordance with Regulatory Guide 1.99, Revision 2, “Radiation Embrittlement of Reactor Vessel Materials.” The program meets the requirements of 10 CFR 50, Appendix H and ASTM E-185-82, “Standard Practice for Design of Surveillance Programs for Light-Water Moderated Nuclear Power Reactor Vessels,” by providing sufficient material data and dosimetry to monitor irradiation embrittlement through the period of extended operation and by providing operating restrictions on reactor coolant inlet temperature and neutron exposure (spectrum and flux). The program monitors plant operating conditions to ensure appropriate steps are taken if reactor vessel exposure conditions are altered, such as the review and updating of 60-year fluence projections to support upper shelf energy calculations and pressure-temperature limit curves. These measures are effective in detecting the extent of embrittlement of the reactor pressure vessel during the period of extended operation.

The Reactor Vessel Surveillance program is part of the BWRVIP Integrated Surveillance Program (ISP) described in the latest NRC approved version of BWRVIP-86. Clinton Power Station is a BWRVIP ISP non-host plant with three capsules in the vessel. Clinton Power Station is not scheduled for withdrawal of any capsules during the period of extended operation and relies on capsule test data from River Bend Nuclear Generating Station. River Bend is scheduled to withdraw capsules in accordance with the BWRVIP Integrated Surveillance Program-Extended ISP(E) schedule. The program is effectively providing fluence and materials data necessary for managing the effects of loss of fracture toughness due to neutron irradiation embrittlement during the period of extended operation. Surveillance capsules removed during the period of extended operation will meet the requirements of ASTM E 185-82 to the extent practicable and any changes to the capsule withdrawal schedule will be NRC approved prior to implementation. Untested capsules placed in storage will be maintained for future insertion.

A.2.1.21 One-Time Inspection

The One-Time Inspection aging management program is a new condition monitoring program that will be used to verify the system-wide effectiveness of the Water Chemistry (A.2.1.2) program, Fuel Oil Chemistry (A.2.1.19) program, and Lubricating Oil Analysis (A.2.1.26) program, which are designed to prevent or minimize aging to the extent that it will not cause a loss of intended function during the period of extended operation. The AMP is a condition monitoring program consisting of a one-time inspection of selected components to verify: (a) the system-wide effectiveness of an AMP that is designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the period of extended operation; (b) the insignificance of an aging effect; and (c) that long-term loss of material will not cause a loss of intended function for steel components exposed to environments that do not include corrosion inhibitors as a preventive action.

The elements of the program will include: (a) determination of the sample size of components to be inspected based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience, (b) identification of the inspection locations in the system or component based on the potential for the aging effect to occur, (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined, and (d) an 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.

Periodic inspections instead of this program will be used for structures or components with known age-related degradation. Inspections not conducted in accordance with ASME Code Section XI requirements will be conducted in accordance with plant-specific procedures including inspection parameters such as lighting, distance, offset, and surface conditions.

This new aging management program will be implemented no later than six months prior to the period of extended operation. The one-time inspections will be performed within the 10 years prior to entering the period of extended operation and no later than six months prior to the period of extended operation.

A.2.1.22 Selective Leaching

The Selective Leaching aging management program is a new condition monitoring program that will include one-time visual inspections of a representative sample of susceptible components within the scope of license renewal. These one-time inspections will include visual examinations, coupled with either hardness measurement or other mechanical examination techniques such as destructive testing, scraping, or chipping, of selected components that may be susceptible to selective leaching. This is to determine whether loss of material due to selective leaching is occurring, and whether the process will affect the ability of the components to perform their intended function for the period of extended operation. Metallurgical evaluation may also be performed. If loss of material is identified, further evaluation of the extent of condition will be performed under the corrective action program, which may include an expansion of the sample size and locations. Components in the scope of this program include components constructed of gray and ductile cast iron or copper alloy with 15 percent or greater zinc, that are exposed to raw water, treated water, closed cycle cooling water, waste water, and soil environments.

The Selective Leaching aging management program will be implemented no later than six months prior to the period of extended operation. One-time inspections will be conducted within the five years prior to entering the period of extended operation and no later than six months prior to the period of extended operation.

A.2.1.23 One-time Inspection of ASME Code Class 1 Small-Bore Piping

The One-time Inspection of ASME Code Class 1 Small-Bore Piping aging management program is a new condition monitoring program that augments the existing ASME Code, Section XI requirements. The program will manage the aging effect of cracking in ASME Code Class 1 small-bore piping that is less than nominal pipe size (NPS) 4-inches, and greater than or equal to NPS 1-inch. The program includes pipes, fittings, branch connections, and all full penetration (butt) and partial penetration (socket) welds. The program implements one-time inspection of a sample of piping full penetration (butt) and partial penetration (socket) welds that are susceptible to cracking by using volumetric examinations. The inspection sample size will include at least three percent with a maximum of 10, of the butt welds managed by this program and at least three percent with a maximum of 10, of the socket welds managed by this program. This results in nine butt weld inspections and nine socket weld inspections. Inspection of socket welds will be performed by a volumetric examination technique demonstrated to be capable of detecting cracking. If such a volumetric examination technique is not available by the time of the inspections, the examination method will be by destructive examination. If destructive examination is used, then each weld receiving a destructive examination can be credited as equivalent to having volumetrically examined two welds. Inspections required by the program will augment ASME Code, Section XI requirements.

The program provides for a one-time inspection of a sample of the population of welds (butt welds or socket welds) for plants that have not experienced cracking or have experienced cracking but have implemented corrective actions, such as a design change, to effectively mitigate the cause(s) of the cracking. The program provides for periodic inspection of a sample of the population of welds (butt welds or socket welds) that have experienced cracking and have not implemented corrective actions to effectively mitigate the cause(s) of the cracking. There have been no instances of cracking of ASME Code Class 1 small-bore piping at Clinton Power Station over 35 years of operation; therefore, this one-time inspection program is applicable and adequate to manage this aging effect during the period of extended operation. Should evidence of cracking be revealed by the one-time inspection program, a plant-specific, periodic inspection program will be implemented.

One-time inspections will be performed within the six years prior to entering the period of extended operation and no later than six months prior to the period of extended operation.

A.2.1.24 External Surfaces Monitoring of Mechanical Components

The External Surfaces Monitoring of Mechanical Components aging management program is a new condition monitoring program that directs visual inspections of external surfaces of components be performed during system inspections and walkdowns. The program consists of periodic visual inspection of metallic, fiberglass, and polymeric components such as piping, piping components, ducting, and other components within the scope of license renewal. The program manages aging effects of metallic and polymeric materials through visual inspection of external surfaces for evidence of loss of material, cracking, and changes in material properties. When appropriate for the component and material, visual inspections are supplemented by physical manipulation to detect hardening and loss of strength of polymers. For coated surfaces, confirmation of the integrity of the paint or coating will be used for managing the effects of corrosion on the metallic surface.

The External Surfaces Monitoring of Mechanical Components aging management program includes visual inspection of the metallic jacketing on thermal insulation to ensure that the jacketing is performing its function to protect the insulation from damage, such as in-leakage of moisture, that could reduce the thermal resistance of the insulation.

Inspections are performed at a frequency not to exceed one refueling cycle. This frequency accommodates inspections of components that may be in locations that are normally only accessible during outages. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at such intervals that would ensure the components' intended functions are maintained.

A sample of outdoor component surfaces that are insulated and a sample of indoor insulated components exposed to condensation (due to the in-scope component being operated below the dew point), are periodically inspected, under the insulation, every 10 years during the period of extended operation. Inspections subsequent to the initial inspection will consist of examination of the exterior surface of the insulation for indications of damage to the jacketing or protective outer layer of the insulation if the initial inspection verifies no loss of material beyond that which could have been present during initial construction. If the external visual inspections of the insulation reveal damage to the exterior surface of the insulation or if there is evidence of water intrusion through the insulation, then periodic inspections under insulation to detect corrosion under insulation will continue. Removal of tightly-adhering insulation that is impermeable to moisture is not required unless there is evidence of damage to the moisture barrier.

The external surfaces of components that are buried are inspected via the Buried and Underground Piping and Tanks (A.2.1.28) program. The external surface of aboveground tanks is inspected via the Aboveground Metallic Tanks (A.2.1.18) program.

This new aging management program will be implemented no later than six months prior to the period of extended operation.

A.2.1.25 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program is a new condition monitoring program that will consist of inspections of the internal surfaces of metallic, elastomeric, and polymeric components such as piping, piping components and piping elements, ducting components, tanks, heat exchanger components, and other components that are exposed to environments of air, closed cycle cooling water, condensation, diesel exhaust, treated water, raw water, and waste water. These internal inspections will be performed during the periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection. At a minimum, in each 10-year period during the period of extended operation, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) or a maximum of 25 components per population will be inspected. Where practical, the inspections will focus on the bounding or lead components most susceptible to aging because of time in service and severity of operating conditions. Opportunistic inspections will continue in each period even after meeting the sampling limit.

The program will manage the aging effects of loss of material, reduction of heat transfer, flow blockage, and cracking for metallic components. The program will also manage the aging effects of loss of material and hardening and loss of strength for elastomeric and polymeric components. The program will include visual inspections to ensure that existing environmental conditions are not causing material degradation or flow blockage that could result in a loss of the component's intended function. For certain materials, such as elastomers, physical manipulation to detect hardening or loss of strength will be used to supplement the visual examinations conducted under this program.

This new aging management program will be implemented no later than six months prior to the period of extended operation.

A.2.1.26 Lubricating Oil Analysis

The Lubricating Oil Analysis aging management program is an existing condition monitoring program that provides monitoring of oil condition to manage loss of material and reduction of heat transfer in gearboxes, piping, piping components, heat exchangers, and tanks within the scope of license renewal exposed to a lubricating oil environment. Sampling, analysis, and condition monitoring activities identify specific wear products and verify that the contamination levels (primarily water and particulates) and the physical properties of lubricating oil are maintained within acceptable limits to ensure that component intended functions are maintained. The presence of water or particulates may also indicate in-leakage and corrosion product buildup.

The Lubricating Oil Analysis aging management program will be enhanced to:

1. Perform lubricating oil analysis of the old oil following periodic oil changes for the control room HVAC chilled water pumps A and B, and the fire protection jockey pump.

This enhancement will be implemented no later than six months prior to the period of extended operation.

A.2.1.27 Monitoring of Neutron-Absorbing Materials Other Than Boraflex

The Monitoring of Neutron-Absorbing Materials Other Than Boraflex aging management program is an existing condition monitoring program that includes periodic inspection and analysis of test coupons of the neutron-absorbing material in the spent fuel storage racks to determine if the neutron-absorbing capability of the material has degraded. This program ensures that a five percent sub-criticality margin in the spent fuel pool is maintained during the period of extended operation by monitoring for loss of material, changes in dimension, and loss of neutron-absorption capacity of the material.

The Monitoring of Neutron-Absorbing Materials Other Than Boraflex aging management program will be enhanced to:

1. Perform NES rack (Boral material) inspections and testing per NEI 16-03-A guidance at a frequency not to exceed 10 years during the period of extended operation to assure proper neutron attenuation is maintained.

This enhancement will be implemented no later than six months prior to the period of extended operation.

A.2.1.28 Buried and Underground Piping and Tanks

The Buried and Underground Piping and Tanks aging management program is an existing condition monitoring program that manages the aging effect of loss of material associated with the external surfaces of buried piping. Cracking is not considered an applicable aging effect. The program addresses piping composed of steel and cast iron. There are no buried or underground tanks or underground piping within the scope of license renewal. There is no cementitious, polymeric, or stainless-steel piping within the scope of the program.

The program also manages aging through preventive and mitigative actions (i.e., coatings, backfill quality, and cathodic protection). The number of inspections is based on the effectiveness of the preventive and mitigative actions. Annual cathodic protection surveys are conducted. For steel components, where the acceptance criteria for the effectiveness of the cathodic protection is other than -850 mV instant off, loss of material rates are measured.

Inspections are conducted by qualified individuals. Where the coatings, backfill or the condition of exposed piping does not meet acceptance criteria such that the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material rate is extrapolated to the end of the period of extended operation, the sample size will be increased. External inspection of buried components will occur opportunistically when they are excavated for any reason. If a reduction in the number of inspections recommended in NUREG-1801 AMP XI.M41, as modified by LR-ISG-2015-01, Table XI.M41-2 is claimed based on a lack of soil corrosivity as determined by soil testing, then soil testing is conducted once in each 10-year period starting 10 years prior to the period of extended operation.

The Buried and Underground Piping and Tanks aging management program will be enhanced to:

1. Perform extent of condition inspections as follows: When measured pipe wall thickness, projected to the end of the period of extended operation, does not meet the minimum pipe wall thickness requirements due to external environments, the number of inspections within the affected piping categories will be doubled or increased by five, whichever is smaller. If adverse indications are found in the expanded sample, an analysis will be conducted to determine the extent of condition and extent of cause. The size of the follow-up inspections will be determined based on the analysis. Timing of any additional inspections will be based on the severity of the identified degradation and the consequences of leakage or loss of function. Any additional inspections will be performed within the same 10-year inspection interval in which the original degradation was identified, or within four years after the end of the 10-year interval if the degradation was identified in the latter half of the 10-year interval. Expansion of sample size may be limited by the extent of piping subject to the observed degradation mechanism or if the piping system or portion of the system is replaced or otherwise mitigated within the same 10-year inspection interval in which the original degradation was identified or within four years after the end of the 10-year interval, if the degradation was identified in the latter half of the 10-year interval.

2. Perform annual system monitoring of the cathodic protection system to ensure effective protection of buried piping.

3. Perform direct visual inspections of buried piping in accordance with LR-ISG-2015-01, "Changes in Buried and Underground Piping and Tank Recommendations," Table XI.M41-2, during each 10-year interval, beginning 10 years prior to the period of extended operation. The inspection quantities to be performed on buried piping are determined based on the as-found results of cathodic protection system availability and effectiveness as recommended in LR-ISG-2015-01, Table XI.M41-2. The length of piping sections for each inspection will be based on the guidance in LR-ISG-2015-01, section 4 paragraph c.

These enhancements will be implemented no later than six months prior to the period of extended operation. Inspections that are to be completed prior to the period of extended operation will be completed no later than six months prior to the period of extended operation.

A.2.1.29 ASME Section XI, Subsection IWE

The ASME Section XI, Subsection IWE aging management program is an existing condition monitoring program based on ASME Code and complies with the provisions of 10 CFR 50.55a. The program consists of periodic visual, surface, and volumetric examinations, where applicable, of metallic pressure-retaining components of steel containments for signs of degradation, damage, irregularities and for coated areas distress of the underlying metal shell, and corrective actions. Acceptability of inaccessible areas of steel containment shell is evaluated when conditions found in accessible areas indicate the presence of, or could result in, flaws or degradation in inaccessible areas.

Examination methods include visual and volumetric testing as required by ASME Section XI, Subsection IWE, as approved in 10 CFR 50.55a. Observed conditions that have the potential for impacting an intended function are evaluated for acceptability in accordance with ASME requirements or corrected in accordance with corrective action program.

The ASME Section XI, Subsection IWE aging management program will be enhanced to:

1. Provide guidance for proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting consistent with EPRI NP-5067 and TR-104213. Also, provide guidance for storage, lubricant selection, and bolting and coating material selection consistent with Section 2 of Research Council on Structural Connections (RCSC) publication "Specification for Structural Joints Using High-Strength Bolts."

The enhancement will be implemented no later than six months prior to the period of extended operation.

A.2.1.30 ASME Section XI, Subsection IWL

The ASME Section XI, Subsection IWL aging management program is an existing condition monitoring program that consists of a periodic visual inspection of accessible concrete surfaces for reinforced concrete containments (Class CC) for signs of material degradation (deterioration or distress), including loss of bond, loss of material, cracking, distortion, and increase in porosity and permeability; the assessment of damage; and corrective actions. The primary containment Mark III design does not include a prestressing system.

The ASME Section XI, Subsection IWL program also includes an evaluation of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate degradation could also exist or could have extended into the inaccessible areas.

Examination results that do not meet the acceptance standards or requirements of IWL-3000 are evaluated in accordance with IWL-3300 and the repair procedures, if required, are detailed in accordance with IWL-4000.

This program is in accordance with ASME Section XI, Subsection IWL, which complies with ASME Section XI, Subsection IWL, 2013 Edition as approved in 10 CFR 50.55a.

A.2.1.31 ASME Section XI, Subsection IWF

The ASME Section XI, Subsection IWF aging management program is an existing condition monitoring program that consists of visual examinations of ASME Class 1, 2, 3, and MC piping and component supports and structural bolting for signs of degradation (i.e., loss of material, loss of mechanical function, and loss of preload), evaluations, and corrective actions. The program is implemented through procedures, in accordance with the requirements of the ASME Code, Section XI, Subsection IWF, 2013 Edition, as approved in 10 CFR 50.55a. The monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant degradation.

The ASME Section XI, Subsection IWF aging management program will be enhanced to:

1. Add the MC component support examinations for the fuel transfer tube and for containment penetrations spanning from the containment wall to the drywell wall for: reactor water cleanup, feedwater, residual heat removal, reactor core isolation cooling, and main steam drain to the scope of the program.

2. Provide guidance, regarding the selection of supports to be examined in subsequent inspection intervals, when a support that is acceptable for continued service as defined in IWF-3400, is restored in accordance with the corrective action program. The enhanced guidance will ensure that the sample is increased to include another support, of the same type and function, that has not been restored to correct the observed condition.

These enhancements will be implemented no later than six months prior to the period of extended operation.

A.2.1.32 10 CFR Part 50, Appendix J

The 10 CFR Part 50, Appendix J aging management program is an existing performance monitoring program that monitors leakage rates through the drywell and containment pressure boundary, including the containment liner, associated welds, penetrations, fittings, and other access openings, in order to detect degradation of the containment pressure boundary. Corrective actions are taken if leakage rates exceed acceptance criteria. The program provides for aging management of pressure boundary due to aging effects such as the loss of material, loss of sealing, loss of leak tightness, loss of preload, or cracking in various systems penetrating containment. Consistent with the current licensing basis, the containment leak rate tests are performed in accordance with the regulations and guidance provided in 10 CFR Part 50, Appendix J, Option B; Regulatory Guide 1.163, “Performance-Based Containment Leak-Test Program”; NEI 94-01, Revision 2-A and Revision 3-A, “Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J,”; and ANSI/ANS 56.8, “Containment System Leakage Testing Requirements.”

A.2.1.33 Masonry Walls

The Masonry Walls aging management program is an existing condition monitoring program implemented as part of the Structures Monitoring (A.2.1.34) program. Masonry wall condition monitoring is based on guidance provided in IE Bulletin 80-11, "Masonry Wall Design," and NRC Information Notice 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11," and is implemented through station procedures.

The Masonry Walls program manages loss of material and cracking of concrete masonry walls. The program also inspects for separation and gaps between the supports and the masonry walls. The program relies on periodic visual inspections on an interval not to exceed five years to monitor and maintain the condition of masonry walls within the scope of license renewal. Masonry walls that are considered fire barriers are also managed by the Fire Protection (A.2.1.16) program.

A.2.1.34 Structures Monitoring

The Structures Monitoring aging management program is an existing condition monitoring program that was developed to implement the requirements of 10 CFR 50.65 and is based on NUMARC 93-01, Revision 2 “Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” and Regulatory Guide 1.160, Revision 2 “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.” The program consists of periodic inspection and monitoring the condition of structures and structural component supports, to ensure that aging degradation leading to loss of intended functions will be detected and the extent of degradation can be determined. The inspections are conducted on an interval not to exceed five years. Groundwater will be periodically sampled on an interval not to exceed five years and tested to ensure the groundwater remains non-aggressive.

The Structures Monitoring aging management program will be enhanced to:

1. Include the following structures:
    a. Yard Structures
2. Include the following components and commodities:
    a. Pipe whip restraints and jet impingement shields
    b. Missile barriers
    c. Panels, racks, cabinets, and other enclosures
    d. Sliding surfaces
    e. Sump and pool liners
    f. Outdoor electrical cable trays and conduits
    g. Doors
    h. Penetration seals and sleeves
    i. Tube Tracks
    j. Gaskets and seals
    k. Hatches, plugs, handholes, and manholes
    l. Metal components (decking, vent stack, and miscellaneous steel)
3. Require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R with respect to knowledge of inservice inspection of concrete and visual acuity requirements.
4. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of license renewal.
5. Monitor concrete for increase in porosity and permeability.
6. Include inspection of accessible sliding surfaces for indication of significant loss of material due to wear or corrosion and that debris or dirt will not restrict or prevent sliding.
7. Monitor elastomeric vibration isolators and structural sealants for indication of loss of material, cracking or hardening resulting in loss of sealing or function.
8. Clarify that loose bolts and nuts and cracked high strength bolts, not subject to stress corrosion cracking, are not acceptable unless accepted by engineering evaluations.

These enhancements will be implemented no later than six months prior to the period of extended operation.

A.2.1.35 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program is an existing condition monitoring program implemented as part of the Structures Monitoring (A.2.1.34) program. The program consists of inspection and surveillance programs to provide aging management for water-control structures associated with emergency cooling water systems or flood protection based on RG 1.127, Revision 1. In addition to reinforced concrete and earthen structures, the program also includes structural steel and structural bolting associated with water-control structures, and miscellaneous steel, such as trash racks. There are no surface dams, canals, steel or wood piles and sheeting, or sluice gates within the scope of the program.

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP monitors the condition of the screen house (including the B fire pump room and the foundation of the FLEX building) and the in-scope portions of the cooling lake (i.e., baffle dike, submerged dam, ultimate heat sink (UHS), and UHS discharge structure). The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program addresses age-related deterioration, degradation due to extreme environmental conditions, and the effects of natural phenomena that may affect the intended function of the water-control structures. The program is used to manage aging effects such as loss of material, cracking, distortion, loss of bond, loss of material (spalling, scaling), increase in porosity and permeability, and loss of strength. Elements of the program are designed to detect degradation and take corrective actions to prevent the loss of an intended function.

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program will be enhanced to:

1. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of license renewal.

2. Require inspection of accessible in-scope portions of the cooling lake and screen house immediately following the occurrence of significant natural phenomena, which includes hurricanes, tornadoes, large floods, and intense local rainfalls.

3. Document current practices in implementing procedure for inspection of the cooling lake baffle dike.

These enhancements will be implemented no later than six months prior to the period of extended operation.

A.2.1.36 Protective Coating Monitoring and Maintenance

The Protective Coating Monitoring and Maintenance program is an existing condition monitoring program that manages the aging effect of loss of coating or lining integrity of Service Level I coatings inside primary containment. The Protective Coating Monitoring and Maintenance program manages coating selection, application, visual inspections, assessments, repairs, and maintenance of Service Level I protective coatings as defined in Regulatory Guide 1.54, Revision 1, "Service Level. I, II, and III Protective Coatings Applied to Nuclear Power Plants." The program is comparable to a monitoring and maintenance program for Service Level I protective coatings as described in RG 1.54, Revision 2.

Service Level I coatings will prevent or minimize the loss of material due to corrosion, but these coatings are not credited for managing the effects of corrosion for the carbon steel containment liner and components. This program ensures that the Service Level I coatings maintain adhesion so as to not affect the intended function of the emergency core cooling systems (ECCS) suction strainers.

The program also provides controls over the amount of unqualified coating, which is defined as coating inside the primary containment that has not passed the required laboratory testing, including irradiation and simulated design basis accident (DBA) conditions, or has inadequate quality documentation, or both. Unqualified coating may fail in a way to adversely affect the intended function of the ECCS suction strainers. Therefore, the quantity of unqualified coating is controlled to ensure that the amount of unqualified coating in the primary containment is kept within allowable limits.

A.2.1.37 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is a new condition monitoring program that will be used to manage the effects of reduced insulation resistance of the insulation material for non-EQ cables and connections during the period of extended operation. Accessible cables and connections located in adverse localized environments will be visually inspected at least once every 10 years for cable jacket and connection insulation surface anomalies, such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination that could indicate incipient conductor insulation aging degradation from temperature, radiation, or moisture. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service environment for the cable or connection.

This new program will be implemented no later than six months prior to the period of extended operation. The first inspections for license renewal will be completed no later than six months prior to the period of extended operation.

A.2.1.38 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits aging management program is a new condition monitoring program that will be used to manage the effects of reduced insulation resistance of non-EQ cable and connection insulation in instrumentation circuits with sensitive, high-voltage, low-level current signals. The program applies to the in scope portions of the Neutron Monitoring and Reactor Protection System and the Process Radiation Monitoring System. The circuits for these instruments are located in areas where the cables and connections could be exposed to adverse localized environments caused by temperature, radiation, or moisture. These adverse localized environments can result in reduced insulation resistance causing increases in leakage currents. Other instrument circuits in the Neutron Monitoring and Reactor Protection System, Process Radiation Monitoring System, Containment Monitoring System, and Area Radiation Monitoring System are not in scope of this aging management program either because they are managed by the Environmental Qualification (EQ) of Electric Components (A.3.1.2) program; they do not perform a license renewal intended function; or they are not sensitive to high voltage, low-level signal circuits.

Calibration testing will be performed for the in scope circuits when the cables are included as part of the calibration circuit. The calibration results will be reviewed to provide an indication of the existence of aging effects based on acceptance criteria for instrumentation circuit performance. Review of results obtained during normal calibration may detect severe aging degradation prior to the loss of the cable and connection intended function. A proven cable test (such as insulation resistance tests, time domain reflectometry tests, or other testing judged to be effective in determining cable system insulation condition) will be performed for the in scope circuits when the cables are not included as part of the calibration.

This new program will be implemented no later than six months prior to the period of extended operation. In addition, the first review of calibration or surveillance results and cable test results will be completed no later than six months prior to the period of extended operation. Cable test frequency will be based on engineering evaluation and will be performed at least once every 10 years. Calibration and assessment of results will be performed at least once every 10 years during the period of extended operation.

A.2.1.39 Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is a new condition monitoring program that will be used to manage the effects of reduced insulation resistance of non-EQ, in scope, inaccessible power cables. For this program, power is defined as greater than or equal to 400 volts (V). These inaccessible power cables may at times be exposed to significant moisture. Power cable exposure to significant moisture may cause reduced insulation resistance that can potentially lead to failure of the cable's insulation system.

The cables within the scope of this program will be tested using one or more proven tests for detecting reduced insulation resistance of the cable’s insulation system due to wetting or submergence, such as dielectric loss (dissipation factor or power factor), AC voltage withstand, partial discharge, step voltage, time domain reflectometry, insulation resistance and polarization index, line resonance analysis, or other testing that is state of the art at the time the test is performed.

The cable testing will be performed at least once every six years. More frequent testing may occur based on test results and operating experience. The first cable testing for license renewal will be completed no later than six months prior to the period of extended operation.

Periodic actions will be taken to prevent inaccessible cables from being exposed to significant moisture. Cable vaults associated with the cables included in this program will be inspected for water collection with subsequent corrective actions (e.g., water removal), as necessary. Prior to the period of extended operation, the frequency of inspections for accumulated water will be established and adjusted based on plant-specific operating experience with cable wetting or submergence, including water accumulation over time and event driven occurrences such as heavy rain or flooding. The inspection includes direct observation that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and dewatering/drainage systems (i.e., sump pumps) and associated alarms operate properly. Operation of dewatering devices will be verified prior to any known or predicted heavy rain or flooding event.

During the period of extended operation, the inspections will occur periodically based on water accumulation over time. The manholes / cable vaults equipped with solar powered monitoring and alarms will be inspected at least once annually. The first inspections for license renewal will be completed no later than six months prior to the period of extended operation.

The manholes / cable vaults equipped with 120 VAC powered level monitoring and alarms that result in consistent, subsequent pump out of accumulated water prior to wetting or submergence of cables will be inspected at least once every five years. Inspections for water accumulation will also be performed after event driven occurrences such as heavy rain or flooding. Plant specific parameters are established for the initiation of an event-driven inspection. The manholes / cable vaults equipped with solar powered monitoring and alarms will be inspected following event driven occurrences, such as heavy rain or flooding. The manholes/ cable vaults equipped with 120 VAC powered level monitoring and alarms, will be inspected following event driven occurrences, such as heavy rain or flooding, when level monitoring indicates water is accumulating. The first inspections for license renewal will be completed no later than six months prior to the period of extended operation.

This new aging management program will be implemented no later than six months prior to the period of extended operation.

A.2.1.40 Metal Enclosed Bus

The Metal Enclosed Bus aging management program is an existing condition monitoring program to manage the identified aging effects of in scope metal enclosed bus during the period of extended operation. The internal portions of the accessible bus enclosure assemblies are inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The bus insulation is visually inspected for signs of reduced insulation resistance, such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination which may indicate overheating or aging degradation. The internal bus insulating supports are visually inspected for structural integrity and signs of cracks. External surfaces are visually inspected for loss of material due to general, pitting, and crevice corrosion. Enclosure assembly elastomers are visually inspected for surface cracking, crazing, scuffing, dimensional change, shrinkage, discoloration, hardening, and loss of strength. A sample of accessible bolted connections is inspected for increased resistance of connection using a state of the art method such as micro-ohmmeter. The sample will be of 20 percent of the accessible metal enclosed bus bolted connection population with a maximum sample size of 25.

The inspections and resistance measurements will be performed at least once every 10 years for indications of aging degradation. The first inspections and resistance measurements for license renewal will be completed no later than six months prior to the period of extended operation.

A.2.1.41 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is a new conditioning monitoring program. The program implements a technical evaluation of one-time testing results on a representative sample to ensure that either increased resistance of connection is not occurring or that the existing preventive maintenance program is effective such that a periodic inspection program is not required. This technical evaluation of a one-time testing program provides additional confirmation to support industry operating experience that shows that electrical connections have not experienced a high degree of failures and that existing installation and maintenance practices are effective. The technical evaluation of the one-time testing program also confirms the presence or absence of age-related degradation due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. The representative sample of connections are chosen considering voltage level (medium and low voltage), circuit loading (high loading), connection type, and location (high temperature, high humidity, vibration, etc.). A representative sample is 20 percent of the population with a maximum sample size of 25 connections. The specific type of test performed will be a proven test for detecting increased resistance of connections (such as thermography, contact resistance measurement, or another appropriate test) without removing the connection insulation (such as heat shrink tape, sleaving, insulating boots, etc.).

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program does not implement visual inspections of cable connection insulation materials as an alternative to thermography.

This new aging management program will be implemented no later than six months prior to the period of extended operation. The technical evaluation of one-time tests will be completed no later than six months prior to the period of extended operation.

A.2.1.42 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program is a new program that performs periodic visual inspections of internal coatings/linings exposed to closed-cycle cooling water, raw water, waste water, condensation or fuel oil.

This program manages aging effects for internal coatings by conducting periodic visual inspections of all coatings/linings applied to the internal surfaces of in-scope components where loss of coating or lining integrity could impact the component’s or downstream component’s current licensing basis intended function(s). Inspections are performed for signs of coating failures and precursors to coating failures including peeling, delamination, blistering, cracking, flaking, chipping, rusting, and mechanical damage. For coated surfaces determined to not meet acceptance criteria, physical testing is performed where physically possible (i.e., sufficient room to conduct testing) in conjunction with repair or replacement of the coating. The training and qualification of individuals involved in coating/lining inspections of non-cementitious coatings/linings are conducted in accordance with ASTM International Standards endorsed in Regulatory Guide 1.54, “Service Level I, II, and III Protective Coatings Applied in Nuclear Power Plants,” including guidance from the NRC associated with a particular standard.

This new aging management program will be implemented no later than six months prior to the period of extended operation. Baseline inspections required to be completed in the 10-year period prior to the period of extended operation will be completed no later than six months prior to the period of extended operation.

A.2.2 Plant-Specific Aging Management Programs

None. The Clinton Power Station, Unit 1 License Renewal Application does not include plant-specific aging management programs.

A.3.0 NUREG-1801 Chapter X Aging Management Programs

A.3.1 Evaluation of Chapter X Aging Management Programs

Aging Management Programs evaluated in Chapter X of NUREG-1801 are associated with Time-Limited Aging Analysis for metal fatigue of the reactor coolant pressure boundary and environmental qualification (EQ) of electric components. These programs are evaluated in this section.

A.3.1.1 Fatigue Monitoring

The Fatigue Monitoring aging management program is an existing preventive program that manages fatigue damage of the reactor pressure vessel components, reactor coolant pressure boundary piping components, and other components per 10 CFR 54.21(c)(1)(iii).

The Fatigue Monitoring aging management program monitors and tracks the number of occurrences and severity of thermal and pressure transients for Clinton Power Station to ensure that the cumulative usage factor (CUF) for each analyzed component does not exceed 80 percent of the applicable acceptance criterion through the period of extended operation. The program monitors the transients as specified in USAR Table 3.9-1, “Plant Events,” which is referenced in Technical Specification 5.5.5, “Component Cyclic or Transient Limit.”

Environmental fatigue analyses have been prepared for the limiting locations within the reactor pressure vessel and for ASME Class 1 piping systems. The Fatigue Monitoring aging management program procedures will be enhanced by updating SI:FatiguePro™ software to include the calculation and tracking of environmentally assisted fatigue in accordance NUREG/CR-6909, Revision 1, “Effect of LWR Water Environments on the Fatigue Life of Reactor Materials.”

When a program acceptance criterion is exceeded or the severity of an actual transient exceeds the design transient definition the condition is entered into the corrective action program and appropriate corrective actions, such as reanalysis, component or structure inspections, component or structure repair, or replacement activities are implemented to ensure that design limits are not exceeded.

The Fatigue Monitoring aging management program will be enhanced to:

1. Address the cumulative fatigue damage effects of the reactor coolant environment on component life by evaluating the impact of the reactor coolant environment on critical components identified in NUREG/CR-6260. Additional plant-specific component locations in the reactor coolant pressure boundary will be evaluated if they are more limiting than those considered in NUREG/CR-6260. SI:FatiguePro^{TM} software will be updated to include the calculation and tracking of Environmentally Assisted Fatigue, in accordance with NUREG/CR-6909, Revision 1.

2. The jet pump riser brace, the core spray piping of the reactor vessel internals, and the containment electrical penetrations will be added to the Fatigue Monitoring program procedure. The components will be monitored through cycle-based tracking and compared to the applicable design transient occurrence limits.

These enhancements will be implemented no later than six months prior to the period of extended operation.

A.3.1.2 Environmental Qualification (EQ) of Electric Components

The Environmental Qualification (EQ) of Electric Components is an existing program that manages the aging of electrical equipment within the scope of 10 CFR 50.49, “Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants.” The program establishes, demonstrates, and documents the level of qualification, qualified configurations, maintenance, surveillance, and replacements necessary to meet 10 CFR 50.49. A qualified life is determined for equipment within the scope of the program and appropriate actions such as replacement or refurbishment are taken prior to or at the end of the qualified life of the equipment so that the qualified life limit is not exceeded. The various aging effects addressed by this program are adequately managed so that the intended functions of components within the scope of 10 CFR 50.49 are maintained consistent with the current licensing basis during the period of extended operation. In addition to electrical components, Clinton Power Station EQ program includes active safety related mechanical components in harsh areas.

A.4.0 Time-Limited Aging Analyses

A.4.1 Identification and Evaluation of Time-Limited Aging Analyses (TLAAs)

As part of the application for a renewed license, 10 CFR 54.21(c) requires evaluation of Time-Limited Aging Analyses (TLAAs) for the period of extended operation. Identified TLAAs are described in the following sections.

10 CFR 54.21(c)(2) also requires that the application for a renewed license include a list of plant-specific exemptions granted pursuant to 10 CFR 50.12 and are based upon TLAAs as defined in 10 CFR 54.3. It also requires an evaluation that justifies the continuation of these exemptions for the period of extended operation. No plant-specific exemptions granted pursuant to 10 CFR 50.12 were identified for Clinton Power Station (CPS) that are based on TLAAs. Therefore, no further

evaluation is required for plant-specific exemptions granted pursuant to 10 CFR 50.12.

A.4.2 Reactor Pressure Vessel and Internals Neutron Embrittlement Analyses

10 CFR 50.60 requires that all light-water reactors meet the fracture toughness, Pressure-Temperature (P-T) limits, and material surveillance program requirements for the reactor coolant pressure boundary as set forth in 10 CFR 50, Appendices G and H. The current reactor pressure vessel (RPV) embrittlement calculations for CPS that evaluate reduction of fracture toughness of reactor pressure vessel beltline materials for 40 years are based upon a predicted current operating term fluence applicable for 32 Effective Full Power Years (EFPY). These analyses have been identified as TLAAs as defined in 10 CFR 54.21(c) and have been reevaluated for the increased neutron fluence associated with 60 years of operation as described in the subsections below.

A.4.2.1 Reactor Pressure Vessel and Internals Neutron Fluence Analyses

High energy (>1 MeV) neutron fluence has been projected for 60 years of operations and 52 Effective Full Power Years (EFPY). The fluence projections have been used in the evaluation of the neutron embrittlement TLAAs.

The NRC approved General Electric Hitachi (GEH) Discrete Ordinates Transfer (DORT) methodology has been used in developing the fluence projections and associated RPV embrittlement analyses as documented in Sections A.4.2.1.1, A.4.2.1.2, and A.4.2.2 through A.4.2.11.

Below is a summary of CPS historical operating power levels which have been considered in developing the 60-year fluence projections:

The Original Licensed Thermal Power (OLTP) level for CPS was 2894 MWt.

- By Amendment Number 149, dated April 5, 2002, the NRC approved a 20 percent Extended Power Uprate (EPU) that authorized an increase in the maximum thermal power level from 2894 MWt to the current licensed thermal power (CLTP) level of 3473 MWt.

The current uprated power level of 3473 MWt is the maximum power level evaluated for the period of extended operation.

A.4.2.1.1 Reactor Pressure Vessel Neutron Fluence Analyses

Reactor Pressure Vessel fluence projections for 60 years of operations and 52 EFPY have been developed using the NRC approved General Electric Hitachi (GEH) Discrete Ordinate Transfer (DORT) methodology. The GEH methodology adheres to the guidance in Regulatory Guide 1.190, “Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence,” for neutron flux evaluation. The 52 EFPY fluence projection values have been used in the evaluation of the neutron embrittlement TLAAs for RPV beltline materials, which include the RPV shell plate materials, welds, and nozzle forgings. Fluence projections have been developed to evaluate fluence-based RPV TLAAs and to determine when specified fluence threshold values may be exceeded that are used to invoke specific aging management requirements, such as inspections, for these components. The TLAAs are described and evaluated for 60 years in Sections 4.2.2 through 4.2.7.

The RPV beltline component fluence analyses have been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.2.1.2 Reactor Pressure Vessel Internals Neutron Fluence Analyses

Fluence projections for 60 years and 52 EFPY have been developed to evaluate the neutron fluence dependent TLAAs associated with the RPV components. The RPV internal fluence projections used the same methodology and core and vessel model as described in sections A.4.2.1 and A.4.2.1.1. The TLAAs are described and evaluated for 60 years in Sections 4.2.8 through 4.2.11.

The RPV internal component fluence analyses have been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.2.2 Reactor Pressure Vessel Upper-Shelf Energy (USE) Analyses

Appendix G of 10 CFR 50, Paragraph IV.A.1.a, states that RPV beltline materials must have Charpy upper-shelf energy (USE) throughout the life of the vessel of no less than 50 ft-lb, unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation, that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

For the CPS Reactor Pressure Vessel (RPV) Beltline components for which initial unirradiated USE values are available, the original 40-year licensing basis irradiated USE values have been determined. For some CPS RPV shell plates there is insufficient data available to establish the unirradiated USE values. Therefore, for these components the original 40-year licensing basis USE evaluations are based upon Equivalent Margin Analysis (EMA) as specified in BWRVIP-74-A, "BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guideline for License Renewal," which meets the alternative requirements in Appendix G of 10 CFR 50. Since the USE values and EMA methodology are based upon 32 EFPY fluence values assumed for the original 40-year life of the plant, these analyses have been identified as TLAAs requiring evaluation for the period of extended operation.

USE values have been determined for 60 years of operation (based upon 52 EFPY fluence values) for the CPS RPV extended beltline components, in which initial unirradiated USE values are available. The resulting USE values are acceptable with respect to the design limits.

Equivalent Margin Analysis (EMA) have been determined for 60 years of operation (based upon 52 EFPY fluence values) for CPS RPV extended beltline shell plates where there is insufficient data available to establish the unirradiated USE values. The results of the EMA were compared against the limits defined in Appendix B of BWRVIP-74-A and concluded to be acceptable.

Therefore, RPV extended beltline USE values and EMA have been successfully projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.2.3 Reactor Pressure Vessel Adjusted Reference Temperature (ART) Analyses

The adjusted reference temperature (ART) of the limiting beltline material is used to adjust the P-T limit curves to account for irradiation effects. The initial nil-ductility reference temperature (RT_{NDT}) is the temperature at which an unirradiated ferritic steel material changes in fracture characteristics from ductile to brittle behavior. RT_{NDT} is evaluated according to the procedures in the ASME Code. Neutron embrittlement increases the RT_{NDT} beyond its initial value.

10 CFR 50, Appendix G, defines the fracture toughness requirements for the life of the vessel. The shift in the initial RT_{NDT} (ΔRT_{NDT}) is evaluated as the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. This increase (ΔRT_{NDT}) determines how much higher the vessel temperature must be raised for the material to continue to act in a ductile manner. The 40-year P-T limit curves in the Technical Specifications are based on adjusted reference temperatures for 40 years and 32 EFPY fluence values. Therefore, these analyses have been identified as TLAAs requiring evaluation for the period of extended operation.

For license renewal, 60-year ART values, based on 52 EFPY, have been determined for CPS RPV extended beltline materials using the methodology specified in Regulatory Guide 1.99, Revision 2, “Radiation Embrittlement of Reactor Vessel Materials.” The 52 EFPY ART values of the limiting beltline materials remain below 200 degrees F, which is the RT_{NDT} limit.

The 52 EFPY ART analyses have been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(ii).

A.4.2.4 Reactor Pressure Vessel Pressure-Temperature (P-T) Limits

10 CFR 50 Appendix G requires that the reactor pressure vessel be maintained within established Pressure-Temperature (P-T) limits, including heatup and cooldown operations. These limits specify the minimum acceptable reactor coolant temperature as a function of reactor pressure. As the RPV is exposed to increased neutron irradiation over time, its fracture toughness is reduced. The P-T limits must account for the change in material properties due to anticipated RPV fluence.

The P-T limit curves are located in Technical Specification 3.4.11 and are based on 32 EFPY fluence projections that were considered to represent the amount of power to be generated over 40 years of plant operation. The P-T limits have been identified as TLAAs requiring evaluation for the period of extended operation.

The CPS P-T limits are currently located in the Technical Specifications, but a Pressure Temperature Limits Report (PTLR) may be submitted for NRC approval for the next P-T limit update. Updated P-T limits will be approved for use prior to exceeding 32 EFPY. Therefore, in accordance with NUREG-1800 Revision 2, Section 4.2.2.1.3, the P-T limits for the period of extended operation will be updated at the appropriate time prior to expiration of the 32 EFPY P-T limit curves.

Therefore, the effects of aging on the intended function(s) of the RPV will be adequately managed through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.4.2.5 Reactor Pressure Vessel Circumferential Weld Failure Probability Analyses

CPS has previously applied for and been granted relief from RPV circumferential weld inspection for the vessel. The relief from inspection is based on assessment of the probability of failure of the limiting circumferential weld. This assessment is based on 32 EFPY fluence values associated with 40 years of operation and has, therefore, been identified as a TLAA requiring evaluation for the period of extended operation.

In order to evaluate the CPS RPV circumferential weld failure probability for 60 years, 52 EFPY fluence values have been projected for each circumferential weld and mean RT_{NDT} values for the welds have been determined. The mean RT_{NDT} values have been compared to circumferential weld probability analysis results at 64 EFPY specified in the NRC’s Final Safety Evaluation Report (FSER) of BWRVIP-05, “BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations.” The CPS mean RT_{NDT} values based on 52 EFPY are significantly less than the NRC RT_{NDT} values based on 64 EPFY used in determining the conditional failure probability in the NRC’s FSER of BWRVIP-05. Therefore, the NRC conditional failure probability is bounding for CPS, consistent with the requirements defined in NRC Generic Letter (GL) 98-05, “Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief from Augmented Examination Requirements on Reactor Pressure Vessel Circumferential Shell Welds.”

Reapplication for relief from circumferential weld examination will be made in accordance with 10 CFR 50.55a(z)(1) in time for NRC review and approval prior to exceeding 32 EFPY. The plant-specific information described above demonstrates that at the end of the period of extended operation, the circumferential beltline weld materials meet the limiting conditional failure probability for circumferential welds specified in the NRC’s FSER of BWRVIP-05. These analyses will be managed in accordance with 10 CFR 54.21(c)(1)(iii) by requesting relief from circumferential weld inspection using the 10 CFR 50.55a process.

A.4.2.6 Reactor Pressure Vessel Axial Weld Failure Probability Analyses

The BWRVIP recommendations for inspection of RPV shell welds in BWRVIP-05 include examination of 100 percent of the axial welds and inspection of the circumferential welds only at the intersections of these welds with the axial welds. The NRC provided separate conditional failure probability assessments in the Supplement to the Final Safety Evaluation of the BWRVIP-05 Report, dated March 7, 2000, and calculated a RPV failure frequency of 5.02E-06 due to failure of limiting axial welds in the BWR fleet. Since these NRC failure probability assessments are applicable to CPS, they are identified as TLAAs requiring evaluation through the period of extended operation.

In order to evaluate axial weld failure probability analyses for 60 years for the CPS RPV, 52 EFPY fluence projections have been developed for the inside surface of the limiting axial welds. Using the bounding inside surface fluence value, the mean RT_{NDT} values have been determined for these welds, where the mean RT_{NDT} value does not include the margin term (M) described in Regulatory Guide 1.99, Revision 2, “Radiation Embrittlement of Reactor Vessel Materials,” consistent with the evaluation methodology described in Section 2.1 of the March 7, 2000 supplement to the final safety evaluation.

The limiting CPS RPV axial weld mean RT_{NDT} values at 52 EFPY (without margin) are bounded by the mean RT_{NDT} values (without margin) determined for the limiting reactor in the March 7, 2000 supplement to the final safety evaluation. Therefore, the NRC’s calculated RPV failure frequency of 5.02E-06 due to failure of limiting axial welds in the BWR fleet, is bounding for CPS. Therefore, this analysis has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.2.7 Reactor Pressure Vessel Reflood Thermal Shock Analysis

10CFR50 Appendix A, General Design Criterion 31 requires that the reactor coolant pressure boundary of a light water reactor be designed such that it possesses adequate margin against non-ductile failure for all postulated conditions. USAR Section 3.1.2.4.2 documents that the CPS RPV conforms to this design requirement. For boiling water reactors, this requirement is demonstrated both by development of P-T limit curves, which are addressed in Section A.4.2.4, and by reference to a generic fracture mechanics analysis that evaluates the effects of the limiting Loss of Coolant Accident (LOCA) event.

The generic fracture mechanics analysis evaluates the effects of a postulated LOCA on the structural integrity of an RPV. The rupture of a main steam line was determined to bound all other LOCA events with respect to this evaluation. After the rupture, several emergency core cooling systems are activated at different times and the vessel is flooded with cooling water. The vessel depressurization and the subsequent injection of cold water to reflood the RPV produce a rapid reduction in temperature and high thermal stresses in the vessel. The analysis concludes that the RPV has a considerable margin to failure by brittle fracture even in the presence of postulated pre-existing flaws. This generic analysis envelopes CPS and is based on BWR vessel material properties and cumulative fluence assumed for 40 years of operation. Therefore, this analysis has been identified as a TLAA requiring evaluation for the period of extended operation.

An updated 60-year fracture mechanics evaluation was performed for the reflood thermal shock event to evaluate components with the limiting material properties from the CPS beltline shell plates, axial welds, and circumferential welds. The analysis used projected 52 EFPY fluence values and determined that during the period of extended operation, the RPV has sufficient toughness margin to prevent unacceptable flaw propagation due to thermal shock during reflooding after LOCA events.

The RPV reflood thermal shock analysis has been successfully projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.2.8 Jet Pump Beam Bolts and Core Plate Bolts Preload Relaxation Analyses

GEH design basis evaluations of RPV internal components considered preload relaxation due to accumulated fluence. For CPS this included the jet pump beam bolts and core plate bolts. Since the neutron fluence values were assumed through the end of the initial 40 years of operation, these design basis evaluations have been identified as TLAAs that require evaluation for the period of extended operation.

CPS RPV jet pump beam bolts and core plate bolts preload relaxation was evaluated for 60 years using fluence projections for 52 EFPY. The evaluations used location specific fluence projections and material data for the bolting components. The evaluation of the clamping loads, with relaxation, at 52 EFPY for the jet pump beam bolts and core plate bolts were calculated to be greater than the clamping loads necessary to meet the component design basis requirements.

The jet pump beam bolts and core plate bolts preload relaxation analyses have been successfully projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.2.9 Core Shroud Repair Stabilizer Assembly Bracket Preload Relaxation Analysis

In 2006, CPS pre-emptively installed core shroud stabilizer assembly brackets because of industry intergranular stress corrosion cracking (IGSCC) concerns documented in NRC Generic Letter (GL) 94-03, "Intergranular Stress Corrosion Cracking of Core Shrouds in Boiling Water Reactors." These assemblies maintain the alignment of the core shroud to the RPV and the originally designed reactor flow partitions. Each stabilizer assembly consists of a tie rod, an upper and lower stabilizer, an upper support, and other connecting members. The assembly design analysis evaluated loss of pre-load relaxation of the assembly tie rods. This evaluation demonstrated that the pre-load relaxation over the 40-year operating life of the plant would not exceed design requirements. Since this analysis evaluated fluence effects on tie rod relaxation over the 40-year operating life of CPS, this analysis has been identified as a TLAA that requires evaluation for the period of extended operation.

The CPS RPV core shroud stabilizer assembly bracket tie rod relaxation was evaluated for 60 years using fluence projections for 52 EFPY. This evaluation demonstrated that the peak fluence projections at 52 EFPY are less than the fluence assumed in the original design evaluation.

The shroud repair stabilizer assembly bracket preload relaxation analyses have been successfully projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.2.10 Reactor Pressure Vessel Core Support Structure Strain Evaluation

CPS design specifications required calculated strain assessments of Reactor Core Support Structure (CSS) components fabricated from 304, 304L, 308, and 308L austenitic stainless steels which exceeded specified fluence thresholds. These specified requirements were not required by ASME Section III. As a result, evaluations demonstrating that the specified criteria was met for the 40-year life of the plant, were documented in the original component design stress reports.

Since the original stress reports evaluated fluence effects on material properties over the 40-year operating life of the plant, these analyses have been identified as TLAAs that require evaluation for the period of extended operation.

CSS components fabricated from austenitic stainless steels were evaluated using 60-year fluence projections for 52 EFPY. This evaluation demonstrated that CSS components fabricated from applicable austenitic stainless steels, which exceed the specified fluence values, meets the design specification strain acceptance criteria. The following CSS components were evaluated: the shroud, shroud support, top guide, core plate, core plate wedges, orificed fuel support, peripheral fuel support, control rod guide tubes, and control rod housing.

The RPV core support structure strain evaluation has been successfully projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.2.11 Top Guide IASCC Analysis

For periodic RPV top guide inspections, the BWR Vessel Internals (A.2.1.9) aging management program utilizes the recommendations provided in BWRVIP-26-A and BWRVIP-183. BWRVIP-183 documents a fluence threshold value of 5.0E+20 n/cm^2 beyond which irradiation assisted stress corrosion cracking (IASCC) may occur in BWR vessel internal components. Applicant Action Item Number 4 in the NRC SER to BWRIVP-26-A states that license renewal applicants referencing BWRIVP-26-A for aging management should identify and evaluate the projected neutron fluences which are compared to the inspection threshold, as a potential TLAA.

60-year fluence values for the CPS RPV top guide are projected to exceed the threshold. Therefore, the top guide will be inspected periodically for cracking during the period of extended operation in accordance with the BWR Vessel Internals (A.2.1.9) aging management program and recommendations in BWRVIP-26-A.

Aging effects of IASCC of the RPV top guide will be managed by the BWR Vessel Internals (A.2.1.9) aging management program through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.4.3 Metal Fatigue Analyses

Metal fatigue was considered explicitly in the design process for pressure boundary components designed in accordance with ASME Section III, Class 1 requirements. Metal fatigue was evaluated implicitly for components designed in accordance with

ASME Section III, Class 2 or 3 requirements or ANSI B31.1 requirements. Each of these fatigue analyses and evaluations are considered to be TLAAs requiring evaluation for the period of extended operation in accordance with 10 CFR 54.21(c) as described below.

A.4.3.1 Transient Cycle and Cumulative Usage Projections for 60 years

Fatigue analyses are based upon explicit numbers and amplitudes of thermal and pressure transients usually described in design specifications. The intent of the design basis transient definitions is to bound a wide range of possible events with varying ranges of severity in temperature and pressure. Since the existing fatigue analyses are based upon a number of transient occurrences postulated to bound 40 years of operation, projection of the transient occurrences through the period of extended operation is required to demonstrate that the analyses and waivers remain valid.

Projections of the transient occurrences through the period of extended operation were developed for 60 years and used as input to calculate projected 60-year cumulative usage factor (CUF) and environmentally assisted cumulative usage factor (CUF_{en}) values to determine whether the existing analyses remain valid for 60 years. The number of transient occurrences, CUF values, and CUF_{en} values have been projected through the period of extended operation. The following fatigue TLAAs have been dispositioned using the projected number of transient cycles, CUF values, and CUF_{en} values through the period of extended operation.

A.4.3.2 ASME Section III, Class 1 and Environmentally Assisted Fatigue Analyses

A.4.3.2.1 ASME Section III, Class 1 RPV and Piping Component Fatigue Analyses

The CPS RPV was designed to Class 1 requirements in accordance with the ASME Code Section III, 1971 Edition including all Addenda up to Summer 1973. In addition, Clinton Class 1 piping systems were designed in accordance with the ASME Code Section III, 1974 Edition including Summer 1974 Addenda or 1983 Edition with Addenda up to Winter 1984. The Class 1 RPV and piping fatigue analyses determined the effects of transient loadings resulting from changes in system temperature and pressure and for seismic loading cycles. The fatigue analyses evaluated explicit numbers and types of transients that were postulated for the 40-year design life of the plant specified in design specifications. These Class 1 explicit fatigue analyses were required to demonstrate that the CUF for each component will not exceed the ASME Section III design limit of 1.0 for all the postulated transients.

Sixty-year CUF and CUF_{en} projections show that all ASME Section III, Class 1 fatigue analysis will continue to meet the ASME Section III design limit of 1.0 through the period of extended operation. To ensure the projected CUF and CUF_{en} values remain acceptable for the 60-year period of extended operation, the Fatigue Monitoring (A.3.1.1) program will monitor cumulative CUF and CUF_{en} for limiting locations through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.4.3.2.2 Environmentally Assisted Fatigue Analyses for Class 1 RPV and Piping

NUREG-1801, Revision 2 provides a recommendation for evaluating the effects of the reactor water environment on the fatigue life of a set of sample reactor coolant system components. One method to satisfy this recommendation is to assess the impact of the reactor coolant environment on a sample of critical components as described in NUREG/CR-6260. Additional component locations are evaluated if they are considered to be more limiting than those considered in NUREG/CR-6260.

Environmental fatigue calculations were performed for component locations listed in NUREG/CR-6260. In order to ensure that any other locations that may not be bounded by the NUREG/CR-6260 locations were evaluated, environmental fatigue screening calculations were performed for all Class 1 RPV and piping component locations that have a reported CUF value in the governing stress reports and are exposed to reactor coolant.

These environmental fatigue analyses will be managed by the Fatigue Monitoring (A.3.1.1) program in the same manner as the ASME Section III, Class 1 fatigue analyses. The program ensures that the CUF_{en} values are maintained below the ASME Section III design limit of 1.0. If a CUF_{en} limit is approached, corrective actions are triggered to prevent exceeding the limit.

The effects of aging on the intended functions will be adequately managed by the Fatigue Monitoring (A.3.1.1) program through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.4.3.3 ASME Section III, Class 1 Components

A.4.3.3.1 Main Steam System Transients

The CPS main steam system was designed as a Class 1 system in accordance with ASME Section III, 1974 Edition with Summer 1974 Addenda. USAR Section 3.9.1.1.5 documents the transients and transient occurrences considered in the design analysis of this piping system. The resulting fatigue evaluations calculated various piping component CUF values and the maximum calculated design CUF values of bounding piping component locations were 0.41, 0.12, and 0.09.

The Fatigue Monitoring (A.3.1.1) program monitors bounding component locations of the main steam system. The following SI:FatiguePro™ locations bound the above components: “1MS-05 Node 345 (MS_345),” “1MS-06 Node 325,” “1MS-38A Node 450/460 at valve 1B21-F067B” (MS_460) and “1MS-38A Node 85 at valve 1B21-F067C.”

Therefore, the effects of aging on the intended function of these components will be adequately managed by the Fatigue Monitoring (A.3.1.1) program through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.4.3.3.2 Main Steam Isolation Valve Transients

The CPS main steam isolation valves (MSIVs) were procured as Class 1 components in accordance with ASME Section III, Subsection NB, July 1974. USAR Section 3.9.1.1.8 documents specified transients and transient occurrences considered in the design of these valves. The resulting fatigue evaluation calculated various valve subcomponent CUF values, all of which were less than 0.08.

Transient projections, performed for the license renewal project, determined that the assumed number of transient occurrences will not be exceeded in 60 years of operation. Therefore, the fatigue evaluation remains valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.3.3.3 Safety/Relief Valve Transients

The CPS safety/relief valves were procured as Class 1 components in accordance with ASME Section III, Subsection NB, July 1974 Edition with Addenda up to and including Summer 1976. USAR Section 3.9.1.1.9 documents the transients and transient occurrences considered in the design analysis of these valves. The resulting fatigue evaluation calculated various valve subcomponent CUF values, all of which were less than 0.1.

Transient projections, performed for the license renewal project, determined that the assumed number of transient occurrences will not be exceeded in 60 years of operation. Therefore, this fatigue evaluation remains valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.3.3.4 Recirculation System Transients

The CPS recirculation system was designed as a Class 1 system in accordance with ASME Section III, Subsection NB, 1983 Edition with Addenda up to Winter 1984. USAR Section 3.9.1.1.5 documents the transients and transient occurrences considered in the design analysis of this piping system. The resulting fatigue evaluations contained in the design analyses calculated various piping component CUF values and the maximum calculated design CUF values of bounding piping component locations were 0.472 and 0.46.

The Fatigue Monitoring (A.3.1.1) program monitors the following bounding component locations of the recirculation system: nodes “RR_735” and “RR_151.”

Therefore, the effects of aging on the intended function of these components will be adequately managed by the Fatigue Monitoring (A.3.1.1) program through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.4.3.3.5 Recirculation Flow Control Valve Transients

The CPS recirculation system flow control valves were procured as Class 1 components in accordance with ASME Section III, Subsection NB, 1974 Edition with Addenda through Summer 1976. USAR Section 3.9.1.1.10 documents transients and transient occurrences considered in the design analysis of these valves.

The resulting fatigue evaluations contained in the design analysis calculated various valve subcomponent CUF values, all of which were less than or equal to 0.002.

Transient projections, performed for the license renewal project, determined that the assumed number of transient occurrences will not be exceeded in 60 years. Therefore, the fatigue evaluation remains valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.3.3.6 Recirculation Gate Valve Transients

The CPS recirculation system gate valves were procured as Class 1 components in accordance with ASME Section III, Subsection NB 1971 edition, up to and including Winter 1973 Addenda. USAR Section 3.9.1.1.12 documents transients and transient occurrences considered in the design analysis of these valves.

The resulting fatigue evaluations contained in the design analysis calculated various valve subcomponent CUF values, all of which were less than or equal to 0.005 for 40 years.

Transient projections, performed for the license renewal project, determined that the assumed number of transient occurrences will not be exceeded in 60 years. Therefore, the fatigue evaluation remains valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.3.3.7 Recirculation Pump Transients

The CPS recirculation system pumps were procured as Class 1 components in accordance with ASME Section III, Subsection NB, 1974 Edition with Addenda through Summer 1974.

Among other insignificant transients, the fatigue evaluation contained in the design analysis assumed 120 startups, 111 shutdowns, 10 loss of feedwater pump, 180 scrams, eight relief valve blowdowns, one automatic blowdown (emergency), one improper start of pump in cold loop (emergency), one improper start of pump with reactor drain shutoff followed by a turbine roll (emergency), one pipe rupture and blowdown (faulted), and two safe shutdown earthquakes. The resulting fatigue evaluations contained in the design analysis calculated various valve subcomponent CUF values, all of which were less than 0.254.

Transient projections, performed for the license renewal project, determined that the assumed number of transient occurrences will not be exceeded in 60 years. Therefore, the fatigue evaluation remains valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.3.3.8 Control Rod Drive System Transients

The CPS control rod drives (CRDs) were designed as Class 1 components in accordance with ASME Section III, 1974 edition and Winter 1975 Addenda.

The transients and transient occurrences documented in USAR Section 3.9.1.1.1 were specified for the design of the CRDs. The resulting fatigue evaluations contained in the design analysis calculated design CUF values for the following Class 1 CRD subcomponents: main flange, ring flange, indicator tubes, indicator tube base weld, indicator tube cap weld, lower and upper tube connection, lower piston tube threads, and flange plugs. All calculated design CUF values were 0.2 or less.

The fatigue evaluation contained in the design analysis assumed 600 scrams with CRD cooling water off. This assumption is conservative since the CRDs are designed with cooling water flow to mitigate CRD subcomponent temperature changes during power operation and scrams. The analysis concluded that all other transients documented in USAR Section 3.9.1.1.1 have negligible contribution to fatigue on all Class 1 CRD subcomponents.

Transient projections, performed for the license renewal project, determined that the assumed number of transient occurrences will not be exceeded in 60 years. Therefore, the analysis remains valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.3.4 ASME Section III, Class I Fatigue Exemptions

The CPS reactor pressure vessel (RPV) was designed for 40 years of service in accordance with the ASME Code Section III. Some design stress reports for Class 1 RPV components included fatigue exemptions in accordance with ASME Section III, Subsection NB-3222.4(d), thus demonstrating that these RPV components do not require explicit fatigue analyses.

These original stress reports that contained fatigue exemptions included assumptions for postulated numbers of temperature and pressure transients that were expected over the 40-year life of the plant. The following Class 1 RPV components satisfied the ASME Section III fatigue exemption requirements: top head nozzle, in-core housing, jet pump instrumentation penetration seals, CRD housings, CRDH flange, power range detector dry tubes, and intermediate range monitor (IRM)/source range monitor (SRM) dry tubes.

These fatigue exemptions have been re-evaluated for the period of extended operation using 60-year projected transient occurrences. The re-evaluation used the same ASME Section III, Subsection NB-3222.4(d) methodologies and acceptance criteria. Pressure and temperature ranges for assumed transients were adjusted for Extended Power Uprate (EPU) operating conditions. Results of the re-evaluations showed that the criteria in ASME Section III, Subsection NB-3222.4(d) remain satisfied for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.3.5 ASME Section III, Class 2 and 3, and ANSI B31.1 Allowable Stress Analyses and Related HELB Selection Analyses

Piping designed in accordance with ASME Section III, Class 2 or 3, or ANSI B31.1 Piping Code design rules is not required to have an explicit analysis of cumulative fatigue usage, but cyclic loading is considered in the design process. If the numbers of anticipated thermal cycles exceed specified limits, these codes require the application of a stress range reduction factor to the allowable stress to prevent damage from cyclic loading. This is an implicit fatigue analysis since it is based upon the anticipated number of cycles for the life of the piping system.

These codes first require the overall number of thermal and pressure cycles expected during the plant lifetime of these components to be determined. A stress range reduction factor is then determined for that number of cycles using the applicable design code. If the total number of cycles is 7,000 or less, the stress range reduction factor of 1.0 is applied, which would not reduce the allowable stress values. For higher numbers of cycles, the stress range reduction factors limit the allowable stresses that can be applied to the piping.

In addition, some Non ASME Class 1 high energy piping locations were selected for HELB analyses at nodes where calculated stresses for normal and upset plant conditions exceeded 0.8 (1.2 S_h + S_a), where S_h is the allowable stresses at maximum (hot) temperature and S_a is the allowable stress range for thermal expansion as defined in Article NC-3600 of the ASME Code, Section III.

Portions of the following Class 2 and 3 and ANSI B31.1 piping systems within the scope of license renewal are directly connected to the reactor coolant system (RCS) and are affected by the same operational transients that result in thermal cycles for Class 1 RCS piping. These are: the main steam system, the reactor core isolation cooling system, the reactor feedwater system, and the residual heat removal system. These transient cycles have been projected for 60 years. The projections demonstrate that the total number of thermal cycles for these piping systems will not exceed 25 percent of the 7,000-cycle threshold that would result in a reduction in the stress range reduction factor. Therefore, these TLAAs have been demonstrated to remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

For the remaining Class 2 and 3 and ANSI B31.1 piping systems within the scope of license renewal that are affected by thermal and pressure transients that are different than the RCS transients, an operational review was performed. These piping systems include portions of the Class 2 control rod drive system piping, emergency diesel generator system exhaust system piping, hydrogen water chemistry system piping, fire protection system diesel engine exhaust system piping, reactor core isolation cooling system, reactor water cleanup system, residual heat removal (RHR) pump effluent 1A/1B sample lines, RHR heat exchangers sample line, and the recirculation system sample lines.

The review concluded that the total number of thermal cycles for these systems, projected through the period of extended operation, will not exceed the 7,000-cycle threshold. Therefore, the stress range reduction factors originally selected for Class 2 and 3 and ANSI B31.1 piping systems remain applicable and these TLAAs have been demonstrated to remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.3.6 High Energy Line Break (HELB) Analyses Based on Cumulative Fatigue Usage

As described in USAR Section 3.6.2, the High Energy Line Break (HELB) analyses for CPS used the CUF values from the ASME Class 1 fatigue analyses as input in determining intermediate break locations. Locations with a design CUF value less than or equal to 0.1 did not require an intermediate break to be postulated.

The current Fatigue Monitoring (A.3.1.1) program uses SI:FatiguePro^{TM} to determine the overall effect of the cumulative numbers of transient occurrences that have occurred at a given time and determines the CUF values resulting from the combination of transient occurrences that have occurred. SI:FatiguePro^{TM} monitors six bounding locations for all HELB analyses.

The Fatigue Monitoring (A.3.1.1) program administrative requirements will ensure that corrective action is taken prior to the bounding location CUF value exceeding the HELB break exclusion acceptance criterion of 0.1. Therefore, these fatigue analyses will be managed by the Fatigue Monitoring (A.3.1.1) program through period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.4.3.7 Reactor Vessel Internals

CPS reactor vessel internal (RVI) components that support the core are designed in accordance with ASME Section III, Subsection NG, 1974 Edition with Addenda up to and including Summer 1976. These components are documented in USAR Section 3.9.5.1.a and are evaluated for the period of extended operation in sections A.4.3.7.2 and A.4.3.7.3.

Some additional RVI components which do not support the core were evaluated for fatigue, as part of the Extended Power Uprate (EPU) project, per the guidance in the ASME Section III Code. These are evaluated for the period of extended operation in section A.4.3.7.1.

A.4.3.7.1 Reactor Vessel Internals Fatigue Analysis

By Amendment Number 149, dated April 5, 2002, the NRC approved a 20 percent EPU that authorized an increase in the maximum thermal power level from 2894 MWt to the licensed thermal power level of 3473 MWt. To support this power uprate, GEH issued two analyses which evaluated RVI components for fatigue using EPU operating conditions. The following RVI components, within the scope of license renewal, were evaluated in the two analyses: jet pump riser brace, core spray piping, core plate stiffener to skirt weld, and top guide/grid.

For the jet pump riser brace and core spray piping, to ensure conservative management of these two components, the CPS Fatigue Monitoring (A.3.1.1) program procedure will be enhanced to add these components for cycle-based monitoring. Therefore, the effects of fatigue on the intended functions of the jet pump riser brace and core spray piping RVI components will be managed by the Fatigue Monitoring (A.3.1.1) program through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

For the core plate stiffener to skirt weld and top guide/grid components the 60-year projections are more than 30 times less than the assumed occurrences in the corresponding fatigue evaluations. Therefore, it is not credible that the calculated design CUF values for these two components will be exceeded during the period of extended operation. For these two components the assumed transient occurrences for 40 years are valid for 60 years of operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.3.7.2 ASME Section III, Class CS Fatigue Exemptions

Some design stress reports for Class CS RPV components included fatigue exemptions in accordance with ASME Section III, Winter 1973 Addenda, Subsection NG-3222.4(d), thus demonstrating that these RPV components did not require explicit fatigue analyses.

The following are RPV components that satisfied these ASME Section III fatigue exemption requirements: the control rod guide tubes, the peripheral fuel supports, and the orificed fuel supports.

These fatigue exemptions have been successfully re-evaluated for the period of extended operation using 60-year projected transient occurrences. The re-evaluation used the same ASME Section III, Subsection NG-3222.4(d) methodologies and acceptance criteria. Pressure and temperature ranges for assumed transients were adjusted for EPU operating conditions. Results of the re-evaluations showed that the criteria in ASME Section III, Subsection NG-3222.4(d) remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.3.7.3 Core Shroud Support and Stabilizer Assembly Brackets

In 2006, CPS pre-emptively installed core shroud stabilizer assembly brackets because of industry intergranular stress corrosion cracking (IGSCC) concerns documented in NRC Generic Letter 94-03. These assemblies maintain the alignment of the core shroud to the reactor pressure vessel (RPV) and the originally designed reactor flow partitions. The tie rod and upper support provide vertical load restraint capability from the top of the shroud to the RPV shroud support plate, as well as positioning the new radial stabilizers.

The modification altered the load path and produced additional loads on the core shroud support structure. Therefore, the design basis of these existing components was re-analyzed in accordance with ASME Section III, 1974 Edition with Addenda up to and including Summer 1976. The basis analysis evaluated fatigue for various core shroud support structure sub-components assuming 10 normal and transient upset transients and an associated number of occurrences. The maximum usage factor of the core shroud support structure was determined to be 0.426 for 40 years at the core shroud support plate. Twelve thousand six hundred SRV actuations contribute to the majority of the total fatigue usage.

In addition, the core shroud stabilizer assembly brackets were designed in accordance with ASME Section III, Subsection NG, 1998 Edition up to and including 2000 Addenda. The basis stress analysis for the brackets evaluated fatigue for various assembly sub-components consistent with the core shroud support plate analysis. The maximum usage factors determined for the stabilizer assembly were determined to be significantly less than the core shroud support plate usage. Therefore, the core shroud support plate is the limiting component, with respect to fatigue, for the core shroud stabilizer assembly brackets and core shroud support structure.

For 60 years CPS is projected to experience significantly less actuations, by more than an order of magnitude. Therefore, it is not credible that CPS will experience more than 12,600 SRV actuations in 60 years in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.4 Environmental Qualification of Electric and Mechanical Equipment

A.4.4.1 Environmental Qualification of Electric and Mechanical Equipment

Thermal, radiation, and cyclical aging analyses of plant electrical and mechanical components, developed to meet 10 CFR 50.49 requirements, have been identified as time-limited aging analyses (TLAAs) for CPS. The NRC has established nuclear station environmental qualification (EQ) requirements in 10 CFR 50.49. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments are qualified to perform their safety function in those harsh environments after the effects of in-service aging. Harsh environments are defined as those areas of the plant that could be subject to the harsh environmental effects of a loss-of-coolant accident (LOCA), high energy line break (HELB), or post-LOCA radiation. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification.

The Environmental Qualification of Electric and Mechanical Components (A.3.1.2) program will manage the effects of aging effects for the components associated with the environmental qualification through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii). The program meets the requirements of 10 CFR 50.49 for the applicable electrical components important to safety. Reanalysis of an aging evaluation to extend the qualifications of components is performed on a routine basis as part of the EQ program. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, ongoing qualification, and corrective actions if acceptance criteria are not met.

If the qualification cannot be extended by reanalysis, the component must be refurbished, replaced, or requalified prior to exceeding the period for which the current qualification remains valid. A reanalysis is to be performed in a timely manner such that sufficient time is available to refurbish, replace, or requalify the component if the reanalysis is unsuccessful.

The effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The Environmental Qualification of Electric and Mechanical Components (A.3.1.2) program has been demonstrated to be capable of programmatically managing the qualified lives of the electrical components falling within the scope of the program for license renewal in accordance with 10 CFR 54.21(c)(1)(iii).

A.4.5 Concrete Containment Tendon Prestress Analysis

A.4.5.1 Concrete Containment Tendon Prestress Analysis

The CPS containment does not have pre-stressed tendons. As such, this topic is not a TLAA.

A.4.6 Primary Containment Fatigue Analyses

A.4.6.1 Containment Class MC Mechanical Penetrations

USAR Section 3.6.2.4 documents that CPS containment mechanical penetrations are designed as Class MC components in accordance with ASME Section III, 1974 Edition, through Summer of 1974 Addenda. Therefore, design calculations, which contained fatigue evaluations in accordance with ASME Section III, Subsection NE 3222.4 were developed for each in service mechanical penetration.

Each fatigue evaluation assumed various transients and transient occurrences projected over 40 years. All calculations demonstrated that the design CUF values for each in service containment mechanical penetration was less than the ASME Section III limit of 1.0. These penetrations are documented in USAR Table 3.8-5.

The fatigue calculations of all 121 in service containment Class MC mechanical penetrations were assessed for an additional 20 years of operation. The assessment is summarized below in three groupings.

Calculations That Assumed Only Monitored Transients

The calculations for 95 of the 121 Class MC in service penetrations assumed only transients that are monitored by the CPS Fatigue Monitoring Program (USAR Table 3.9-1) or transients that specify no temperature or pressure changes. Except for two transients, projected 60-year occurrences for each transient are significantly less than the occurrences assumed in these calculations. All of these calculations computed CUF values less than or equal to 0.414; with the vast majority less than 0.1.

The two exceptions are the “Hydro Test” transient and the “Misc. Head Spray” transient. The impact on fatigue due to these two transients is concluded to be negligible and more than compensated by other transients in which the projected 60-year number of occurrences are much less than the assumed occurrences in the calculations. Therefore, these calculations remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Calculations That Assumed Some Unmonitored Transients

The calculations of 24 of the 121 Class MC in service penetrations assumed some transients that are not monitored by the CPS Fatigue Monitoring Program (USAR Table 3.9-1). These calculations postulated specific transients for the process piping contained in the associated penetration, transients that are monitored by the CPS Fatigue Monitoring Program, and transients that specified no temperature or pressure changes. These calculations computed CUF values that were less than or equal to 0.19. Review of these calculations showed that the assumed number of unmonitored transient occurrences used as input are more than the projected number of occurrences expected to occur in 60 years.

Therefore, these calculations remain valid through the period of extended operation in accordance with10 CFR 54.21(c)(1)(i).

Calculations In Which An Assumed Number of Unmonitored Transients Were Revised

For the two remaining in service penetrations, 1MC-64 and 1MC-65, the associated calculations assumed unmonitored transient occurrences which could be less than the number of occurrences expected in 60 years.

For penetration 1MC-64, among other transients, the associated calculation assumed 20 occurrences in which the redundant not in service RWCU heat exchanger train is placed into service ("swapped") while the plant is at power. Although this transient occurs rarely during power operation (e.g., once per year), 20 occurrences could be exceeded in 60 years. However, assuming the RWCU heat exchangers are "swapped" while at power 10 times per year for 60 years, increases the CUF value to approximately 0.272, which is significantly less than the limit of 1.0.

For penetration 1MC-65, among other transients, the associated calculation assumed 2,450 "backwash" occurrences in 40 years (once every six days) resulting in a calculated CUF value of 0.01245. Operating experience shows that this "backwash" transient occurs more often, as frequently as once per day. Conservatively assuming the "backwash" transient occurs 10 times per day for 60 years results in an increase in the CUF value to approximately 0.11, which is significantly less than the limit of 1.0.

Therefore, for these two design calculations some assumed transient occurrences have been successfully revised for 60 years of operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.6.2 Containment Liner

The containment liner was designed in accordance with ASME Section III, Division 2, Article CC-3300 (1973). When subject to SRV discharge loads, the liner plates are also designed in accordance with ASME Section III, Subsection NE. The fatigue evaluation contained in the design analysis calculated a CUF value of 0.016 for the liner plates and 0.036 for the liner welds; assuming 1,948 SRV actuations during the 40-year life of the plant.

The projected number of actuations for all SRVs is 300 for 60 years. This value is well within the original design analysis of 1,948 SRV actuations. Therefore exceeding 1,948 SRV actuations in 60 years is not credible.

Therefore, the transients and transient occurrences that were assumed for 40 years are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.6.3 Suppression Pool Liner

The suppression pool Liner was designed in accordance with ASME Section III, Division 1, Subsection NE, 1974 edition with winter 1975 Addenda. The GEH design guidance specified 1,800 SRV actuations to analyze liner fatigue.

The design analysis evaluated fatigue for the suppression pool floor liner successfully by addressing the six criteria in NE-3222.4(d) assuming 1,000 SRV actuations during the 40-year life of the plant. Also, the design analysis evaluated fatigue for the suppression pool wall liner in accordance with ASME Section III, Subsection NE-3222.4(e). The evaluation calculated a CUF value of 0.0144 assuming 1,800 SRV actuations during the 40-year life of the plant.

The projected number of actuations for all SRVs is 300 for 60 years. Exceeding 1,000 SRV actuations in 60 years is not credible.

Therefore, the transients and transient occurrences that were assumed for 40 years are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.6.4 Containment and Drywell Equipment Hatch and Personnel Locks, and Drywell Head Fatigue Assessment

The containment equipment access hatch and personnel airlock were designed to meet all requirements of Subsection NE, ASME Section III, 1971 Edition and Addenda up to and including the Summer 1973 Addenda. The drywell equipment access hatch, personnel airlock, and head are designed in accordance with ASME Section III, Subsection NE, 1974 Edition with Summer 1976 Addenda. Therefore, these components were required to be evaluated for fatigue in accordance with ASME Section III Subsection NE-3222.4.

Based on the specified design and operating temperatures and pressures, specified component materials, and a very conservative projection of at least 2,500 occurrences in which the component experiences a temperature and pressure increase from ambient to operating temperature and pressure, these five components were demonstrated to meet the six criteria in NE-3222.4(d).

The number of projected startup and shutdown transient occurrences is approximately 100 for 60 years. Exceeding the assumed 2,500 startup and shutdown occurrences over 60 years is not credible.

Therefore, the transients and transient occurrences that were assumed for 40 years are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.6.5 Inclined Fuel Transfer Tube Bellows

The CPS inclined fuel transfer tube bellows were designed as a Class MC component in accordance with ASME Section III, Subsection NC, 1974 Edition.

The design analysis for these bellows certified that they could accommodate displacements for:

1. 150 occurrences of “Normal Operation” where pressure and temperature changes from ambient conditions to the design temperature and pressure of 185 degrees F and 20 psig; respectively,

2. 30 occurrences of “Upset Conditions” where pressure and temperature changes from ambient conditions to the design temperature and pressure of 185 degrees F and 20 psig; respectively, concurrent with operation basis earthquake (OBE) conditions, and

3. One occurrence of “Faulted Conditions” where pressure and temperature changes from ambient conditions to the design temperature and pressure of 185 degrees F and 20 psig; respectively, concurrent with safe shutdown earthquake (SSE) conditions.

The CPS containment design temperature and pressure are 185 degrees F and 15 psig; respectively, which bounds the postulated design basis accident peak temperature and pressure. Therefore, the design analysis assumed occurrences of temperature and pressure changes that were greater than temperature and pressure changes that are postulated to occur during a design basis accident. It is not credible that CPS will experience this number of transient occurrences over a 60-year service life.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.6.6 Refueling Bellows

The refueling bellows were designed in accordance with ASME Section III, Subsection NE, 1977 Edition with Winter 1977 Addenda. The refueling bellows along with the refueling bulkhead are designed to allow flooding of the drywell head cavity during refueling. The bellows accommodate thermal displacement between the refueling bulkhead and the reactor vessel during plant startups and shutdowns.

The bellows were specified for a minimum of 360 occurrences of axial compression corresponding to the thermal expansion of the reactor vessel during normal operational startups and shutdowns, and three cycles of axial compression corresponding to the thermal expansion of the reactor vessel during accident conditions. They were also specified for a minimum of 30 OBE and 30 SSE seismic cycles of horizontal and vertical movement.

The specified 360 startup and shutdown transient occurrences are conservative when considering that CPS is projected to startup and shutdown 101 and 98 times, respectively, in 60 years. The 30 OBE and 30 SSE cycles are also extremely conservative.

Therefore, the transients and transient occurrences that were specified for 40 years are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.6.7 SRV X-Quenchers

The CPS safety relief valve (SRV) X-Quenchers were originally analyzed according to the requirements of the ASME Code, Section III, Subsection ND-3600 as Class 3 components. However, the NRC expressed a concern about the fatigue life of the X-Quencher due to thermal gradient and local bending stresses. Although ND-3600 does not require a detailed fatigue evaluation, it was decided to re-analyze four critical locations on the X-Quencher, to the requirements of Section III, Subsection NB-3600 of the ASME Code, 1983 Edition, in order to address the concern. The result of the re-analysis is documented in USAR Attachment B3.9.

The re-analysis assumed 11,600 SRV actuations, five OBEs, and one SSE over 40 years, consistent with the original design specification, and concluded a maximum CUF value of 0.84.

The maximum number of projected actuations of any individual SRV for 60 years is 30 and the total number of projected actuations for all SRVs is 300 for 60 years. These projected actuations are well within the analyses of the SRV X-Quenchers of 11,600 SRV actuations for any one individual SRV.

Therefore, the transients and transient occurrences that were assumed for 40 years in the re-analysis are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.6.8 Containment/Drywell Penetration High Energy Guard Pipe Bellows

The design of the CPS high energy lines from the reactor includes penetration guard pipe bellows as they transition from the drywell into containment. The intended function of these components is to seal normal drywell environment conditions from containment. These bellows do not serve a primary containment function. These bellows were designed to withstand a 30 psid internal pressure, a 17 psid external pressure, a 330 degrees F temperature, and the corresponding required axial and lateral movements resulting from a transient in which the bellows experienced temperature and pressure changes from ambient to these design conditions.

In 1984 CPS identified minor damage to 10 of the 11 bellows during installation. The analysis of the repairs credited qualification testing. The testing included 10,000 cycles of the originally specified axial and lateral movements. The bellows were repaired in late 1984 consistent with the repair analysis.

The repair analysis of the bellows credited prototype testing that used replicated bellows that were purposely damaged in a manner that duplicated the existing damaged bellows. The prototype bellows were successfully tested by imposing greater than 10,000 cycles of the required axial and lateral movements.

The CPS drywell design temperature and pressure is 330 degrees F and 30 psig which bounds postulated drywell design basis accident peak temperatures and pressures. Therefore, the qualification testing essentially replicated 10,000 occurrences of axial and lateral movements corresponding to temperature and pressure changes greater than those postulated to occur during a design basis accident. It is not credible that CPS will experience this number of transient occurrences over a 60-year service life.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.6.9 Containment Liner Corrosion Assessment

The containment liner welds are covered by leak test channels which were intended to support initial pressure testing of the liner welds. Threaded female test connections were included in the test channel configuration to connect a pressure source during the initial testing. During Integrated Leak Rate Testing (ILRT), the male threaded plugs that normally seal the test connections are removed to ensure that the liner surfaces under the test channels are tested. Over the years the male plugs were not reinstalled after ILRT. With the male plugs removed, the liner surfaces under the channels, which are not coated, are subject to the containment environment. Liner surfaces outside the test channels are coated.

In 1991, CPS issued a calculation to determine if the absence of the male plugs could result in detrimental corrosion on the uncoated liner surfaces under the test channels. The calculation conservatively assumed that the air that enters the test channels was consistent with an industrial marine environment containing corrosive salt and relative humidity of 90 percent. The calculation then selected conservative corrosion rates for the assumed environment from corrosion handbooks. The resulting material loss over 40 years was compared to acceptance criteria based on a 15 percent thickness margin assumed in the original containment liner stress calculation. The calculation concluded that the estimated conservative material loss over 40 years was less than the acceptance criteria.

For license renewal the original liner thickness acceptance criteria was reevaluated for the specific configuration of the liner under the test channels using a finite element analysis. The reevaluation concluded that the liner under the 3-inch wide test channels can accommodate local thinning up to 125 mils and the liner would still perform its safety related functions.

The basis for the 1991 assumption, that the air environment surrounding the uncoated surfaces is consistent with an industrial marine environment with relative humidity values of 90 percent, was thoroughly evaluated. The evaluation included a review of the design capabilities of the primary containment ventilation system and containment temperature trends over a two-year period. It was concluded that the CPS containment ventilation system maintains low humidity of 5 to 60 percent through-out the year, the air does not contain salt, and containment air temperatures remain well above the dew point throughout the year. Therefore, the environmental assumptions used in the original 1991 evaluation were very conservative.

For the uncoated carbon steel surfaces under the test channels, more accurate corrosion rates were identified based on the parabolic behavior of exposed carbon steel surfaces which are not disturbed in an air environment with 60 percent relative humidity. If a carbon steel surface is exposed to an oxidizing atmosphere, the stable oxides that are formed on the surface gradually diminish oxygen diffusion to the metallic surface. Since the test channels protect the liner surfaces from disturbances, such as air or water flow, this parabolic corrosion rate behavior is applicable to this situation. The overall effect is a parabolic reduction in corrosion rates over time. For example, corrosion rates change from 0.5 mpy over the first six months of exposure to 0.018 mpy after only nine years of exposure. Therefore, a total material loss of 3.5 mils is estimated for carbon steel surfaces for 60 years of exposure in this environment. Clearly this amount of material loss is significantly less than the acceptance criteria of 125 mils of local thinning under the test channels.

Since the containment environment has a relative humidity of 5 to 60 percent and temperature remains well above the dew point throughout the year, condensation will not occur on uncoated carbon steel surfaces in contact with stainless steel under the test channels. Thus, without the presence of an electrolyte on the carbon steel surfaces, no measurable galvanic corrosion would be anticipated and only the general corrosion of the carbon steel is applicable.

Therefore, the corrosion assessment of exposed surfaces under the test channels has been successfully evaluated through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.4.6.10 Containment Electrical Penetrations

CPS electrical containment penetrations were designed and qualified to IEEE 317-1976, "IEEE Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations." In addition, portions of the penetration assembly primary header plates, associated modules, and weld neck flanges are designated as Class MC components in accordance with ASME Section III Subsection NE, 1974 Edition with Summer 1976 Addenda. These penetrations are listed in USAR Table 3.8-5.

For electrical penetrations the fatigue requirements were met through qualification testing as is allowed by ASME Section III, Subsection NE 3222.4(a). The testing qualified the electrical penetrations to 120 startups and shutdowns in which penetration temperature was increased from ambient to 150 degrees F and back down to ambient. These test conditions are more conservative than the containment normal operating temperatures which in general areas is 104 degrees F and in some closed compartments is 122 degrees F. The penetrations were also qualified to required seismic loads and design basis accident temperatures and pressures.

To ensure that the original fatigue qualification testing remains valid for 60 years, the Fatigue Monitoring (A.3.1.1) program procedure will be enhanced to add these components for cycle-based monitoring. Therefore, the effects of fatigue on the intended functions of containment electrical penetrations will be managed by the Fatigue Monitoring (A.3.1.1) program through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

Therefore, it is concluded that the assumed number of transient occurrences used in the qualification testing is valid for 60 years of operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.6.11 ECCS Suction Strainer Bellows

CPS has installed large passive suction strainers on the ECCS and reactor core isolation cooling (RCIC) pump suction piping in the suppression pool. The replacement ECCS and RCIC system suction strainers were designed as Class 2 components in accordance with ASME Section III, Subsection NC and NF 1977 Edition with Winter 1977 Addenda. These new strainer assemblies included expansion bellows as the attached piping penetrates the suppression pool walls.

These bellows were specified to be qualified for a minimum of 12,600 occurrences of axial and lateral movements which bounded displacements corresponding to: thermal, seismic, SRV actuation, and LOCA transients.

The specified 12,600 transient occurrences are conservative when considering that CPS is projected for approximately 300 SRV actuations, seven high pressure core spray (HPCS) injections, one low pressure core spray (LPCS) injection, and 91 RCIC and RHR/RCIC injections in 60 years.

Therefore. the transients and transient occurrences that were specified for 40 years are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.7 Other Plant-Specific Time-Limited Aging Analyses

A.4.7.1 Clinton Power Station Cranes Cyclic Loading Analyses

The cranes listed below are within the scope of license renewal and their design meets the intent of Crane Manufacturers Association of America (CMAA) Specification 70, which includes considerations for frequency of operation and expected load sizes relative to their maximum load capacity. Based on these considerations, these cranes are designed for a given service class with an expected maximum number of design load occurrences over the life of the crane. The expected maximum number of design load occurrences over the life of each crane provides the basis for the TLAA evaluation.

Containment Polar Crane

The containment polar crane, which has a capacity of 100 tons, lifts heavy loads such as the: drywell head, reactor vessel head, steam separator, steam dryer, and shroud head, during refueling operations. This crane was designed consistent with the guidance in CMAA Specification 70 and is considered a “Class A” crane experiencing “irregular occasional use followed by long idle periods.” For this designation, the specification allows between 20,000 and 100,000 load cycles. Therefore, 20,000 load occurrences is a conservative threshold. Load occurrences that lift less than 50 percent of the crane design capacity result in minimal fatigue on the crane. The number of heavy lift occurrences projected for 60 years of operation is 1,040 occurrences which is approximately 5.2 percent of the 20,000 conservative threshold. Therefore, the fatigue analysis for the containment polar crane remains valid through the period of extended operation.

Fuel Building Crane

The main purpose of this crane, with a design capacity of 125 tons, is to manipulate the dry casks for the ISFSI facility and low level radwaste casks.

The crane meets the design requirements in CMAA Specification 70 and is considered a “Class A” crane experiencing “irregular occasional use followed by long idle periods.” For this designation, the specification allows between 20,000 and 100,000 load cycles. Therefore, 20,000 load occurrences is a conservative threshold. Load occurrences that lift less than 50 percent of the crane design capacity result in minimal fatigue on the crane. The number of heavy lift occurrences projected for 60 years of operation is 1,720 occurrences which is approximately 8.6 percent of the 20,000 conservative threshold. Therefore, the fatigue analysis for the fuel building crane remains valid for through the period of extended operation.

These analyses remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.7.2 Main Steam Line Flow Restrictor Erosion Analysis

USAR Section 5.4.4 describes the design functions of the main steam line flow restrictors. In the event of a main steam line break outside of primary containment the flow restrictors will limit main steam line flow to less than 135 percent of rated flow prior to main steam isolation valves (MSIVs) closure. This design function will limit reactor coolant loss, maintain core cooling, and limit the release of radiological materials to the environment to within allowable regulatory limits. USAR Section 5.4.4 documents that erosion of the stainless-steel flow restrictor elements is expected to be very slow, and even if a conservative corrosion rate of 0.004 inches per year is assumed over 40 years the resulting increase in choked flow rate would be no more that 5 percent. Since this erosion evaluation was based on 40 years of operation, erosion of the main steam line flow restrictors has been identified as a TLAA that requires evaluation for the period of extended operation.

The main steam line flow restrictors are welded into each main steam line between the main steam relief valves and the inboard MSIVs. The flow restrictor assemblies consist of stainless-steel venturi-type nozzles welded into the carbon steel main steam line piping. The main steam line break analysis indicates that the calculated integrated mass of coolant leaving the reactor through the main steam line, prior to MSIV closure, is 96,250 lbs., of which 53,750 lbs. is liquid and 42,500 lbs. is steam. The main steam line break analysis applied an acceptance threshold of 140,000 lbs. release, as provided in the Standard Review Plan Section 15.6.4 for a GESSAR-251 plant. A postulated erosion rate resulting in an increase of an additional 5 percent choked flow during the period of extended operation (for a total of 10 percent over 60 years) would increase choked flow to 105,875 lbs., which is less than the acceptance threshold. Therefore, the potential loss of material due to erosion, remains within previously analyzed limits and remains valid for the period of extended operation.

The analysis remains valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.4.7.3 Generic Letter 81-11 Crack Growth Analysis to Demonstrate Conformance to the Intent of NUREG-0619

NUREG-0619, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10,” was issued by the NRC per Generic Letter (GL) 81-11 in February 1981 because of observed cracking on the inside surfaces of feedwater nozzles in some BWR plants. NUREG-0619 did not identify CPS as a plant which experienced these conditions. The observed cracking in other BWRs was caused by thermal feedwater sparger sleeve leakage which caused rapid thermal cycling, on the order of a cycle per second, driven by convective instability due to the leakage. The cracks initiated by this rapid thermal cycling fatigue mechanism were shallow because the induced thermal stresses have steep gradients and shallow depth. These small internal cracks could potentially propagate to larger cracks by low cycle fatigue due to normal plant transients such as heatup, cooldown, and feedwater transients. These normal operational transients produce larger, through wall, stress cycles in the nozzle wall, and in time could drive the smaller internal cracks, already formed by the rapid thermal cycling fatigue mechanism, to continue to grow to depths for which vessel fracture mechanics analyses would predict further growth through the nozzle wall.

USAR Section 5.3.3.1.4.5 documents features implemented at CPS that comply with the NRC's recommendations in NUREG-0619 for the feedwater nozzles and spargers.

In addition, the control rod drive return line nozzles have been capped to eliminate the same concerns raised in NUREG-0619.

In May of 2002 GEH reevaluated the CPS specific fracture mechanics analysis nozzles to account for Extended Power Uprate (EPU) conditions. The purpose of the analysis was to justify the 10-year feedwater nozzle inspection frequency. The analysis evaluated the potential growth of a crack with an initial depth of 0.25 inches, over a 40-year plant life. The analysis assumed 260 startup and shutdown transient occurrences and 468 scram occurrences. The analysis concluded that the crack would not exceed the Section XI acceptance criteria, which complies with NUREG-0619 as amended by GL 81--11.

Since the plant-specific fracture mechanics analysis assumed thermal transient cycle occurrences over the 40-year life of the plant, this analysis is considered a TLAA and must be evaluated for the period of extended operation.

The number of startup and shutdown transient occurrences projected for 60 years are approximately 100 and the number of scram transient occurrences projected for 60 years are 89. These 60-year projections are significantly less than 2.5 times the number of occurrences assumed in the GEH evaluation. Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.7.4 Reactor Shield Wall Fluence

USAR Section 3.8.3.6 documents that there is no danger of radiation damage to the steel plates of the reactor shield wall, because damage occurs at a neutron fluence of approximately 10×10^{22} n/cm^2 (E>1MeV). This USAR section documents that the inside face of the shield wall will experience a neutron fluence of less than 5×10^{17}n/cm^2 (E>1MeV) in the 40-year life expectancy of the station. Since this USAR section documents a fluence value projected over the 40-year life of the plant it has been identified as a TLAA that requires evaluation for the period of extended operation.

Neutron fluence was projected for 60 years at the inside face of the reactor shield wall for 52 EFPY. The 52 EFPY fluence projection is significantly less (by an order of magnitude) than the 10×10^{22} n/cm^2 (E>1MeV) threshold. Therefore, the fluence limit that was assumed for 40 years is valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.7.5 Hydraulic Control Units

USAR Table 3.2-1 documents that components on the hydraulic control units (HCUs) are Safety Class 2. As such, associated design calculations and reports are not required to explicitly evaluate HCU components for fatigue in accordance with ASME Section III requirements for Class 1 Components. However, since pressure retaining components on the HCUs, excluding the accumulator and nitrogen tanks, were designed in accordance with ANSI B31.1.0 Code requirements or Section III requirements for Class 2 components, these components are qualified to 7,000 occurrences in which the components are heated and pressurized to the design temperature and pressure.

In addition, USAR Section 3.9.2.2.1.6.4, "Hydraulic Control Unit (HCU)," documents that the HCUs were analyzed for faulted conditions including the effects of seismic and hydrodynamic loads. This design adequacy was determined by qualification testing and analysis. The qualification testing included vibration testing equivalent to 1,800 SRV actuations, one OBE, and one SSE.

USAR Section 3.9.1.1.3, "Hydraulic Control Unit Transients," documents the transients and transient occurrences that were considered in the design of the HCUs. The total number of startup, shutdown, and scram transient occurrences documented on this table are significantly less than 7,000 thermal and pressure cycles, one OBE, and one SSE transient occurrences. The "shim/drive cycle" and "jog cycle" transients documented in USAR Section 3.9.1.1.3 result in a negligible contribution to fatigue. Therefore, the transients and transient occurrences documented in USAR Section 3.9.1.1.3 are bounded by ANSI B31.1.0 Code requirements, Section III requirements for Class 2 components, and qualification testing.

Since the design analysis and qualification testing assumed transient occurrences over 40 years, these have been identified as a TLAA that must be evaluated for the period of extended operation.

The number of 60-year projected transient occurrences for startup, shutdown, and scrams are significantly less than 7,000 occurrences. In addition, it is not credible that CPS will experience 1,800 SRV lift occurrences, one OBE, and one SSE transient occurrences in the 60-year life of the plant.

Therefore, the transients and transient occurrences that were assumed for 40 years are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.7.6 Fuel Pool Storage Rack Fatigue Analysis

The CPS spent fuel pool storage capacity was expanded in the mid-2000's and new fuel storage racks were installed. Although not required by ASME Section III, the new fuel storage racks were evaluated for fatigue consistent with ASME Section III, Subsection NB-3222.4. The fatigue evaluation assumed 20 OBEs and one SSE. The resulting fatigue evaluation calculated a CUF value of 0.104. Since the evaluation resulted in a calculated CUF value using transients and transient occurrences assumed over the 40-year life of the plant, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

CPS has not experienced any OBEs or SSEs and experiencing 20 OBEs and one SSE during the period of extended operation is not credible.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.7.7 Refueling Bulkhead Ring Flaw Evaluation

In 1982 and 1983 CPS evaluated a number of crack indications in the weldments of the refueling bulkhead ring plates. The crack indications were detected by ultrasonic examination and were evaluated using fracture mechanics methodology guidelines per ASME Section XI, Winter 1975 Edition. This methodology included a fracture mechanics stability evaluation which assessed the influences of fatigue-type loadings (cyclic in nature) on crack propagation. The evaluations concluded that based on the fracture toughness of the weldment materials, the cracks will not propagate as long as they experience 500 or fewer thermal transient occurrences. Since the evaluations concluded that the cracks would not propagate prior to 500 thermal transient occurrences assumed over the 40-year life of the plant, they have been identified as TLAAs that must be evaluated for the period of extended operation.

The assumption that these weldments will experience 500 transient occurrences from ambient to 350 degrees F, is extremely conservative when considering that CPS is projected to startup and shutdown approximately 100 times in 60 years and typical temperatures of the refueling bellow ring plate weldments during normal operations is approximately 235 degrees F.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original evaluations are valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.4.7.8 Fuel Pool Cleanup System, Flow Control Valves

The fuel pool cleanup system flow control valves regulate flow through the system demineralizers. These valves are ASME Class 3 components. However, an existing Current Licensing Basis (CLB) design analysis evaluated these valves for fatigue. The fatigue evaluation in the analysis assumed 87,600 operational loads, 14,790 SRV lifts, five OBEs, and one SSE. The resulting fatigue evaluation calculated various valve subcomponent CUF values, all of which were less than or equal to a value of 0.092.

Since the design analysis resulted in calculated CUF values using transients and transient occurrences assumed to occur over 40 years, and these valves are in scope for license renewal, this analysis has been identified as a TLAA that must be evaluated for the period of extended operation.

The 60-year transient projections for SRV lift, OBE, and SSE transient occurrences are significantly less than 14,790 SRV lifts, five OBEs, and one SSE.

The 87,600 operational load transient occurrences are based on an assumption that each valve is in service and operated six times a day for 40 years. Review of the system operating procedures shows that this assumption is extremely conservative. For example, 1FC004A and B are redundant valves and during normal operation only one valve controls flow while the other is placed out of service by shutting the valve. These valves are swapped in service quarterly. This factor by itself effectively reduces the original assumption of six occurrences each day for 40 years in half.

Therefore, the transients and transient occurrences that were assumed for 40 years in the original analysis is valid for 60 years in accordance with 10 CFR 54.21(c)(1)(i).

A.5 License Renewal Commitment List

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Existing program is credited.	Ongoing	Section A.2.1.1
2	Water Chemistry	Existing program is credited.	Ongoing	Section A.2.1.2
3	Reactor Head Closure Stud Bolting	Existing program is credited.	Ongoing	Section A.2.1.3
4	BWR Vessel ID Attachment Welds	Existing program is credited.	Ongoing	Section A.2.1.4
5	BWR Feedwater Nozzle	Existing program is credited.	Ongoing	Section A.2.1.5
6	BWR Control Rod Drive Return Line Nozzle	Existing program is credited.	Ongoing	Section A.2.1.6
7	BWR Stress Corrosion Cracking	Existing program is credited.	Ongoing	Section A.2.1.7
8	BWR Penetrations	Existing program is credited.	Ongoing	Section A.2.1.8
9	BWR Vessel Internals	Existing program is credited.	Ongoing	Section A.2.1.9
10	Flow-Accelerated Corrosion	Existing program is credited.	Ongoing	Section A.2.1.10
11	Bolting Integrity	Bolting Integrity is an existing program that will be enhanced to: 1. Perform shutdown service water (SX) pump inspection with specific instructions to inspect the condition of all closure bolting for evidence of cracking, loss of material, or loss of preload.	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.11
12	Open-Cycle Cooling Water System	Existing program is credited.	Ongoing	Section A.2.1.12

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
13	Closed Treated Water Systems	Closed Treated Water Systems is an existing program that will be enhanced to: 1. Perform condition monitoring, including periodic visual inspections and non-destructive examinations to verify the effectiveness of water chemistry control in mitigating aging effects. It will provide for the development of the criteria for identifying a representative sample of piping and components for visual and non-destructive inspections. A minimum of 25 inspections will be performed, with at least two samples of each material type, distributed evenly among the three different closed cooling water chemistries. Inspections will be scheduled at intervals not to exceed 10 years. As applicable, these inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, or other plant-specific inspection guidance by qualified personnel using procedures that are capable of detecting loss of material, wall thinning due to erosion, reduction of heat transfer, or cracking. If visual examination identifies adverse conditions, then additional examinations, including ultrasonic testing, will be conducted. Components inspected will be those with the highest likelihood of corrosion, reduction of heat transfer due to fouling, or cracking. The selection of susceptible locations will also consider plant specific operating experience wherein internal or even recurring internal corrosion has occurred in accordance with LR-ISG-2012-02, “Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation.” Locations identified as being susceptible to wall thinning due to erosion based upon plant specific operating experience will also be inspected.	Program will be enhanced no later than six months prior to the period of extended operation. Inspection schedule identified in the commitment.	Section A.2.1.13
14	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems is an existing program that will be enhanced to: 1. Provide additional guidance to include inspection of structural components, rails, and bolting for loss of material due to corrosion; rails for loss of material due to wear; and bolted connections for loss of preload.	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.14
15	Compressed Air Monitoring	Compressed Air Monitoring is an existing program that will be enhanced to: 1. Perform periodic inspections of the internal surfaces of system filters, compressors and internal coolers, and opportunistic inspections of other system components for signs of corrosion and corrosion products. Document unacceptable conditions in the corrective action program.	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.15

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
16	Fire Protection	Fire Protection is an existing program that will be enhanced to: 1. Enhance the fire barrier inspection program to perform periodic visual inspection of combustible liquid spill retaining curbs for signs of cracking, spalling, or loss of material that could impede the functionality of the curb. 2. Enhance halon and carbon dioxide tests to perform periodic visual piping inspections for identification of corrosion that may lead to loss of material on the external surfaces of the halon and low pressure carbon dioxide fire suppression systems. 3. Provide additional inspection guidance to identify aging effects as follows: a. Fire barrier walls, ceilings, and floors degradation from spalling and loss of material that may be caused by freeze-thaw, chemical attack, and reaction with aggregates. b. Elastomeric fire barrier material degradation such as increased hardness, shrinkage, and loss of strength. c. Grout fire barrier material degradation such as concrete cracking and spalling. d. Silicates and subliming compound fire barrier degradation such as change in material properties, cracking and delamination, loss of material, and separation.	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.16
17	Fire Water System	Fire Water System is an existing program that will be enhanced to: 1. Perform external visual inspections of in scope sprinkler piping and sprinklers for corrosion, loss of material, leaks, and proper sprinkler orientation. External visual inspections of the accessible in scope sprinklers and system piping will be performed annually. Guidance will direct the inspection for corrosion, loss of material, leaks, and proper sprinkler orientation. Corroded, leaking, or damaged sprinklers shall be replaced. 2. Perform external visual inspections of the in scope above ground fire main supply piping every two years to identify excessive corrosion, loss of material, leaks, and physical damage.	Program will be enhanced no later than six months prior to the period of extended operation. Inspection schedule identified in the commitment.	Section A.2.1.17

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		3. Perform internal visual inspections of sprinkler and deluge system piping to identify internal corrosion, foreign material, and obstructions to flow. Follow-up volumetric wall thickness examinations will be performed if internal visual inspections detect an unexpected level of degradation due to corrosion and corrosion product deposition. If organic material, foreign material, or internal flow blockage that could result in failure of system function is identified, then an obstruction investigation will be performed within the corrective action program. The obstruction investigation includes the removal of the material, an extent of condition determination, a review for increased inspection frequencies, follow-up examinations, and a flush consistent with the guidance provided in NFPA 25 Annex D.5, Flushing Procedures. The internal visual inspections will consist of the following: a. Wet pipe sprinkler systems - 50 percent of the wet pipe sprinkler systems in scope for license renewal will have internal visual inspections of piping by removing a hydraulically remote sprinkler, performed every five years, consistent with NFPA 25, 2011 Edition, Section 14.2. During the next five-year inspection period, the alternate systems previously not inspected shall be inspected. b. Preaction sprinkler systems - preaction sprinkler systems in scope for license renewal will have internal visual inspections of piping by removing a hydraulically remote nozzle, performed every five years, consistent with NFPA 25, 2011 Edition, Section 14.2. c. Deluge systems - perform an external visual inspection on a refueling outage frequency of the accessible piping and spray spargers inside the filter plenums to assure they are in their proper position and spray patterns are not obstructed. This will be in addition to the air flow tests that are currently performed to ensure there is no flow blockage. In addition, the program will be enhanced to include internal visual inspections of piping around the flanged spool piece during air flow testing.		

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		4. Perform a minimum flow duration of one minute after the hydrant valve is fully open during the fire hydrant inspection and flush test to remove all foreign material. 5. Utilize the corrective action program to determine an increased test frequency when established test criteria are not met or when significant degraded trends that could adversely affect system intended function are identified during the underground fire main flow test. When test results pass the established test criteria, the test frequency may be extended to a five-year frequency in accordance with NFPA 25 and allowed by NEIL and site-specific procedures. 6. Perform flow tests for hose stations at the hydraulically most limiting locations for each zone of the system on a five-year frequency to demonstrate the capability to provide the design pressure at the required flow. 7. Perform volumetric testing of the pipe when unexpected levels of degradation and irregularities are detected during visual inspection. 8. Improve restoration procedure guidance for the in scope preaction systems to ensure piping is completely drained after actuation. 9. Prior to 50 years of service and every 10 years after, remove a representative sample of sprinklers and submit for testing to a recognized laboratory.		
18	Aboveground Metallic Tanks	The Aboveground Metallic Tanks aging management program is a new condition monitoring program that manages aging effects associated with in-scope outdoor aboveground metallic tanks constructed on concrete and sand. Inspections required during the period of extended operation will be based on the results of the initial inspection occurring during the 10-year period prior to the period of extended operation.	Program will be implemented no later than six months prior to the period of extended operation. Initial inspection will be completed no later than six months prior to the period of extended operation.	Section A.2.1.18

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
19	Fuel Oil Chemistry	Fuel Oil Chemistry is an existing program that will be enhanced to: 1. Enhance diesel fuel sampling procedures to include adding biocides to stored fuel when periodic sampling identifies the presence of microbiological activity in a fuel storage tank. 2. Perform periodic (quarterly) sampling and analysis for the levels of microbiological organisms for diesel fire pump fuel oil day tanks 0DO01TA and 0DO01TB. This enhances the sampling and analysis scope of these tanks which currently checks for water, sediment content, and particulate concentration. 3. Perform periodic (quarterly) sampling and analysis for water and sediment content, particulate concentration, and the levels of microbiological organisms for diesel generator fuel oil day tanks 1DG01TA, 1DG01TB, and 1DG01TC. 4. Perform periodic (quarterly) sampling and analysis for the levels of microbiological organisms and for water and sediment content for diesel fuel oil storage tanks 1DO01TA, 1DO01TB, and 1DO01TC. This enhances the sampling and analysis scope of these tanks which currently checks for water and sediment content yearly and particulate concentration monthly. 5. Perform periodic internal inspections of diesel fire pump fuel oil day tanks 0DO01TA and 0DO01TB, diesel generator fuel oil day tanks 1DG01TA, 1DG01TB, and 1DG01TC, diesel fuel oil storage tanks 1DO01TA, 1DO01TB, and 1DO01TC at least once during the 10-year period prior to the period of extended operation, and at least once every 10 years during the period of extended operation. Each diesel fuel tank will be drained and cleaned, the internal surfaces visually inspected (if physically possible), and, if evidence of degradation is observed during inspections, or if visual inspection is not possible, these diesel fuel tanks will be volumetrically inspected. 6. Perform periodic (quarterly) trending of water and sediment content, particulate contamination concentrations, and the levels of microbiological organisms for stored fuel oil in all fuel oil tanks within the scope of the program.	Program will be enhanced no later than six months prior to the period of extended operation. Inspection schedule identified in the commitment. Inspections that are to be completed prior to the period of extended operation will be completed no later than six months prior to the period of extended operation.	Section A.2.1.19

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
20	Reactor Vessel Surveillance	Existing program is credited.	Ongoing	Section A.2.1.20
21	One-Time Inspection	One-Time Inspection is a new condition monitoring program that will be used to verify the system-wide effectiveness of the Water Chemistry (A.2.1.2) program, Fuel Oil Chemistry (A.2.1.19) program, and Lubricating Oil Analysis (A.2.1.26) program which are designed to prevent or minimize aging to the extent that it will not cause a loss of intended function during the period of extended operation.	Program will be implemented no later than six months prior to the period of extended operation. One-time inspections will be performed within the 10 years prior to the period of extended operation and no later than six months prior to the period of extended operation.	Section A.2.1.21
22	Selective Leaching	The Selective Leaching is a new condition monitoring program that will include one-time visual inspections of a representative sample of susceptible components to determine if loss of material due to selective leaching is occurring.	Program will be implemented no later than six months prior to the period of extended operation. One-time inspections will be performed within the five years prior to the period of extended operation and no later than six months prior to the period of extended operation.	Section A.2.1.22
23	One-time Inspection of ASME Code Class 1 Small-Bore Piping	One-time Inspection of ASME Code Class 1 Small-Bore Piping is a new condition monitoring program that will manage the aging effect of cracking in ASME Code Class 1 small-bore piping that is less than nominal pipe size (NPS) 4-inches, and greater than or equal to NPS 1-inch.	Program will be implemented no later than six months prior to the period of extended operation.	Section A.2.1.23

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
			One-time Inspections will be performed within the six years prior to the period of extended operation and no later than six months prior to the period of extended operation.	
24	External Surfaces Monitoring of Mechanical Components	External Surfaces Monitoring of Mechanical Components is a new condition monitoring program that directs visual inspections of external surfaces of components be performed during system inspections and walkdowns.	Program will be implemented no later than six months prior to the period of extended operation.	Section A.2.1.24
25	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Internal Surfaces in Miscellaneous Piping and Ducting Components is a new condition monitoring program that will consist of inspections of the internal surfaces of metallic, elastomeric, and polymeric components such as piping, piping components and piping elements, ducting components, tanks, heat exchanger components, and other components that are exposed to environments of closed cycle cooling water, condensation, diesel exhaust, treated water, raw water, and waste water.	Program will be implemented no later than six months prior to the period of extended operation.	Section A.2.1.25
26	Lubricating Oil Analysis	Lubricating Oil Analysis is an existing program that will be enhanced to: 1. Perform lubricating oil analysis of the old oil following periodic oil changes for the control room HVAC chilled water pumps A and B, and the fire protection jockey pump.	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.26
27	Monitoring of Neutron-Absorbing Materials Other than Boraflex	Monitoring of Neutron-Absorbing Materials Other than Boraflex is an existing program that will be enhanced to: 1. Perform NES rack (Boral material) inspections and testing per NEI 16-03-A guidance at a frequency not to exceed 10 years during the period of extended operation to assure proper neutron attenuation is maintained.	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.27

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
28	Buried and Underground Piping and Tanks	Buried and Underground Piping and Tanks is an existing program that will be enhanced to: 1. Perform extent of condition inspections as follows: When measured pipe wall thickness, projected to the end of the period of extended operation, does not meet the minimum pipe wall thickness requirements due to external environments, the number of inspections within the affected piping categories will be doubled or increased by five, whichever is smaller. If adverse indications are found in the expanded sample, an analysis will be conducted to determine the extent of condition and extent of cause. The size of the follow-up inspections will be determined based on the analysis. Timing of any additional inspections will be based on the severity of the identified degradation and the consequences of leakage or loss of function. Any additional inspections will be performed within the same 10-year inspection interval in which the original degradation was identified, or within four years after the end of the 10-year interval if the degradation was identified in the latter half of the 10-year interval. Expansion of sample size may be limited by the extent of piping subject to the observed degradation mechanism or if the piping system or portion of the system is replaced or otherwise mitigated within the same 10-year inspection interval in which the original degradation was identified or within four years after the end of the 10-year interval, if the degradation was identified in the latter half of the 10-year interval. 2. Perform annual system monitoring of the cathodic protection system to ensure effective protection of buried piping. 3. Perform direct visual inspections of buried piping in accordance with LR-ISG-2015-01, “Changes in Buried and Underground Piping and Tank Recommendations,” Table XI.M41-2, during each 10-year interval, beginning 10 years prior to the period of extended operation. The inspection quantities to be performed on buried piping are determined based on the as-found results of cathodic protection system availability and effectiveness as recommended in LR-ISG-2015-01, Table XI.M41-2. The length of piping sections for each inspection will be based on the guidance in LR-ISG-2015-01, section 4 paragraph c.	Program will be enhanced no later than six months prior to the period of extended operation. Inspection schedule identified in the commitment. Inspections that are to be completed prior to the period of extended operation will be completed no later than six months prior to the period of extended operation.	Section A.2.1.28

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
29	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE is an existing program that will be enhanced to: 1. Provide guidance for proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting consistent with EPRI NP-5067 and TR-104213. Also, provide guidance for storage, lubricant selection, and bolting and coating material selection consistent with Section 2 of Research Council on Structural Connections (RCSC) publication “Specification for Structural Joints Using High-Strength Bolts.”	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.29
30	ASME Section XI, Subsection IWL	Existing program is credited.	Ongoing	Section A.2.1.30
31	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF is an existing program that will be enhanced to: 1. Add the MC component support examinations for the fuel transfer tube and for containment penetrations spanning from the containment wall to the drywell wall for: reactor water cleanup, feedwater, residual heat removal, reactor core isolation cooling, and main steam drain to the scope of the program. 2. Provide guidance, regarding the selection of supports to be examined in subsequent inspection intervals, when a support that is acceptable for continued service as defined in IWF-3400, is restored in accordance with the corrective action program. The enhanced guidance will ensure that the sample is increased to include another support, of the same type and function, that has not been restored to correct the observed condition.	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.31
32	10 CFR Part 50, Appendix J	Existing program is credited.	Ongoing	Section A.2.1.32
33	Masonry Walls	Existing program is credited.	Ongoing	Section A.2.1.33
34	Structures Monitoring	Structures Monitoring is an existing program that will be enhanced to: 1. Include the following structures: a. Yard Structures	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.34

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
		2. Include the following components and commodities: a. Pipe whip restraints and jet impingement shields b. Missile barriers c. Panels, racks, cabinets, and other enclosures d. Sliding surfaces e. Sump and pool liners f. Outdoor electrical cable trays and conduits g. Doors h. Penetration seals and sleeves i. Tube Tracks j. Gaskets and seals k. Hatches, plugs, handholes, and manholes l. Metal components (decking, vent stack, and miscellaneous steel) 3. Require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R with respect to knowledge of inservice inspection of concrete and visual acuity requirements. 4. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of license renewal. 5. Monitor concrete for increase in porosity and permeability. 6. Include inspection of accessible sliding surfaces for indication of significant loss of material due to wear or corrosion and that debris or dirt will not restrict or prevent sliding. 7. Monitor elastomeric vibration isolators and structural sealants for indication of loss of material, cracking or hardening resulting in loss of sealing or function. 8. Clarify that loose bolts and nuts and cracked high strength bolts, not subject to stress corrosion cracking, are not acceptable unless accepted by engineering evaluations.		

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
35	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants is an existing program that will be enhanced to: 1. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of license renewal. 2. Require inspection of accessible in-scope portions of the cooling lake and screen house immediately following the occurrence of significant natural phenomena, which includes hurricanes, tornadoes, large floods, and intense local rainfalls. 3. Document current practices in implementing procedure for inspection of the cooling lake baffle dike.	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.2.1.35
36	Protective Coating Monitoring and Maintenance	Existing program is credited.	Ongoing	Section A.2.1.36
37	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements is a new program that will be used to manage the effects of reduced insulation resistance of the insulation material for non-EQ cables and connections. Accessible cables and connections located in adverse localized environments will be visually inspected at least once every 10 years for cable jacket and connection insulation surface anomalies, such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination that could indicate incipient conductor insulation aging degradation from temperature, radiation, or moisture.	Program will be implemented no later than six months prior to the period of extended operation. The first inspections will be completed no later than six months prior to the period of extended operation. Inspection schedule identified in the commitment.	Section A.2.1.37

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
38	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits is a new program that will be used to manage the effects of reduced insulation resistance of non-EQ cable and connection insulation instrumentation circuits with sensitive, high-voltage, low-level current signals. The program applies to in scope portions of the Neutron Monitoring and Reactor Protection System and the Process Radiation Monitoring System. Calibration and cable tests will be performed and results will be assessed for reduced insulation resistance no later than six months prior to the period of extended operation. Cable test frequency will be based on engineering evaluation and will be performed at least once every 10 years. Calibration and assessment of results will be performed at least once every 10 years during the period of extended operation.	Program will be implemented no later than six months prior to the period of extended operation. The first review of results will be completed no later than six months prior to the period of extended operation. Calibration, test and assessment schedule identified in the commitment.	Section A.2.1.38
39	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements is a new program that will be used to manage the effects of reduced insulation resistance of non-EQ, in scope, inaccessible power cables. Cables will be tested using one or more proven tests for detecting reduced insulation resistance of the cable's insulation system due to wetting or submergence. Cable testing will be performed at least once every six years. More frequent testing may occur based on test results and operating experience. Cable vaults associated with the cables included in this program will be inspected for water collection with subsequent corrective actions (e.g., water removal), as necessary. The frequency of inspections for accumulated water will be established at least six months prior to the period of extended operation and adjusted based on plant specific operating experience with cable wetting or submergence, including water accumulation over time and event driven occurrences such as heavy rain or flooding. Operation of dewatering devices will be verified prior to any known or predicted heavy rain or flooding event. During the period of extended operation, the inspections will occur periodically based on water accumulation over time. The cable vaults will be inspected at least annually.	Program will be implemented no later than six months prior to the period of extended operation. Tests and inspections that are required to be performed prior to the period of extended operation will be completed no later than six months prior to the period of extended operation. Test and inspection schedule identified in the commitment.	Section A.2.1.39

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
40	Metal Enclosed Bus	Existing program is credited.	Ongoing Inspections and resistance measurements that are required to be performed prior to the period of extended operation will be completed no later than six months prior to the period of extended operation.	Section A.2.1.40
41	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 is a new program that will implement a technical evaluation of one-time testing of a representative sample (20 percent with a maximum sample size of 25) of non-EQ electrical cable connections to ensure that either increased resistance of connection is not occurring or that the existing preventive maintenance program is effective such that a periodic inspection program is not required.	Program will be implemented no later than six months prior to the period of extended operation. Testing and evaluation of results will be completed no later than six months prior to the period of extended operation.	Section A.2.1.41
42	Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program is a new program that manages degradation of internal coatings/linings exposed to closed-cycle cooling water, raw water, waste water, condensation or fuel oil where loss of coating or lining integrity could impact the component's or downstream component's current licensing basis intended function(s).	Program will be implemented no later than six months prior to the period of extended operation. Baseline inspections that are required to be completed in the 10-year period prior to the period of extended operation will be completed no later than six months prior to the period of extended operation.	Section A.2.1.42

NO.	PROGRAM OR TOPIC	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE
43	Fatigue Monitoring	Fatigue Monitoring is an existing program that will be enhanced to: 1. Address the cumulative fatigue damage effects of the reactor coolant environment on component life by evaluating the impact of the reactor coolant environment on critical components identified in NUREG/CR-6260. Additional plant-specific component locations in the reactor coolant pressure boundary will be evaluated if they are more limiting than those considered in NUREG/CR-6260. SI:FatiguePro^{TM} software will be updated to include the calculation and tracking of Environmentally Assisted Fatigue, in accordance with NUREG/CR-6909, Revision 1. 2. The jet pump riser brace, the core spray piping of the reactor vessel internals, and the containment electrical penetrations will be added to the Fatigue Monitoring program procedure. The components will be monitored through cycle-based tracking and compared to the applicable design transient occurrence limits.	Program will be enhanced no later than six months prior to the period of extended operation.	Section A.3.1.1
44	Environmental Qualification (EQ) of Electric Components	Existing program is credited.	Ongoing	Section A.3.1.2
45	Operating Experience	Existing program is credited.	Ongoing	Section A.1.6

APPENDIX B AGING MANAGEMENT PROGRAMS TABLE OF CONTENTS

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 (AMR) results provided in Sections 3.1 through 3.6 of this application.

In general, there are four types of AMPs:

- Prevention programs preclude aging effects from occurring.
- Mitigation programs slow the effects of aging.
- Condition monitoring programs inspect/examine for the presence and extent of aging.
- Performance monitoring programs test the ability of a structure or component to perform its intended function.

More than one type of AMP may be implemented for a component to ensure that aging effects are managed.

Part of the demonstration that the effects of aging are adequately managed is to evaluate credited programs and activities against certain required attributes. Each of the AMPs described in this section has ten elements which are consistent with the attributes described in Appendix A.1, “Aging Management Review – Generic (Branch Technical Position RLSB-1)” and in Table A.1-1 “Elements of an Aging Management Program for License Renewal” of NUREG-1800. The 10-element detail is not provided when the program is deemed to be consistent with the assumptions made in NUREG-1801. The 10-element detail is only provided when the program is plant specific.

Credit has been taken for existing plant programs whenever possible. As such, all programs and activities associated with a system, structure, component, or commodity grouping were considered. Existing programs and activities that apply to systems, structures, components, or commodity groupings were reviewed to determine whether they include the necessary actions to manage the effects of aging.

Existing plant programs were often based on a regulatory commitment or requirement, rather than aging management. Many of these existing programs included the required license renewal 10-element attributes and have been demonstrated to adequately manage the identified aging effects. If an existing program did not adequately manage an identified aging effect, the program was enhanced as necessary. Occasionally, the creation of a new program was necessary.

B.1.2 Method of Discussion

For those AMPs that are consistent with the assumptions made in Sections X and XI of NUREG-1801, or are consistent with exceptions or enhancements, each program discussion is presented in the following format:

- A Program Description abstract of the overall program form and function is provided.
- A NUREG-1801 Consistency statement is made about the program.
- Exceptions to the NUREG-1801 program are outlined and a justification for the exceptions is provided.
- Enhancements or additions to the NUREG-1801 program are provided. A proposed schedule for completion is discussed.
- Operating Experience (OE) information specific to the program is provided.
- A Conclusion section provides a statement of reasonable assurance that the program is effective, or will be effective when implemented, if new or enhanced.

The plant specific AMPs are described in terms of the 10 program elements in NUREG-1800, Section A.1.2.3 “Aging Management Program Elements.”

B.1.3 Quality Assurance Program and Administrative Controls

The Quality Assurance Program implements the requirements of 10 CFR 50, Appendix B, and is consistent with the summary in Appendix A.2, “Quality Assurance For Aging Management Programs (Branch Technical Position IQMB-1)” of NUREG-1800. The Quality Assurance Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to the safety-related and nonsafety-related systems, structures, components (SSCs), and commodity groups that are subject to AMR. Generically, the three elements are applicable as follows:

Corrective Actions:

A single corrective action program is applied regardless of the safety classification of the system, structure, component, or commodity group. Corrective actions are implemented through the initiation of an Issue Report (IR) in accordance with the Corrective Action Program in place to meet the requirements of 10 CFR 50, Appendix B. The Corrective Action Program requires the initiation of an IR for actual or potential problems, including unexpected plant equipment degradation, damage, failure, malfunction, or loss of function. Site documents that implement aging management programs for license renewal direct that an IR be prepared in accordance with those procedures whenever non-conforming conditions are found (i.e., the acceptance criteria are not met).

Equipment deficiencies are corrected through the Work Control Process in accordance with plant procedures. The Corrective Action Program specifies that for equipment deficiencies an IR be initiated for condition identification, assignment of significance level and investigation class, investigation, corrective action determination, investigation report review and approval, action tracking, and trend analysis.

The Corrective Action Program implements the requirements of NO-AA-10, the Constellation Energy Generation Company Quality Assurance Topical Report

(QATR), Chapter 16, "Corrective Action." Specifically, measures are established to assure that conditions adverse to quality, such as failures, malfunctions, adverse trends, deficiencies, deviations, defective material, design errors, equipment, and nonconformances, are identified and corrected. In cases of significant conditions adverse to quality, the cause of the condition is determined and documented, resolution determined and documented, and corrective action taken and documented to preclude recurrence. In addition, the cause of the significant condition adverse to quality and the corrective action taken are reported to appropriate levels of management.

Confirmation Process:

The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting and precluding repetition of adverse conditions. The Corrective Action Program includes provisions for timely evaluation of adverse conditions and implementation of corrective actions required, including root cause determinations and prevention of recurrence where appropriate (e.g., significant conditions adverse to quality). The Corrective Action Program provides for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions are taken. The Corrective Action Program also includes monitoring for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions results in the initiation of an IR. The aging management programs required for license renewal would also result in identification of related unsatisfactory conditions due to ineffective corrective action.

Since the same 10 CFR 50, Appendix B corrective actions and confirmation process is applied for nonconforming safety-related and nonsafety-related systems, structures, and components subject to AMR for license renewal, the Corrective Action Program is consistent with the NUREG-1801 elements.

Administrative Controls:

The document control process applies to all generated documents, procedures, and instructions regardless of the safety classification of the associated system, structure, component, or commodity group. Document control processes are implemented in accordance with the requirements of 10 CFR 50, Appendix B, "Quality Assurance Requirements for Nuclear Power Plants and Fuel Reprocessing Plants." Implementation is further defined in NO-AA-10, the Constellation Energy Generation Company Quality Assurance Topical Report (QATR), Chapter 6, "Document Control."

Administrative controls procedures provide information on procedures, instructions and other forms of administrative control documents, as well as guidance on classifying these documents into the proper document type and as-building frequency. Revisions will be made to procedures and instructions that implement or administer aging management program requirements for the purposes of managing the associated aging effects for the period of extended operation.

B.1.4 Operating Experience

Operating experience from internal (also referred to as in-house operating experience) and external (also referred to as industry) sources is captured and systematically reviewed on an ongoing basis in accordance with the Quality Assurance program, which meets the requirements of 10 CFR Appendix B, and the Operating Experience (OPEX) program, which meets the requirements of NUREG- 0737, “Clarification of TMI Action Plan Requirements,” Item I.C.5, “Procedures for Feedback of Operating Experience to Plant Staff.” The OPEX program interfaces with and relies on active participation in the Institute of Nuclear Power Operations (INPO) Operating Experience program, as endorsed by the NRC.

Operating experience is used at CPS to enhance plant programs, prevent repeat events, and prevent events that have occurred at other plants. As part of the Constellation fleet (formerly Exelon), CPS personnel receive operating experience (internal and external to Constellation) daily. The OPEX process includes screening, evaluation, and acting on operating experience documents and information to prevent or mitigate the consequences of similar events. The OPEX process includes review of operating experience from external and internal sources. External operating experience may include such things as INPO documents (e.g., Significant Operating Experience Reports, INPO Event Reports, etc.), NRC documents (e.g., GALL Revisions, Information Notices, Interim Staff Guidance, Regulatory Issue Summaries, etc.), and other documents (e.g., EPRI Category 1 and 2 Technical Reports, 10 CFR Part 21 Notifications, etc.), as well as relevant research and development information. Internal operating experience may include event investigations, trending reports, and lessons learned from in-house events as captured in program health reports, program assessments, and in the 10 CFR Part 50, Appendix B corrective action program.

The Constellation fleet OPEX program that is implemented at CPS is an ongoing program that conforms to the recommendations of LR-ISG-2011-05, “Ongoing Review of Operating Experience.” The systematic review of plant-specific and industry operating experience concerning aging management and age-related degradation ensures that the license renewal aging management programs (AMPs) are, and will continue to be, effective in managing the aging effects for which they are credited. The AMPs are either enhanced or new AMPs developed, as appropriate, when it is determined through the evaluation of operating experience that the effects of aging may not be adequately managed. AMPs are informed by the review of operating experience on an ongoing basis, regardless of the AMP’s implementation schedule. The Constellation process directs the reporting of plant-specific operating experience on age-related degradation and aging management to the industry through the INPO OPEX program.

Each AMP summary in this appendix contains a discussion of operating experience relevant to the program. This information was obtained through the review of internal operating experience captured by the corrective action program, program assessments, program health reports, and through the review of external operating experience. Additionally, operating experience was obtained through interviews with strategic engineers, program engineers, and other plant personnel. New programs utilized internal and external operating experience, as applicable, and the AMP summaries in this appendix discuss the operating experience and associated corrective actions as they relate to implementation of the new program. The operating experience in each AMP summary identifies past corrective actions that have resulted in program enhancements and provides objective evidence that the effects of aging have been, and will continue to be, adequately managed so that the intended functions of the structures and components within the scope of each program will be maintained during the period of extended operation.

B.1.5 NUREG-1801 Chapter XI Aging Management Programs

The following AMPs are described in the sections listed in this appendix. The programs are either generic in nature as discussed in NUREG-1801, Section XI, or are plant-specific. NUREG-1801 Chapter XI programs are listed in Section B.2.1. Plant-specific programs are listed in Section B.2.2. All generic programs are fully consistent with or are, with some exceptions, consistent with programs discussed in NUREG-1801. Programs are identified as either existing or new.

1. ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (Section B.2.1.1) [Existing]
2. Water Chemistry (Section B.2.1.2) [Existing]
3. Reactor Head Closure Stud Bolting (Section B.2.1.3) [Existing]
4. BWR Vessel ID Attachment Welds (Section B.2.1.4) [Existing]
5. BWR Feedwater Nozzle (Section B.2.1.5) [Existing]
6. BWR Control Rod Drive Return Line Nozzle (Section B.2.1.6) [Existing]
7. BWR Stress Corrosion Cracking (Section B.2.1.7) [Existing]
8. BWR Penetrations (Section B.2.1.8) [Existing]
9. BWR Vessel Internals (Section B.2.1.9) [Existing]
10. Flow-Accelerated Corrosion (Section B.2.1.10) [Existing]
11. Bolting Integrity (Section B.2.1.11) [Existing - Requires Enhancement]
12. Open-Cycle Cooling Water System (Section B.2.1.12) [Existing]
13. Closed Treated Water Systems (Section B.2.1.13) [Existing - Requires Enhancement]
14. Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (Section B.2.1.14) [Existing – Requires Enhancement]

15. Compressed Air Monitoring (Section B.2.1.15) [Existing – Requires Enhancement]
16. Fire Protection (Section B.2.1.16) [Existing – Requires Enhancement]
17. Fire Water System (Section B.2.1.17) [Existing – Requires Enhancement]
18. Aboveground Metallic Tanks (Section B.2.1.18) [New]
19. Fuel Oil Chemistry (Section B.2.1.19) [Existing – Requires Enhancement]
20. Reactor Vessel Surveillance (Section B.2.1.20) [Existing]
21. One-Time Inspection (Section B.2.1.21) [New]
22. Selective Leaching (Section B.2.1.22) [New]
23. One-time Inspection of ASME Code Class 1 Small-Bore Piping (Section B.2.1.23) [New]
24. External Surfaces Monitoring of Mechanical Components (Section B.2.1.24) [New]
25. Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.1.25) [New]
26. Lubricating Oil Analysis (Section B.2.1.26) [Existing – Requires Enhancement]
27. Monitoring of Neutron-Absorbing Materials Other Than Boraflex (Section B.2.1.27) [Existing – Requires Enhancement]
28. Buried and Underground Piping and Tanks (Section B.2.1.28) [Existing – Requires Enhancement]
29. ASME Section XI, Subsection IWE (Section B.2.1.29) [Existing – Requires Enhancement]
30. ASME Section XI, Subsection IWL (Section B.2.1.30) [Existing]
31. ASME Section XI, Subsection IWF (Section B.2.1.31) [Existing – Requires Enhancement]
32. 10 CFR Part 50, Appendix J (Section B.2.1.32) [Existing]
33. Masonry Walls (Section B.2.1.33) [Existing]
34. Structures Monitoring (Section B.2.1.34) [Existing – Requires Enhancement]
35. RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (Section B.2.1.35) [Existing – Requires Enhancement]

36. Protective Coating Monitoring and Maintenance Program (Section B.2.1.36) [Existing]

37. Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B.2.1.37) [New]

38. Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (Section B.2.1.38) [New]

39. Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B.2.1.39) [New]

40. Metal Enclosed Bus (Section B.2.1.40) [Existing]

41. Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B.2.1.41) [New]

42. Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (Section B.2.1.42) [New]

B.1.6 NUREG-1801 Chapter X Aging Management Programs

The following NUREG-1801 Chapter X AMPs are described in Section B.3 of this appendix as indicated. Programs are identified as either existing or new.

1. Fatigue Monitoring (Section B.3.1.1) [Existing - Requires Enhancement]

2. Environmental Qualification (EQ) of Electric Components (Section B.3.1.2) [Existing]

B.2 Aging Management Programs

B.2.0 NUREG-1801 Aging Management Program Correlation

The correlation between the NUREG-1801 (Generic Aging Lessons Learned (GALL)) programs and the CPS Aging Management Programs (AMPs) is shown below.

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	CPS PROGRAM
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (Section B.2.1.1)
XI.M2	Water Chemistry	Water Chemistry (Section B.2.1.2)

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	CPS PROGRAM
XI.M3	Reactor Head Closure Stud Bolting	Reactor Head Closure Stud Bolting (Section B.2.1.3)
XI.M4	BWR Vessel ID Attachment Welds	BWR Vessel ID Attachment Welds (Section B.2.1.4)
XI.M5	BWR Feedwater Nozzle	BWR Feedwater Nozzle (Section B.2.1.5)
XI.M6	BWR Control Rod Drive Return Line Nozzle	BWR Control Rod Drive Return Line Nozzle (Section B.2.1.6)
XI.M7	BWR Stress Corrosion Cracking	BWR Stress Corrosion Cracking (Section B.2.1.7)
XI.M8	BWR Penetrations	BWR Penetrations (Section B.2.1.8)
XI.M9	BWR Vessel Internals	BWR Vessel Internals (Section B.2.1.9)
XI.M10	Boric Acid Corrosion	Not Applicable (CPS Unit 1 is a BWR)
XI.M11B	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only)	Not Applicable (CPS Unit 1 is a BWR)
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	This program is not used or credited. CPS Unit 1 do not have any components that require the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) program for aging management.
XI.M16A	PWR Vessel Internals	Not Applicable (CPS Unit 1 is a BWR)
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion (Section B.2.1.10)
XI.M18	Bolting Integrity	Bolting Integrity (Section B.2.1.11)
XI.M19	Steam Generators	Not Applicable (CPS Unit 1 is a BWR)

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	CPS PROGRAM
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System (Section B.2.1.12)
XI.M21A	Closed Treated Water Systems	Closed Treated Water Systems (Section B.2.1.13)
XI.M22	Boraflex Monitoring	This program is not credited for aging management. Boraflex is not a credited neutron-absorbing material in the CPS spent fuel pool racks.
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (Section B.2.1.14)
XI.M24	Compressed Air Monitoring	Compressed Air Monitoring (Section B.2.1.15)
XI.M25	BWR Reactor Water Cleanup System	Not applicable. The RWCU piping downstream of the second isolation valve is carbon steel and not subject to the scope of the program.
XI.M26	Fire Protection	Fire Protection (Section B.2.1.16)
XI.M27	Fire Water System	Fire Water System (Section B.2.1.17)
XI.M29	Aboveground Metallic Tanks	Aboveground Metallic Tanks (Section B.2.1.18)
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry (Section B.2.1.19)
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance (Section B.2.1.20)
XI.M32	One-Time Inspection	One-Time Inspection (Section B.2.1.21)
XI.M33	Selective Leaching	Selective Leaching (Section B.2.1.22)
XI.M35	One-time Inspection of ASME Code Class 1 Small Bore-Piping	One-time Inspection of ASME Code Class 1 Small-Bore Piping (Section B.2.1.23)

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	CPS PROGRAM
XI.M36	External Surfaces Monitoring of Mechanical Components	External Surfaces Monitoring of Mechanical Components (Section B.2.1.24)
XI.M37	Flux Thimble Tube Inspection	Not Applicable (CPS Unit 1 is a BWR)
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.1.25)
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis (Section B.2.1.26)
XI.M40	Monitoring of Neutron-Absorbing Materials Other Than Boraflex	Monitoring of Neutron-Absorbing Materials Other Than Boraflex (Section B.2.1.27)
XI.M41	Buried and Underground Piping and Tanks	Buried and Underground Piping and Tanks (Section B.2.1.28)
XI.M42	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (Section B.2.1.42)
XI.S1	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE (Section B.2.1.29)
XI.S2	ASME Section XI, Subsection IWL	ASME Section XI, Subsection IWL (Section B.2.1.30)
XI.S3	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF (Section B.2.1.31)
XI.S4	10 CFR 50, Appendix J	10 CFR Part 50, Appendix J (Section B.2.1.32)
XI.S5	Masonry Walls	Masonry Walls (Section B.2.1.33)
XI.S6	Structures Monitoring	Structures Monitoring (Section B.2.1.34)
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (Section B.2.1.35)

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	CPS PROGRAM
XI.S8	Protective Coating Monitoring and Maintenance Program	Protective Coating Monitoring and Maintenance Program (Section B.2.1.36)
XI.E1	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B.2.1.37)
XI.E2	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (Section B.2.1.38)
XI.E3	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B.2.1.39)
XI.E4	Metal Enclosed Bus	Metal Enclosed Bus (Section B.2.1.40)
XI.E5	Fuse Holders	Not used. CPS Fuse Holders (not part of active equipment): Metallic Clamps in scope for CPS license renewal. Further Evaluation determined no aging management program is required.
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 (Section B.2.1.41)
X.M1	Fatigue Monitoring	Fatigue Monitoring (Section B.3.1.1)
X.S1	Concrete Containment Tendon Prestress	Not applicable. (CPS Unit 1 is a Mark III containment design)
X.E1	Environmental Qualification (EQ) of Electrical Components	Environmental Qualification (EQ) of Electrical Components (Section B.3.1.2)

B.2.1 NUREG-1801 Chapter XI Aging Management Programs

This section provides summaries of the NUREG-1801 Chapter XI programs credited for managing the effects of aging.

B.2.1.1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

Program Description

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management program is an existing condition monitoring program which manages the aging effects of cracking, loss of material, and loss of fracture toughness in Class 1, 2, and 3 piping and components exposed to reactor coolant environment. This program includes periodic visual, surface, and volumetric examination of Class 1, 2, and 3 pressure-retaining components. The program implements the Inservice Inspection (ISI) requirements of ASME Code, Section XI, for Class 1, 2, and 3 pressure-retaining components, their integral attachments, and pressure-retaining bolting. Examination of these components is in accordance with Subsections IWB, IWC, and IWD respectively.

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program implements the required component examination schedule per ASME Section XI, Subsection IWB-2400, IWC-2400, or IWD-2400 and examination categories, applicable components, examination methods, acceptance standards, and frequency of examination as specified in Tables IWB-2500-1, IWC-2500-1, and IWD-2500-1. The examination methods specified in Tables IWB-2500-1, IWC-2500-1, and IWD-2500-1 are based on approved industry standards for detecting degradation of components. The program requires that indications and relevant conditions detected during examinations be evaluated in accordance with ASME Section XI, Articles IWB-3000 for Class 1, IWC-3000 for Class 2, and IWD-3000 for Class 3. The program directs that repair and replacement activities be performed in conformance with Subsection IWA-4000.

For the current fourth ten-year inspection interval, the ISI program was developed in accordance with the requirements of ASME Code, Section XI, 2013 Edition with no Addenda, and Risk Informed Inservice Inspection (RI-ISI) alternative requirements to Examination Categories B-F, B-J, C-F-1 and C-F-2 for Class 1 and Class 2 piping welds as approved by relief request. Examination locations, and the number of locations requiring examination, are based on the guidelines provided in EPRI TR-112657, “Revised Risk Informed Inservice Inspection Evaluation Procedure,” Revision B-A, and ASME Code Case N-578-1. Clinton has also applied risk informed inspection methodology for Break Exclusion Region (BER) piping per EPRI TR-1006937, Revision 0-A, “Extension of the EPRI Risk-Informed Inservice Inspection (RI-ISI) Methodology to Break Exclusion Region (BER) Programs.” Any deviation from ASME Code, Section XI requirements must be approved by the NRC per a relief request. Repair or replacement of components covered by the program is performed in accordance with Subsection IWA-4000 of ASME Code.

In accordance with 10 CFR 50.55a(g)(4)(ii), the ISI program is updated each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified 18 months before the start of the inspection interval. Any deviation from ASME Code, Section XI requirements must be approved by the NRC per a relief request.

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program includes all component inspection activity required by ASME Code, Section XI, Subsections IWB, IWC, and IWD. In addition to ASME Section XI ISI Program the following license renewal aging management programs include augmented requirements:

- Reactor Head Closure Stud Bolting (B.2.1.3)
- BWR Vessel ID Attachment Welds (B.2.1.4)
- BWR Feedwater Nozzle (B.2.1.5)
- BWR Control Rod Drive Return Line Nozzle (B.2.1.6)
- BWR Stress Corrosion Cracking (B.2.1.7)
- BWR Penetrations (B.2.1.8)
- BWR Vessel Internals (B.2.1.9)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.1.23)

NUREG-1801 Consistency

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management program is consistent with the ten elements of aging management program XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. A periodic focused area self-assessment (FASA) was conducted in March 2018 for the ISI program that utilizes ASME XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management program to identify flaws and degradation in Class 1, 2, and 3 components and their integral attachments in light-water cooled power plants. The purpose of the FASA was to determine if the ISI program is being properly executed to provide high equipment reliability, ensure reactor safety, and comply with regulatory requirements. Some of the assessment objectives included:

    - Ensure that the NDE examination data reports provide ASME Code acceptable results.

    - Ensure that ASME Section XI Repairs and Replacements are being completed in accordance with the Code.

    - Ensure any relevant information gained from recent NRC ISI Inspections (since the previous inspection) is assessed for applicability to Clinton. Also, ensure that ISI related problems have been entered in the corrective action program.

    The program identified one deficiency. The deficiency identified was administrative where an IR was issued for a missing work order (WO) task that was lost and could not be found. The self-assessment resulted in the identification of seven performance improvement recommendations which would ensure any relevant information gained from recent NRC ISI Inspections is assessed for applicability to Clinton. Also, ensure that ISI related issues are entered in the corrective action program.

    This example provides objective evidence that the site ISI program undergoes self-assessment to ensure program performance meets standards. When issues are discovered, they are addressed by corrective actions that support continuous improvement.

2. During the refueling outage in 2017, per the ISI program, an ultrasonic examination was performed on Reactor Recirc Dissimilar (DM) Weld NIB-W-1 to meet the augmented program requirements of the IGSCC program. During the examination, a planar indication (embedded discontinuity) was discovered in the weld. The planar indication was considered a subsurface indication. This indication was not connected to the ID surface. Per the ISI program, this weld was evaluated per IWB-3514. This calculation showed that this indication exceeded the allowable limits specified in Section XI, therefore, was unacceptable. This weld was examined in accordance with the requirements of ASME Section XI, Appendix VIII. A flaw analysis was performed and determined the flaw to be acceptable prior to completion of the outage. As required by IWB-2420 ultrasonic examinations were performed in 2019 and 2021. The results were compared with the previous outage results, which remained essentially unchanged.

This example provides objective evidence on how the current ISI program is being effectively implemented to manage aging effects. Continued implementation of the ASME Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD aging management program will assure that the piping welds within the scope of the program will continue to perform their intended functions during the period of extended operation.

3. The Clinton fall 2019 refueling outage marked the completion of the third ten-year interval. At the conclusion of this refueling outage, all mandatory examinations required by IWA-2400 were successfully completed.

   This example provides objective evidence on how the current ISI program is being effectively implemented to perform examinations to identify any indication of flaws. Continued implementation of the ASME Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD aging management program will assure that the piping welds within the scope of the program will continue to perform their intended functions during the period of extended operation.

The operating experience relative to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting the identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management program provides reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.2 Water Chemistry

Program Description

The Water Chemistry aging management program is an existing mitigative program whose activities mitigate the loss of material, cracking, and reduction of heat transfer in components exposed to a treated water environment. The program includes periodic monitoring of the treated water and control of known detrimental contaminants such as chlorides, dissolved oxygen, and sulfate concentrations below the levels known to result in loss of material or cracking in accordance with BWRVIP-190, Revision 1, EPRI-3002002623.

The Water Chemistry program consists of monitoring and controlling the chemical environments of those systems that are exposed to reactor coolant, steam, condensate and feedwater, control rod drive water, demineralized water, suppression pool water, and spent fuel pool water, such that aging effects of system components are minimized in accordance with BWRVIP-190, Revision 1.

Major component types include the reactor vessel, reactor internals, piping, piping elements and piping components, heat exchangers, fuel storage racks, submerged structural bolting and tanks. Reactor coolant, condensate, control rod drive water, feedwater, demineralized water storage tank water, suppression pool water, and spent fuel pool water are classified as treated water for aging management.

The Water Chemistry program is also credited for mitigating loss of material for components exposed to a sodium pentaborate environment. The Standby Liquid Control (SLC) system contains a demineralized water and sodium pentaborate solution controlled in accordance with plant procedures and Technical Specifications. The managing of loss of material on SLC system components subject to the sodium pentaborate environment includes monitoring and control of SLC storage tank makeup water chemistry. The makeup water, from the clean demineralized water storage tank, is monitored in lieu of the sodium pentaborate solution in the storage tank, because the sodium pentaborate would mask the chemistry parameters monitored. The chloride content of the sodium pentaborate powder is certified by the manufacturer to have low levels of chloride contamination.

Industry experience has shown that water chemistry programs may not be effective in low flow or stagnant flow areas of plant systems. The Water Chemistry program does not provide for detection of aging effects. However, components located in such areas will receive a one-time inspection prior to the period of extended operation. These inspections will be performed as part of the One-Time Inspection (B.2.1.21) aging management program. This program includes provisions specified by NUREG-1801 for the verification of effective chemistry control and aging management. Site quality assurance procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B.

NUREG-1801 Consistency

The Water Chemistry aging management program is consistent with the ten elements of aging management program XI.M2, "Water Chemistry," specified in NUREG-1801 with the following exception:

Exceptions to NUREG-1801

The NUREG-1801 AMP XI.M2, "Water Chemistry," relies on the monitoring and control of reactor water chemistry based on the guidelines contained in the Boiling Water Reactor Vessel and Internals Project (BWRVIP)-190, Revision 0 (Electric Power Research Institute [EPRI] 1016579) that was issued in 2008. BWRVIP-190, Revision 1 (EPRI 3002002623) was issued in 2014. The Clinton Water Chemistry aging management program is based on BWRVIP-190, Revision 1 as revised in 2014. Program Element Affected: Scope of Program (Element 1)

Justification for Exception:

EPRI periodically revises the water chemistry guidelines as new information becomes available based on industry operating experience, best practices, and research. In all instances, the chemistry parameter guidelines for Action Levels in BWRVIP-190, Revision 1 are the same or more restrictive than in BWRVIP-190, Revision 0. In no instances are the chemistry parameter guidelines relaxed. Therefore, the Clinton Water Chemistry aging management program, as defined by BWRVIP-190, Revision 1, will continue to be effective in mitigating the loss of material due to corrosion, cracking due to stress corrosion cracking and related mechanisms, and reduction of heat transfer due to fouling in components exposed to a treated water environment.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Water Chemistry program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In March of 2019, a self-assessment was conducted to identify strengths, recommendations, and gaps in the fleet's Condensate Chemistry Program. The assessment found five recommendations for improvement, and Clinton has implemented them as follows:

a. After reviewing plant operating experience, Clinton saw the need to provide additional site-specific guidance on deep bed post-ultraviolet sampling and analysis during outage startup while condensate polisher (CP) beds are feeding the reactor. Clinton issued site specific procedures for CP rinse criteria and RCS sampling based on previously performed fleet benchmarking and guidance from corporate Chemistry.

b. Clinton reviewed and improved its condensate and feedwater chemistry sampling procedures. Clinton's procedure for condensate sampling lists feedwater sample point (FWSP) as the only alternate sample point (for conductivity and dissolved oxygen) for condensate influent (CISP) and effluent (CESP) sample points. After review, Clinton found that CESP would require daily compensatory sampling if no alternate sample point was available. Clinton also discovered the CRD sampling point (CRDSP) could be an alternate sampling point for CISP and CESP if the point was verified to be fed from polished condensate, and that the FWSP may not be representative of condensate since the addition of On-Line NobleChemTM (OLNC). Chemistry verified that CRDSP was fed from polished condensate and could serve as an alternate sample point. Clinton revised its feedwater and condensate water chemistry procedures to replace FWSP as an alternate sample point with CRDSP. This gives a better representation of condensate water chemistry during compensatory sampling while keeping redundancy in the sampling procedures.

c. Clinton scheduled the replacement of the three condensate and feedwater dissolved oxygen (DO) analyzers and sensors with upgraded versions. All three were scheduled to be replaced concurrently, but this would leave no continuous sampling for the condensate and feedwater system, and would impact Clinton's chemistry performance indicator, so the work was canceled. The analyzers and sensors were evaluated to see if they could be replaced individually, but due to logistical constraints, all three had to be replaced concurrently. Clinton re-scheduled and completed the analyzer and sensor upgrade.

d. Clinton found its condenser leakage procedure data and decision points could be updated to include ions recommended by BWRVIP-190 interim guidance. Clinton updated its cycled water procedure to include updated cation and anion collection requirements.

e. Clinton revised their monthly circulating water (CW) analysis to include calcium and sodium. Calcium and sodium were to be added to the Clinton condenser tube leak rate calculation form. The cations were added to Clinton's NuclQ program to allow the calculation form to remain unchanged, while still collecting the new data.

These actions show Clinton proactively monitors, updates, and implements changes to its water chemistry program based on plant specific and industry experience.

2. Reactor water sulfates exceeded industry standard limits of 3.0 ppb. Between May and August of 2022, sulfates exceeded Action Level 1 (AL-1) concentrations (> 5.0 ppb) on four occasions. Continued operation at higher than nominal sulfate levels increases the possibility of intergranular stress corrosion cracking (IGSCC), limiting the usable life of the reactor vessel and challenging long-term continued operation of the plant. Increased sulfate levels were caused by degraded tank liner materials mixing in with the CP resin beds resulting in foreign rubber material leaching sulfates when exposed to operating temperatures. Degrading resin transfer components allowed the contaminated resin to be crushed to fines and bypass the resin traps into reactor feedwater. The sulfates from the bypassed resin entered the feedwater (FW) process stream and concentrated in the reactor pressure vessel (RPV). The issue was entered into the Clinton corrective action program and evaluated to determine the cause and necessary corrective actions to prevent re-occurrence. Corrective actions were implemented to correct and eliminate the root cause of the high reactor water sulfate levels, including design changes to eliminate the rubber liner vulnerability, replacing the resin in all nine condensate polishers, developing and implementing a preventative maintenance (PM) strategy to prevent resin intrusion, implementing a case study to address any organization weaknesses, revising the templates for tanks, including guidance for inspections of tanks with lining materials and specifying the inspection frequency and methodology for lining material.

   This example provides objective evidence that the water chemistry program is effective in monitoring important system parameters and identifying the cause of adverse indications.

3. On September 28, 2017, Clinton was bringing reactor power up from a down power. When power was at 71 percent, Operations personnel noticed dissolved oxygen for CRD and FW started to increase. DO steadily increased with increasing power, CRD was reading 89 ppb and feedwater was reading 76 ppb with spikes up to and beyond 80 ppb. The DO trends did not exceed action level (AL) limits or goal values, but DO readings should have been steady at about 65 ppb for CRD and about 58 ppb for FW. Operations personnel also noted that as power increased and decreased so did CRD and FW oxygen levels. FW and CRD DO exhibited similar behaviors to what was observed during a previous down power on September 10, 2017. CRD and FW DO levels decreased and remained steady at their expected levels when Clinton reached full power. Chemistry investigated the recuring DO trend to determine the root cause of the fluctuations. The fluctuations were attributed to work on a main steam drain tank (MSDT) valve. Instrument Maintenance Department maintenance was being performed on the valve when the increase in DO was observed and the DO trends returned to normal values after restoring the MSDT valve.

This example demonstrates how Clinton reviews operating experience to identify and correct adverse trends before harm is done to the plant, even if action or alarm levels are not reached.

The operating experience relative to the Water Chemistry aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of material due to corrosion, cracking due to stress corrosion cracking (SCC) and related mechanisms, and reduction of heat transfer due to fouling. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the Water Chemistry aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing Water Chemistry program provides reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.3 Reactor Head Closure Stud Bolting

Program Description

The Reactor Head Closure Stud Bolting aging management program is an existing condition monitoring and preventive program that includes ASME Code, Section XI examinations of reactor head closure studs and associated nuts, and washers to manage cracking and loss of material. The Reactor Head Closure Stud Bolting program manages these aging effects in an air-indoor, uncontrolled environment. The program is based on the examination requirements specified in the ASME Code, Section XI, Subsection IWB, Table IWB-2500-1, and preventive measures recommended within NRC Regulatory Guide (RG) 1.65, "Materials and Inspection for Reactor Vessel Closure Studs" and NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants."

The Reactor Head Closure Stud Bolting program implements ASME Code, Section XI inspection requirements through the ISI Program plan. The current ISI Program plan for the fourth 10-year inspection interval (July 1, 2020 through June 30, 2030) is based on the 2013 ASME Code, Section XI. The future 120-month inspection intervals will incorporate the requirements specified in the version of the ASME Code referenced in 10 CFR 50.55a 18 months before the start of the inspection interval.

The program uses visual and volumetric examinations in accordance with the general requirements of Section XI, Subsection IWA-2000 to monitor for cracking, loss of material, and coolant leakage. The extent and schedule for examining and testing the reactor head closure stud bolting components is as specified in Table IWB-2500-1 for B-G-1 components, "Pressure Retaining Bolting Greater than 2 Inches in Diameter." The studs receive a volumetric examination, and the surfaces of nuts, washers, and bushings are inspected using VT-1 examination. The reactor vessel flange connection is within the ASME Code Class 1 pressure-retaining boundary that receives a visual VT-2 examination per Examination Category B-P during the system leakage test that is performed during each refueling outage.

Indications and relevant degraded conditions detected during examinations are evaluated in accordance with ASME Code, Section XI, Subsection IWB-3100 for Class 1 components by comparing ISI results with the acceptance standards of IWB-3400 and IWB-3500. Flaw indications or relevant degraded conditions are evaluated in accordance with IWB-3515 or IWB-3517 as indicated in Table IWB-2500-1 and Table 3410-1 of ASME Code, Section XI.

The reactor head closure studs, nuts, and washers are manufactured from SA-540 Grade B24 alloy steel at the 130 ksi specified minimum yield strengths level. The studs are all fabricated with material that has measured yield strength below 150 ksi. The Reactor Head Closure Stud Bolting program includes the other preventive measures described in RG 1.65, Revision 1 and NUREG-1339 to prevent cracking. The reactor head closure studs, nuts, and washers were coated with an acceptable phosphate surface treatment to inhibit corrosion. In addition, a stable lubricant that does not contain molybdenum disulfide is applied to the studs, nuts, and washers prior to reactor vessel head re-installation.

NUREG-1801 Consistency

The Reactor Head Closure Stud Bolting aging management program is consistent with the ten elements of aging management program XI.M3, "Reactor Head Closure Stud Bolting," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Reactor Head Closure Stud Bolting program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

Clinton has found no recordable indications for examination category B-G-1 and B-P reactor vessel items during the third ISI interval:

1. The 2020 Clinton Power Station, Unit 1, Post Outage 90-Day Inservice Inspection (ISI) Summary Report, documents the inspection of 22 studs, 22 nuts, and 22 washers as acceptable. No issues identified.

2. The 2017 Clinton Power Station, Unit 1, Post Outage 90-Day Inservice Inspection (ISI) Summary Report, documents the inspection of 22 studs, 22 nuts, and 22 washers as acceptable. No issues identified.

3. The 2012 Clinton Power Station, Unit 1, Post Outage 90-Day Inservice Inspection (ISI) Summary Report, documents the inspection of 22 studs, 22 nuts, 22 washers, and 22 flange threads as acceptable. No issues identified. Subsequent inspection of the threads for this interval was not required per approved Relief Request I4R-07 (Accession No. ML17170A013).

The operating experience relative to the Reactor Head Closure Stud Bolting program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including cracking and loss of material. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the Reactor Head Closure Stud Bolting program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing Reactor Head Closure Stud Bolting program provides reasonable assurance that the cracking and loss of material aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.4 BWR Vessel ID Attachment Welds

Program Description

The BWR Vessel ID Attachment Welds aging management program is an existing condition monitoring program that manages the aging effect of cracking of reactor vessel internal attachment welds exposed to reactor coolant through management of water chemistry and augmented inservice inspections. The program substitutes the inspection and evaluation recommendations within BWRVIP-48-A for the requirements within ASME Code, Section XI, Table IWB-2500-1, Examination Category B-N-2. For some attachment welds, the BWRVIP-48-A inspection requirements are more stringent than the requirements of ASME Code, Section XI, Table IWB-2500-1, Examination Category B-N-2. Therefore, all the reactor vessel interior attachment welds within the scope of BWRVIP-48-A are inspected in accordance with the frequency and methods described in BWRVIP-48-A. The potential for stress corrosion cracking (SCC) or intergranular stress corrosion cracking (IGSCC) is mitigated by maintaining high water purity as described in the Water Chemistry (B.2.1.2) program. The program is implemented through station procedures that provide for mitigation of cracking of reactor vessel internal components through management of reactor water chemistry and condition monitoring through in-vessel examinations of the reactor vessel internal attachment welds. The scope of the program includes the steam dryer support and hold down bracket attachment welds, guide rod bracket attachment welds, feedwater sparger bracket attachment welds, jet pump riser brace attachment welds, core spray piping bracket attachment welds, and surveillance sample holder bracket attachment welds.

Indications are evaluated consistent with ASME Code, Section XI, Subsections IWB-3500 and IWB-3600 and the additional guidance provided in BWRVIP-48-A. If indications are found, the scope of the inspection is expanded in accordance with the guidance provided in BWRVIP-48-A. Repair and replacement procedures comply with the requirements of ASME Code, Section XI. If the flaw exceeds the requirements of IWB-3600, repair and replacement is performed consistent with the requirements of ASME Code, Section XI, Subsection IWA-4000.

NUREG-1801 Consistency

The BWR Vessel ID Attachment Welds aging management program is consistent with the ten elements of aging management program XI.M4, "BWR Vessel ID Attachment Welds," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the BWR Vessel ID Attachment Welds program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. During the May 2017 outage, all eight feedwater end bracket welded attachment to RPV welds (FWEBA-1 thru FWEBA-8) were examined by EVT-1 method. No indications were identified.

   Guide rod upper attachments at both 0 degrees and 180 degrees locations were examined by VT-1 method. No indications were identified.

   All three surveillance specimen bracket welded attachments to RPV at 3 degrees, 177 degrees, and 183 degrees at both upper and lower locations were examined by both VT-1 and VT-3 method. No discernable changes were noted at 3 degrees and 177 degrees locations.

   Two new indications were reported on the lower left and right outer tack welds of the 183 degrees bracket. Clinton entered the issue into the corrective action program and evaluated for continued operation in an engineering evaluation.

   Steam dryer support bracket at 326 degrees and RPV attachment weld were examined by EVT-1 method. A gouge indication noted in the previous refueling outage in 2015 showed no apparent change in the 2017 outage inspection. Clinton entered the issue into the corrective action program and evaluated for continued operation in an engineering evaluation.

   Also, during the 2017 outage, jet pump riser brace welded attachments on JP F, G, H, J, and K were examined by EVT-1 method. No indications were identified.

   Additionally, during the May 2017 outage, riser brace welds including RB-2a, b, c, and d were examined by EVT-1 method for JP11 thru JP20. No indications were identified.

   Jet pump sensing lines for JP01 thru JP10 were examined by VT-1 method. No indications were identified.

   Jet pump fouling for JP05, JP10, JP11, and JP19 was visually inspected for Jet pump system monitoring purposes using VT-1 method. No indications were identified.

These examples illustrate how condition monitoring in accordance with BWRVIP inspection guidelines is used to manage the effects of cracking in the vessel internal attachment welds. The inspections have identified indications or have reinspected previously identified indications of the reactor vessel attachment welds. These indications have been assessed per BWRVIP and ASME Code guidance.

The operating experience relative to the BWR Vessel ID Attachment Welds aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including cracking. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the BWR Vessel ID Attachment Welds aging management program will effectively identify degradation prior to failure or loss of intended function during the period of extended operation.

Conclusion

The existing BWR Vessel ID Attachment Welds program provides reasonable assurance that the cracking aging effect is adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.5 BWR Feedwater Nozzle

Program Description

The BWR Feedwater Nozzle aging management program is an existing condition monitoring program that manages the aging effect of cracking in the reactor vessel feedwater nozzles. The feedwater nozzles are exposed to a reactor coolant environment. The program manages examination of feedwater nozzles in accordance with the requirements of ASME Code, Section XI, Subsection IWB, Table IWB-2500-1 and recommendations provided within BWR Owners Group Licensing Topical Report, GE-NE-523-A71-0594-A, Revision 1, “Alternate BWR Feedwater Nozzle Inspection Requirements,” May 2000. The program is implemented through the plant inservice inspection (ISI) program and specifies periodic ultrasonic test (UT) examination of critical regions of the feedwater nozzles. The inspections are performed at intervals not exceeding 10 years.

In response to NUREG-0619, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10,” design features are included in the feedwater nozzles to mitigate or prevent thermally induced fatigue cracking. The design does not include cladding on the nozzle inner surface and uses a triple thermal sleeve feedwater nozzle design.

The Clinton feedwater system meets the intent of the NUREG-0619 recommendations but includes some system arrangements which are not directly applicable to the recommendations. The feedwater system includes two turbine driven feedpumps rated at 50 percent capacity paired with air operated bypass valves to be used when feed flow is minimal. An additional motor driven feedpump rated at 33 percent capacity is paired with a hydraulic operated discharge angle valve to provide feedwater flow control for initial start-up conditions. These design attributes minimize the magnitude and frequency of temperature fluctuations and thermal fatigue experienced by the feedwater nozzles. The feedwater nozzles were installed as described above per NUREG-0619 recommendations. As the Clinton feedwater system design is not directly applicable to the six criteria established in NEDE-21821-A, “BWR Feedwater Nozzle/Sparger Final Report,” for additional assurance, a fracture mechanics analysis was performed, and it supports a ten-year inspection interval. Clinton does not have a thermal sleeve bypass leakage detection system and the inspection interval has not been modified based on leakage data.

Flaw indications are evaluated in accordance with ASME Code, Section XI, IWB-3100, using the acceptance standards of IWB-3512 as directed by Table IWB-2500-1. Inspection results that do not satisfy the acceptance standards of IWB-3500 are documented in accordance with the corrective action program.

NUREG-1801 Consistency

The BWR Feedwater Nozzle aging management program is consistent with the ten elements of aging management program XI.M5, "BWR Feedwater Nozzle," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the BWR Feedwater Nozzle program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. A review of the industry operating experience, as summarized in NUREG-0619, revealed that several BWR plants experienced cracking in the feedwater nozzles and connecting feedwater spargers. Plants designed before 1980 were particularly susceptible and the design and pre-operational modifications made by Clinton mitigated the potential effects.

   NUREG-0619 provided several recommendations for inspections and design improvements. Important design features that were recommended by NUREG-0619 and incorporated into the nozzle design include eliminating the cladding on the inner surface of the nozzles and the use of low leakage triple thermal sleeves. The design of the Clinton feedwater system includes two turbine driven feedpumps rated at 50 percent capacity paired with air operated bypass valves to be used when feed flow is minimal. An additional motor driven feedpump rated at 33 percent capacity is paired with a hydraulic operated discharge angle valve to provide feedwater flow control during initial start-up conditions. These design attributes minimize the magnitude and frequency of temperature fluctuations and thermal fatigue experienced by the feedwater nozzles. These design attributes minimize the magnitude and frequency of temperature fluctuations and resulting thermal fatigue, and thereby minimize the likelihood of cracking in the feedwater nozzles.

   This example provides objective evidence that industry experience and the guidance within approved industry standards have been incorporated into the plant design to minimize thermal fatigue and the probability of cracking in the feedwater nozzles. The lack of significant indications of cracking in the feedwater nozzles can be attributed in part to implementing the design recommendations defined in NUREG-0619.

2. BWR Owners Group (BWROG) Licensing Topical Report, GE-NE-523-A71-0594-A, Revision 1, provides standard industry guidelines for feedwater nozzle inspection scope, methods and frequency. These recommendations have been incorporated into the existing augmented ISI program and the BWR Feedwater Nozzle program for inspection of the feedwater nozzles.

   This example provides objective evidence that industry experience and the guidance within approved industry standards has been incorporated into the existing augmented ISI program for feedwater nozzle inspection to effectively manage the material condition of the feedwater nozzles relative to cracking. Use of industry standard inspection methods provides assurance that inspections will provide timely indication of detection of cracking if it occurs.

3. The feedwater nozzles have been inspected for cracking as part of the existing augmented ISI program in accordance with the guidance in GE-NE-523-A71-0594-A, Revision 1. Each nozzle has been inspected at least two times using UT techniques recommended within GE-NE-523-A71-0594-A, Revision 1.

   Inspections of each feedwater nozzle performed in 2019, 2021, and 2023 continue to find no unacceptable flaw indications. For any previously identified indications which have been evaluated to be acceptable, there are no significant changes. While indications were observed during previous inspections, such as base material plate segregates and welding indications, they have been evaluated as acceptable.

The operating experience relative to the BWR Feedwater Nozzle aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including cracking. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the BWR Feedwater Nozzle aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing BWR Feedwater Nozzle program provides reasonable assurance that the cracking aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.6 BWR Control Rod Drive Return Line (CRDRL) Nozzle

Program Description

The BWR Control Rod Drive Return Line (CRDRL) Nozzle aging management program is an existing condition monitoring program that manages the aging effect of cracking in the CRDRL reactor pressure vessel nozzle. The CRDRL nozzle is exposed to a reactor coolant environment. Prior to initial plant operation modifications were implemented per the recommendations of NUREG-0619, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10,” to mitigate cracking due to thermal fatigue. The CRDRL nozzle was capped and the CRD return line to the reactor vessel was removed and not rerouted as part of the original plant design. Therefore, augmented inspections required by NUREG-0619 and NRC Generic Letter 80-95, “Generic Activity A-10,” are not applicable. The program performs inservice inspections (ISI) to monitor the effects of cracking of the CRDRL nozzle.

The CRDRL nozzle assembly weld examinations are performed at the frequency specified in ASME Code, Section XI, Subsection IWB, Table IWB 2500 1. ISI examinations include volumetric ultrasonic test (UT) examination of the CRDRL nozzle including the nozzle-to-vessel weld and nozzle blend radius. The nozzle, cap and associated welds are included in the visual inspection (VT-2) during the reactor pressure test performed each refueling outage.

Procedures require use of ASME Code, Section XI for evaluating flaw indications. Flaw indications are evaluated in accordance with the guidelines of ASME Section XI, IWB-3100, using the acceptance standards of IWB-3500 as directed by IWB-3410 and Table IWB-2500-1. Flaws that do not meet the acceptance criteria in IWB-3500 may be evaluated analytically per IWB-3600 criteria. Repair and replacement would be performed consistent with the requirements of ASME Section XI, IWA-4000.

NUREG-1801 Consistency

The BWR Control Rod Drive Return Line Nozzle aging management program is consistent with the ten elements of aging management program XI.M6, "BWR Control Rod Drive Return Line Nozzle,” specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the BWR Control Rod Drive Return Line Nozzle aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. A review of the operating experience reveals that cracking in the CRDRL nozzle has occurred in several BWR plants as described in NUREG 0619 and NRC Information Notice (IN) 2004-08, "Reactor Coolant Pressure Boundary Leakage Attributable to Propagation of Cracking in Reactor Vessel Nozzle Welds." Plants placed in operation before 1980 were especially susceptible. In response to the concerns described in NUREG-0619, Clinton eliminated the use of a CRD return line to the reactor vessel and capped the CRDRL nozzle with a carbon steel cap prior to initial reactor power operations. This design improvement significantly reduces thermal fatigue and the likelihood of IGSCC cracking in the nozzle. The CRDRL nozzle has been examined since initial startup in 1987 (over 35 years) with no flaws detected.

   This example illustrates how industry operating experience and best practices relative to plant and nozzle design was implemented to minimize the probability of cracking in this nozzle. The lack of indications identified during subsequent examinations can be attributed in part to implementing the design recommendations defined in NUREG-0619.

2. Inspections of the CRDRL nozzle blend radius and nozzle-to-vessel weld have been periodically conducted in accordance with ASME Section XI, Table IWB-2500-1. The most recent examinations of the nozzle blend radius and nozzle-to-vessel weld were performed in 2019. The nozzle to-safe-end and safe-end-to-cap welds were inspected in 1993 by using liquid penetrant examination. There were no indications of cracking discovered during any of these inspections. In addition, as part of the ISI program, a reactor vessel pressure test and visual inspection (VT-2) is performed during each refueling outage to verify no unacceptable reactor coolant pressure boundary leakage. The inspection includes the CRDRL nozzle, safe-end, and cap associated welds. These pressure tests have not identified any leakage from the CRDRL nozzle.

   This example illustrates how best industry practices relative to UT examination methods and an effective ISI program are being implemented to verify that cracking is not initiating at this nozzle or associated components, that their material condition is good and is being effectively managed.

The operating experience relative to the BWR Control Rod Drive Return Line Nozzle aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including cracking due to thermal fatigue. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the BWR Control Rod Drive Return Line Nozzle aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing BWR Control Rod Drive Return Line Nozzle aging management program provides reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.7 BWR Stress Corrosion Cracking

Program Description

The BWR Stress Corrosion Cracking aging management program is an existing condition monitoring and mitigative program that manages intergranular stress corrosion cracking (IGSCC) in relevant piping and piping welds made of stainless steel and nickel-based alloy in reactor coolant and treated water environments. The program implements the program delineated in NUREG-0313, Revision 2, “Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping,” and NRC Generic Letter (GL) 88-01, “NRC Position on IGSSC in BWR Austenitic Stainless Steel Piping,” and its Supplement 1. The program includes preventive measures to mitigate IGSCC, and inspection and flaw evaluation to monitor IGSCC and its effects.

Reactor coolant water chemistry is controlled and monitored in accordance with EPRI guidelines to maintain high water purity and reduce susceptibility to SCC or IGSCC as described in the Water Chemistry (B.2.1.2) program. Solution heat treatment and the use of IGSCC resistant material has been utilized at Clinton during the construction phases to reduce the susceptibility of IGSCC. Hydrogen water chemistry, Noble Metals Chemical Addition (NMCA), and On-Line NobleChemTM (OLNC) have been implemented to further reduce susceptibility of the piping systems exposed to reactor coolant to SCC or IGSCC.

The program addresses the management of crack initiation and growth due to IGSCC in the piping, welds, and components exposed to a reactor coolant environment through the implementation of the ISI program in accordance with ASME Code, Section XI. Inservice inspections, performed as augmented requirements of the Section XI ISI program ensure that aging effects are identified and repaired before the loss of intended function of the components. The current inspection frequency for welds classified as Category B through G per NRC GL 88-01 is per the recommendations provided in the staff-approved BWRVIP-75-A, “BWR Vessel and Internals Project Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules,” for normal water chemistry conditions. Welds classified as Category A are subsumed into the Risk-Informed Inservice Inspection (RI-ISI) program in accordance with staff-approved EPRI Topical Report TR-112657, Revision B-A, Final Report, “Revised Risk-Informed Inservice Inspection Evaluation Procedure,” December 1999.

Inspection and flaw evaluation is conducted in accordance with the ISI program plan. When a flaw exceeds the applicable acceptance standards of IWB-3500 an analytical evaluation may be performed in accordance with IWB-3600 to determine its acceptability for continued service without repair or replacement. Evaluations are performed by using the applicable crack growth rate provided by ASME Code, Section XI. BWRVIP-14-A, BWRVIP-59-A, BWRVIP-60-A, and BWRVIP-62 also provide approved guidelines that can be used for evaluating crack growth in stainless, nickel alloys, and low-alloy steels. In accordance with NRC GL 88-01, an evaluation performed to accept an IGSCC flaw must be approved by the NRC before resumption of operation.

The guidance for replacement, weld overlay repair, and stress improvement is provided in several industry documents, including NRC GL 88-01; NUREG 0313, Revision 2; ASME Code, Section XI, Subsection IWA-4000; and approved code cases.

NUREG-1801 Consistency

The BWR Stress Corrosion Cracking aging management program is consistent with the ten elements of aging management program XI.M7, "BWR Stress Corrosion Cracking," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the BWR Stress Corrosion Cracking program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. NRC GL 88-01 and NUREG-0313, Revision 2 provided methods for reducing or eliminating IGSCC. Since Clinton is a newer plant, it was able to benefit from the research emerging in the industry relating to IGSCC in austenitic stainless steel. Except for the reactor recirculation piping, all wrought austenitic stainless steel in contact with reactor coolant is 316L stainless steel and, therefore, has a less than 0.035 percent carbon content. The reactor recirculation piping is fabricated primarily of 304 stainless steel. Certain portions have been replaced with “nuclear grade” type 316 which contains less than 0.035 percent carbon. The remainder has had “corrosion-resistant clad” applied in the vicinity of field welds so that no heat-affected type 304 will be in contact with the coolant. These piping assemblies were all solution annealed after all shop welding and application of the cladding.

   Hydrogen water chemistry, NMCA, and OLNC have been implemented to further reduce susceptibility of the piping systems exposed to reactor coolant SCC or IGSCC.

This example illustrates how industry operating experience was effectively used to use IGSCC resistant material and utilize hydrogen water chemistry, NMCA, and OLNC to minimize the probability of stress corrosion cracking at Clinton. The lack of cracking indications in welds within the scope of the program can be attributed in part to the chemistry mitigation and use of solution heat treatment and corrosion resistant cladding during the construction of Clinton.

2. During the 2017 refueling outage, per the ISI Program, an ultrasonic examination was performed on reactor recirc dissimilar metal (DM) weld NIB-W-1 to meet the augmented program requirements of the IGSCC program. During the examination, a planar indication (embedded discontinuity) was discovered in the weld. The planar indication is considered a subsurface indication. This indication is not connected to the ID surface. The indication is 0.80 inches long and has a through wall dimension of 0.45 inches. The top of the indication is located 0.45 inches from the outside surface. Per the ISI Program this weld was evaluated per IWB-3514. Based on the thickness of the pipe wall (excluding cladding) of 1.54 inches an aspect ratio calculation was performed. This calculation showed that this indication exceeded the allowable limits specified in Section XI, therefore, was unacceptable. This weld was examined with General Electric-Hitachi procedures, which have been demonstrated in accordance with the requirements of ASME Section XI, Appendix VIII. This item was evaluated as acceptable prior to completion of the 2017 outage. As required by IWB-2420 an ultrasonic examination was performed in 2019 and 2021. The results were compared with the previous outage results, which remained essentially unchanged.

   This example illustrates how the industry guidelines per NRC GL 88-01, NUREG-0313, Revision 2, and BWRVIP-75-A continue to be effectively applied to monitor the condition of welds within the scope of the program.

The operating experience relative to the BWR Stress Corrosion Cracking aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including cracking. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the BWR Stress Corrosion Cracking aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing BWR Stress Corrosion Cracking aging management program as described in the Clinton ISI Program plan for augmented examinations provides reasonable assurance that the cracking aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.8 BWR Penetrations

Program Description

The BWR Penetrations aging management program is an existing condition monitoring program that manages the aging effect of cracking of the reactor vessel instrumentation penetrations, control rod drive (CRD) housing, incore-monitoring housing (ICMH) penetrations, and standby liquid control (SLC)/Core Plate differential pressure (dP) penetrations exposed to a reactor coolant environment. The program is implemented through station procedures that provide for mitigation of cracking through management of water chemistry and condition monitoring through examinations of reactor vessel penetration welds.

In addition to the requirements of ASME Code, Section XI, Subsection IWB, the BWR Penetrations program incorporates the inspection and evaluation recommendations of BWRVIP-49-A, "Instrument Penetration Inspection and Flaw Evaluation Guidelines," BWRVIP-47-A, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines," and the water chemistry recommendations described in the Water Chemistry (B.2.1.2) program. Per BWRVIP-27-A, “BWR Standby Liquid Control System/Core Plate dP Inspection and Flaw Evaluation Guidelines,” as the Clinton standby liquid control system injects boron through the high pressure core spray sparger, the inspection and evaluation guidelines are not applicable.

The BWR Penetrations program monitors the effects of SCC and IGSCC by requiring inspections of the instrumentation penetrations, CRD housing and ICMH penetrations as part of the ISI program per the requirements of ASME Code, Section XI, Table IWB-2500-1, a relief request to use BWRVIP guidance in lieu of ASME Code requirements, and BWRVIP reports. A description of the ISI program, including the controlling edition of ASME Code, Section XI, is provided in the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1) program. During each refueling outage, a visual inspection (VT-2) of the instrumentation penetrations, CRD housing and ICMH penetrations, and SLC/Core Plate dP penetration is performed during the reactor coolant pressure boundary system leakage test.

When the reactor vessel lower plenum area is accessible during normal reactor refueling activities, visual inspections are performed to the extent practical per BWRVIP-47-A guidelines. Inspections are performed in accordance with the guidelines of BWRVIP-49-A for the instrument penetrations, BWRVIP-47-A for the CRD housing and ICMH housing penetrations. The guidelines of BWRVIP-49-A and BWRVIP-47-A provide information on the type of penetrations, evaluate their susceptibility and consequences of failure, and define the inspection strategy to assure safe operation.

NUREG-1801 Consistency

The BWR Penetrations aging management program is consistent with the ten elements of aging management program XI.M8, "BWR Penetrations,” specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following example of operating experience provide objective evidence that the BWR Penetrations program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. Prior to BWRVIP-47 implementation, no direct inspection or repair history was available for the lower plenum components. However, VT-2 examinations that were conducted as part of Section XI pressure tests have not revealed leaks, nor have orificed fuel support failures been identified as part of normal refueling activities. BWRVIP-47 was implemented during the 2002 refueling outage and inspections were performed on seventeen cells using the specified inspection methods. The CRGT-1 and FS/GT-ARPIN-1 locations were inspected using the VT-3 methods. Welds CRGT-2 and CRGT-3 were inspected using the EVT-1 method. No indications of cracking were identified.

   Clinton performs VT-2 inspections every outage as a part of the Inservice Inspection Program pressure tests. There have been no pressure boundary failures identified.

The operating experience relative to the BWR Penetrations aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including cracking. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the BWR Penetrations aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing BWR Penetrations program provides reasonable assurance that the cracking aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.9 BWR Vessel Internals

Program Description

The BWR Vessel Internals aging management program is an existing condition monitoring and mitigative program that manages aging of the reactor vessel internals in accordance with the requirements of ASME Code, Section XI and Boiling Water Reactor Vessels and Internals Project (BWRVIP) reports. The program manages the aging effects of cracking, loss of material, and loss of fracture toughness of vessel internal components in a reactor coolant environment. The program includes inspection and flaw evaluation in conformance with the guidelines of applicable BWRVIP reports and ASME Code, Section XI. The program also mitigates these aging effects by managing water chemistry per the Water Chemistry (B.2.1.2) program. The BWR Vessel Internals program includes periodic inspections of components fabricated from X-750 material to provide for timely identification of cracks that may be indicative of degradation due to thermal aging and neutron irradiation embrittlement. Precipitation-hardened (PH) martensitic stainless steel (e.g., 15-5 and 17-4 PH steel), and martensitic stainless steel (e.g., Type 403, 410, 431 steel) are not used within the reactor vessel internal components.

The BWR Vessel Internals program follows applicable and approved BWRVIP guidelines for inspection, evaluation, and repair recommendations for the components listed. When new or revised guidance is issued, it will be implemented in accordance with BWRVIP-94 Revision 4 and NEI 03-08, "Guideline for the Management of Material Issues." Additionally, the program allows for deviation from BWRVIP examination recommendations based on the requirements of NEI 03-08.

The program currently includes the following BWRVIP guidelines for inspection, evaluation, and repair recommendations for the components listed.

- Core Shroud: Inspections and flaw evaluations are performed in accordance with BWRVIP-76 Revision 1-A. The repair design criteria in BWRVIP-02-A were utilized in preparing the repair plan for the core shroud.

- Core Plate: Inspections and flaw evaluations are performed in accordance with BWRVIP-25 Revision 1-A. The repair design criteria in BWRVIP-50-A would be utilized in preparing a repair plan for the core plate.

- Core Spray: Inspections and evaluations are performed in accordance with BWRVIP-18 Revision 2-A. The repair design criteria in BWRVIP-16-A and BWRVIP-19-A would be used in preparing a repair plan for core spray system components that are internal to the reactor vessel.

- Shroud Support: Inspections and evaluations are performed in accordance with BWRVIP-38. The repair design criteria in BWRVIP-52-A would be utilized in preparing a repair plan for the core shroud support.

- Jet Pump Assembly: Inspections and evaluations are performed in accordance with BWRVIP-41 Revision 4-A. The repair design criteria BWRVIP-51-A would be used in preparing a repair plan for jet pump components.

- LPCI Coupling: Inspections and flaw evaluations are performed in accordance with BWRVIP-42 Revision 1-A. The repair design criteria in BWRVIP-56-A would be utilized in preparing a repair plan for the LPCI coupling.

- Top Guide: The Clinton BWR/6 top guides are machined from solid plate Type 304L Stainless steel and have no crevices. Inspections and evaluations are performed in accordance with BWRVIP-26-A and BWRVIP-183-A. The repair design criteria in BWRVIP-50-A would be utilized in preparing a repair plan for the top guide. In accordance with the latest revision of BWRVIP-183-A, Clinton inspects the rim areas containing the weld and heat affected zone (HAZ) from the top surface of the top guide and two cells in the same plane/axis at the weld at least every six years at the start of the latest revision of BWRVIP-183-A inspection cycle. Inspections are performed using the EVT-1 method. The program also allows for inspections to be performed using UT once it becomes available. This inspection schedule will continue through the period of extended operation.

- Control Rod Drive Housings: Inspections and evaluations are performed in accordance with BWRVIP-47-A. The inspections required by the latest revision of BWRVIP-47-A relative to CRD housings are further discussed in B.2.1.8, "BWR Penetrations." The repair design criteria in BWRVIP-55-A and BWRVIP-58-A would be utilized in preparing a repair plan for the control rod drive housings.

- Lower Plenum: When accessible, inspections and evaluations are performed in accordance with BWRVIP-47-A. The inspections required by BWRVIP-47-A, relative to instrument penetrations and components within the lower plenum are further discussed in B.2.1.8, "BWR Penetrations." The repair design criteria in BWRVIP-55-A would be utilized in preparing a repair plan for penetrations in the lower plenum. BWRVIP-57 Revision 1 would be utilized in preparing a repair plan for instrument penetrations.

- Steam Dryer: Inspections and evaluations are performed in accordance with BWRVIP-139 Revision 1-A. The repair design criteria in BWRVIP-181-A would be utilized in preparing a repair plan for the steam dryer.

The BWR Vessel Internals program specifies the necessary examinations to be performed during each outage based on the BWRVIP guidelines. BWRVIP-03 specifies VT-1 and EVT-1 examinations to detect surface discontinuities and imperfections such as cracks. Volumetric examinations are performed as specified by BWRVIP guidelines. VT-3 examinations are specified to determine the general condition of components by verifying parameters, such as clearances and displacements, and by detecting discontinuities and imperfections, such as loss of integrity of bolted or welded connections, or loose or missing parts, debris, corrosion, wear, or erosion. The examination procedures also identify the type and location of examination required for each component, as well as the basis for the examination.

The program allows for deviation from BWRVIP examination recommendations based on the requirements of NEI 03-08. Any relief request from the requirements of ASME Code, Section XI is submitted to the NRC for approval in accordance with 10 CFR 50.55a.

Evaluation of indications or flaws identified by examination is conducted consistent with the applicable and approved BWRVIP guideline or ASME Code, Section XI, as appropriate for the affected component. Additional general guidelines per BWRVIP-14-A, BWRVIP-59-A, and BWRVIP-60-A are applied for flaw evaluation of crack growth in stainless steels, nickel alloys, and low-alloy steels. Repair and replacement activities, if needed, are performed in accordance with ASME Code, Section XI requirements for code components, consistent with the recommendations of the appropriate BWRVIP repair and replacement guidelines. For nickel alloy repairs, BWRVIP-44-A would be used for weld repairs of irradiated structural components.

BWRVIP License Renewal Applicant Action Items listed in the NRC Safety Evaluation Reports for BWRVIP reports are addressed in Appendix C.

NUREG-1801 Consistency

The BWR Vessel Internals aging management program is consistent with the ten elements of aging management program XI.M9 “BWR Vessel Internals,” specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the BWR Vessel Internals program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2013, visual inspections were performed on the instrument dry tubes and wear was observed on the plunger of source range monitor (SRM) dry tube D at location 38-35. A corrective action program issue report was written, and a vender evaluation was performed. It was determined that the condition may have been present during the previous refueling

outage but went unnoticed due to camera technology. The dry tube was evaluated to be in-tact and no crack-like indications were reported. Fretting was noted on one side of the dry tube at the plunger shaft to guide plug interface. The progression of the fretting was determined to be slow when compared to wear seen in the previous refueling outage. No safety concerns were noted with the indications seen, as well as if the plunger were to fracture after fuel loading. Initial recommendations were made to take extra care when moving fuel bundles adjacent to the dry tube, perform visual inspections during the next outage, and investigate the engagement of the plunger into the top guide. Further evaluation determined that, per SIL 409, the next required inspection would need to be in 2019. During the 2019 outage, visual inspections noted that there were no discernable changes in the amount of wear from 2013 to 2019. There was a change in the wear pattern, however, which indicated recent movement of the plunger. A correction action program issue report was initiated, and an engineering evaluation determined that movement of the plunger does not affect SRM functionality. The previous engineering evaluation completed in 2013 bounded the wear pattern changes seen in 2019 and, therefore, was determined acceptable for use. Visual inspections performed in 2021 noted no discernable change to the wear pattern/depth from inspections performed in 2019. The inspections did identify slight relaxation of the shaft into the spring housing. The dry tube remained engaged into the top guide, however. A corrective action program issue report was initiated, and engineering evaluation performed in 2019 was determined to remain bounding. The relaxation of the shaft into the spring housing was evaluated to be acceptable for one cycle due to the dry tube remaining engaged with the top guide. The dry tube was re-inspected during the 2023 outage. No discernable change to the amount of wear was seen, however, some relaxation of the dry tube was observed. A corrective action program issue report was initiated, and an engineering evaluation determined that the wear and relaxation was acceptable, with reinspection to be performed in 2027.

This example demonstrates that inspections of instrumentation components are being performed in accordance with BWRVIP guidelines and that those inspections are effective in identifying wear prior to loss of intended functions. This example also illustrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality, monitor and trend the condition, and implement corrective actions to correct the condition.

2. In 2004, during visual inspections of the steam dryer support brackets, it was noted that several support brackets appeared to have contact marks with the steam dryer, while others did not. No cracks or significant degradation of the seating surfaces were identified. A corrective action program issue report was initiated and the in vessel visual inspection program was revised to include examinations of the steam dryer support brackets during the following four refueling outages . Visual inspections between 2006 and 2010 revealed no apparent changes in the indications of the steam dryer support brackets at 34, 90, 145, 220, 270, or 326 degrees. During the visual inspections in 2011, no discernable changes

were seen in any of the six steam dryer support brackets. In 2015, visual inspections found no apparent changes in the steam dryer support brackets at 34, 90, 145, 220, and 270 degrees. A slight change in the wear pattern of the support bracket at 326 degrees was noted. A corrective action program issue report was initiated, and an engineering evaluation was performed. Gauge marks on both sides of the 34-degree support bracket which had been observed in prior outages but not documented were formally reviewed and found to be acceptable for use as-is. The wear pattern on the support bracket at 326 degrees showed a slight increase in wear depth, due to contact between the steam dyer and the support bracket. The new indications were evaluated to be acceptable to use as-is. Visual inspections in 2017 and 2019 showed no discernable changes in the wear patterns of the steam dryer support bracket at 326 degrees. Future inspections will take place in accordance with the latest revision of BWRVIP-139-A.

This example demonstrates that inspections of steam dryer components are being performed in accordance with BWRVIP guidelines and that those inspections are effective in identifying wear indications prior to loss of intended function. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality, monitor and trend the condition, and implement corrective actions to correct the condition.

3. In 2015, cracking was noted during visual inspections of the steam dryer outer diameter access hole patch at 325 degrees. A corrective action program issue report was written, and an engineering evaluation was performed. During the evaluation, footage from 2010 was reviewed and the condition was found to be present at that time but was not identified due to camera positioning. The cracking was found in the heat affected zone around the access hole cover seal weld and appeared to have been initiated by IGSSC. The crack on the outer diameter access hole patch at 325 degrees appeared to have started in the northwest corners and propagated outwards. The evaluation determined that any crack propagation would be slow, with low probability of failure and low consequence in the event of failure; therefore, the indications were determined to be acceptable to use as is. Visual inspections were re-performed in 2017 and 2019 with no discernable changes noted. The follow-up inspections were noted in the corrective action program via issue reports and engineering evaluations. Future inspections will take place in accordance with the latest revision of BWRVIP-139-A.

   This example demonstrates that inspections of steam dryer components are being performed in accordance with BWRVIP guidelines and that those inspections are effective in identifying cracking indications prior to loss of intended function. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and monitor and trend the condition.

4. In 2002, the volumetric examination of shroud weld H4 detected flaws which had a combined length exceeding 10 percent of the circumference

of the weld. Based on those results, the Clinton, Unit 1 shroud was re-categorized to Category ‘C’ Un-Repaired shroud, per BWRVIP 76. Further examinations identified cracking on the H3, H5, and H6b welds. Evaluations were performed on the H3, H4, and H5 welds to justify two cycles of operation. The cracking in the H6b weld was less than 10 percent of the examined length, therefore, no further evaluation was performed. During the 2006 outage, a shroud repair structurally replacing welds H1 through H7 (eight welds) in accordance with BWRVIP-02 and BWRVIP-84. Radially acting stabilizers were mounted on four vertical mechanically preloaded tie rods, one at each location: 75 degrees, 165 degrees, 255 degrees, and 345 degrees. The stabilizers replaced the structural functions of the top guide/grid and shroud horizontal welds H1 through H7, resulting in Clinton no longer relying on all horizontal welds. Examinations of the vertical welds and tie rods would be required moving forward. The Clinton, Unit 1 shroud was re-categorized to Category ‘C’ Repaired shroud after repairs were implemented, per BWRVIP-76.

This example demonstrates that inspections of shroud components are being performed in accordance with BWRVIP guidelines and that those inspections are effective in identifying cracking indications prior to loss of intended function. This example also demonstrates that the corrective action program is used effectively to identify conditions adverse to quality, expand examination scope to determine extent of condition, evaluate conditions, and implement corrective actions/repairs to correct the condition.

5. Inspections of all four tie rods and their upper supports were performed in 2008 and 2010. No reportable indications were identified. INPO recommended inspections of the upper support, specifically the inside corner, to address a concern for cracking that occurred at another station. Starting in 2011, Clinton specified close monitoring of the inside corner during inspections of the upper support. No reportable indications were identified during inspections in 2011, 2015, and 2019.

   This example demonstrates that inspections of shroud components are being performed in accordance with BWRVIP guidelines. This example also demonstrates that industry OE is used to inform the vessel internals ISI program.

6. Volumetric examinations of shroud welds V11, V12, V13, and V14 were performed in 2011. One indication with characteristics associated with IGSCC was noted on weld V11, on the CCW side of the weld from 69.4 degrees to 70.4 degrees. It was determined that 1 percent of the weld length was flawed. A corrective action program issue report was initiated, and engineering evaluation determined that the weld indication was acceptable. Volumetric examinations of shroud welds V11, V12, V13, and V14 were performed in 2019. Two indications were recorded on weld V11; one indication was within the examination area and one indication was outside the examination area. For the weld V11 indication, which was within the examination area, it was determined that 1.2 percent of the weld was flawed. Three indications were recorded on weld V12, all three

of which were outside the examination area. No indications were recorded on welds V13 and V14. During a focused area self-assessment of In-Vessel Visual Inspection (IVVI) reactor vessel core shroud examinations performed since the last material visit review, it was determined that the vertical weld indications found in 2019 were not formally evaluated/documented. As a result of the self-assessment review, a corrective action program issue report and engineering evaluation were initiated for the vertical weld indications found in 2019. The engineering evaluation determined that the weld indications were acceptable, and the next inspection interval would be 10 years from 2019.

This example demonstrates that inspections of shroud components are being performed in accordance with BWRVIP guidelines and that those inspections are effective in identifying cracking indications prior to loss of intended function. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and monitor and trend the condition. Additionally, self-assessments are utilized to recognize gaps/areas for improvements and implement actions to ensure conditions are properly documented/ evaluated.

7. In 2013, all 20 jet pump beams were inspected using volumetric examination. Examinations of all 20 jet pump beams resulted in no reportable indications. The jet pump beams continue to be examined periodically in accordance with the most current BWRVIP guidelines.

   This example demonstrates that inspections of jet pump components are being performed in accordance with BWRVIP guidelines and that those inspections are effective in identifying cracking indications prior to loss of intended function.

The operating experience relative to the BWR Vessel Internals aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the BWR Vessel Internals aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing BWR Vessel Internals aging management program provides reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.10 Flow-Accelerated Corrosion

Program Description

The Flow-Accelerated Corrosion aging management program is an existing condition monitoring program that manages wall thinning caused by flow-accelerated corrosion (FAC) in carbon steel piping and piping components exposed to reactor coolant, steam, and treated water environments. The program is based on commitments made in response to NRC Generic Letter (GL) 89-08, "Erosion/Corrosion Induced Pipe Wall Thinning," and relies on implementation of the Electric Power Research Institute (EPRI) guidelines in the Nuclear Safety Analysis Center (NSAC)-202L-R4, "Recommendations for an Effective Flow-Accelerated Corrosion Program," for an effective FAC program.

CHECWORKS™ is used to predict component wear rates and remaining service life in the systems susceptible to FAC which provides reasonable assurance that structural integrity will be maintained between inspections. The model is revised if any changes in operating conditions or other factors that affect FAC (e.g., plant chemistry, power uprate) have occurred since the CHECWORKS™ model was last updated. Changes may also result from plant modifications that effect FAC behavior such as material changes, the addition of piping systems, piping system configuration changes, and the addition or replacement of in-line components. The CHECWORKS™ model is also refined by importing actual volumetric inspection data thickness measurements and re-running the wear rate analysis. This improves the predictive capability of the model to ensure that intended functions are maintained. Additionally, the program utilizes industry operating experience, plant experience, and engineering judgment of plant engineers to determine inspection locations.

Changes made to the CHECWORKS™ model are done by a qualified FAC engineer. Each change is then independently reviewed and validated by a qualified FAC engineer. Evaluations documenting the calculation of wear, wear rate, remaining life, next scheduled inspection, and sample expansion are independently reviewed by a qualified FAC engineer.

When program software (i.e., CHECWORKS™ and/or Fleet FAC Trending Software) is revised or replaced and the update has potential to affect the calculation of component wear, wear rate, remaining component life, and/or next scheduled inspection, a review will be performed to verify and validate that the software calculates these parameters consistently with NSAC-202L. The verification and validation shall be documented and stored electronically such that it is available for review. Limited or minor revisions or replacements of the software (such as end user enhancements, reporting revisions or additions, etc.) with no potential to affect these calculations (as verified by software change logs, vendor release notes, etc.) are exempt from this requirement and require no documentation.

The program also manages wall thinning caused by mechanisms other than FAC where periodic monitoring is used in lieu of eliminating the cause of various erosion mechanisms.

The program includes: (a) identifying all susceptible piping systems and components; (b) developing FAC predictive models to reflect component geometries, materials, and operating parameters; (c) performing analysis of FAC models and, with consideration of operating experience, selecting a sample of components for inspections; (d) inspecting components; (e) evaluating and trending inspection data to determine the need for inspection sample expansion, repairs, or replacements, and to schedule future inspections; and (f) incorporating inspection data to refine FAC models.

FAC inspections and inspections performed for wall thinning caused by mechanisms other than FAC that do not meet acceptance criteria are evaluated in accordance with the corrective action program.

NUREG-1801 Consistency

The Flow-Accelerated Corrosion aging management program is consistent with the ten elements of aging management program XI.M17, "Flow-Accelerated Corrosion," specified in NUREG-1801, as modified by LR-ISG-2012-01 with the following exception:

Exceptions to NUREG-1801

1. The NUREG-1801 aging management program XI.M17, Flow-Accelerated Corrosion, as modified by LR-ISG-2012-01, relies on implementation of the EPRI guidelines in the NSAC-202L-R2 or -R3 for an effective FAC program. The Clinton Flow-Accelerated Corrosion program is based on NSAC-202L-R4. Program Elements Affected: Scope of Program (Element 1), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), Acceptance Criteria (Element 6)

   Justification for Exception

   EPRI periodically revises NSAC-202L to update FAC program recommendations with the experience of members of the CHECWORKS™ Users Group (CHUG), and recent developments in detection, modeling, and mitigation technology. These recommendations enhance those of earlier versions and ensure the continuity of the Clinton FAC program. The technical changes that affect the program elements of NUREG-1801 aging management program XI.M17, and the non-technical changes, represent improvements in the management of flow-accelerated corrosion. Therefore, this ensures that the main objective of the Flow-Accelerated Corrosion aging management program, which is to manage wall thinning, is maintained. The Clinton Flow-Accelerated Corrosion aging management program, as based on NSAC-202L-R4, will continue to manage the effects of aging so that the intended functions will be maintained consistent with the Current Licensing Basis (CLB) during the period of extended operation.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Flow Accelerated Corrosion program will be effective in assuring that intended functions are maintained consistent with the CLB during the period of extended operation:

1. A fleet focused area self-assessment (FASA) for the FAC/Erosion in Piping and Components (EPC) Program was conducted in 2019. The assessment included an objective to:

    - Verify the FAC/EPC program is effectively identifying, mitigating, and proactively addressing component concerns in accordance with regulatory guidance. Verify component failure rates, declining component health trends, and other non-conforming issues are addressed in documented action plans. Verify if augmented examinations are being complete in accordance with fleet license renewal commitments.

    The assessment of this objective for Clinton identified one deficiency. Although the FAC/EPC Program Long Range Inspection and Replacement plan is properly maintained and periodically approved as required, the station has failed to effectively execute the plan(s). The station was previously noted by WANO as lagging the industry in inspections and replacements. Failure to execute the recovery plan has led to increased inspections to justify the deferred replacements and has failed to close the gap regarding proactive replacements with the industry. This gap places the station at a higher risk of unplanned failures. This risk is demonstrated by the recent outage failures and emergent repair/replacement activities as well as an increase in engineering evaluations to accept degraded components. A corrective action program issue report was generated to capture, evaluate, and establish corrective actions to address this deficiency. A long term plan for FAC proactive pipe replacements was completed.

    This example provides objective evidence that the program manager critically self-assesses program performance and self-identifies actions that support continuous improvement.

2. During the 2019 refueling outage, degradation was observed during ultrasonic examination of FAC/EPC Program scheduled inspections on the minimum flow line for the Low Pressure Core Spray pump. One inspection was performed downstream of an orifice. The other inspection was performed in a section of pipe/elbow downstream of a valve. Both inspections identified thickness measurements below the required minimum thickness. In accordance with program requirements, these findings were entered into the corrective action program for evaluation. Engineering determined that no pipe repair was required for 2019. Pipe replacement/repair was deferred until the 2021 outage. There were no past operability concerns. The section of piping was replaced in 2021 and baseline inspections were performed on the new components.

This example provides objective evidence that age-related inspection findings are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct deficiencies.

3. During the 2021 refueling outage, 77 UT inspections were performed consisting of both FAC and EPC components. The inspections included 32 inspections performed on FAC susceptible modeled components, 22 inspections performed on Susceptible Non-Modeled (SNM) components, and 23 inspections performed for EPC.

   In order to define the scope of outage inspections, the station FAC engineer performed the following pre-inspection activities:

   - Work orders and engineering changes completed during or after the 2019 refueling outage were reviewed to determine any potential impact on the FAC program or the components selected for inspection,
   - Informal interviews were performed with system engineers in an effort to identify any abnormal operating conditions, transients, system line-ups or chemistry conditions which may have changed which would have had an impact on the FAC program or the components selected for inspection,
   - Discussions were held with station Chemistry personnel to identify the chemistry activities that could have a direct or potential impact on the FAC inspection program in 2021 or subsequent outages,
   - A CHECWORKS™ Pass 2 analysis was performed using all inspection data collected up through 2019 and was used in selecting the inspection points. Prior to starting the inspections for 2021, a review of plant operation, plant chemistry, and system lineups was performed to ensure that the current Pass 2 analysis was correct.

   This example provides objective evidence that the FAC engineer performs pre-inspection activities to support development of the outage inspection plan and ensure outage inspection scope is correctly identified.

The operating experience relative to the Flow-Accelerated Corrosion aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the Flow-Accelerated Corrosion aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the initial period of extended operation.

Conclusion

The existing Flow-Accelerated Corrosion aging management program provides reasonable assurance that the aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.11 Bolting Integrity

Program Description

The Bolting Integrity program is an existing program that manages aging of closure bolting for pressure-retaining components. The program utilizes recommendations and guidelines delineated in NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants,” EPRI NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” and EPRI TR-104213, “Bolted Joint Maintenance & Applications Guide,” for material selection, use of approved lubricants, proper torquing, and leakage evaluations which are implemented during plant surveillance and maintenance activities. The Bolting Integrity program activities provide for aging management of closure bolting on pressure-retaining bolted joints for piping and components within the scope of license renewal. The program includes periodic inspection of pressure-retaining bolted joints for indication of loss of preload, cracking, and loss of material due to corrosion. The program also credits visual inspection of pressure-retaining bolted joints in ASME Class 1, 2, and 3 systems for leakage and age-related degradation during system pressure tests performed in accordance with ASME Section XI. In addition, the Bolting Integrity aging management program credits volumetric, surface, and visual inspections of ASME Section XI Class 1, 2, and 3 bolts, nuts, washers, and other associated bolting components performed in accordance with Subsections IWB, IWC, and IWD. The integrity of non-ASME pressure-retaining bolted joints (in non-ASME Class 1, 2, 3, and MC systems) is evaluated by detection of visible leakage, evidence of past leakage, or other age-related degradation during walkdowns and maintenance activities. Closure bolting that is submerged or located in piping systems that contain air or gas for which leakage is difficult to detect, is inspected or tested by alternative means. Aging management reviews have determined that high strength bolting material with actual yield strength of 150 ksi or greater may have been used for component pressure-retaining bolted joints within the scope of license renewal (reactor vessel head vent flanges). However, Clinton does not have any closure bolting within the scope of this program that is both high strength (i.e., actual yield strength greater than or equal to 1,034 MPa [150 ksi]) and larger than 2 inches in diameter, that would be subject to volumetric examination per ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1.

The Bolting Integrity program includes preventive measures to preclude or minimize loss of preload and cracking in pressure-retaining bolted joints. Stress corrosion cracking is precluded or at least minimized by prohibiting the use of lubricants that contain molybdenum disulfide (MoS_2) as well as curtailing the use of bolting material that has an actual measured yield strength of 150 ksi or greater in portions of systems within the scope of license renewal. Inspection activities for bolting in a submerged environment are performed in conjunction with component maintenance activities, testing and routine inspections.

The Bolting Integrity program is supplemented by ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management program (B.2.1.1) for inspection of safety-related closure bolting on pressure-retaining joints.

The following bolting is not included in the Bolting Integrity program:

- The Primary Containment (MC) pressure-retaining bolting is managed as part of ASME Section XI, Subsection IWE aging management program (B.2.1.29).
- ASME Class 1, 2, 3, and MC piping and components support bolting, including NSSS component supports, is managed as part of ASME Section XI, Subsection IWF aging management program (B.2.1.31).
- Structural bolting, other than ASME Class 1, 2, 3, and MC piping and component supports bolting is managed as part of the Structures Monitoring aging management program (B.2.1.34) and R.G. 1.127 Inspection of Water-Control Structures Associated With Nuclear Power Plants aging management program (B.2.1.35).
- Crane and hoist bolting is managed by Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program (B.2.1.14).
- Inspection activities for bolting in a buried environment or underground with restricted access are performed in conjunction with buried piping and component inspections performed as part of the Buried and Underground Piping and Tanks aging management program (B.2.1.28).
- Reactor head closure bolting is managed by the Reactor Head Closure Stud Bolting aging management program (B.2.1.3).

NUREG-1801 Consistency

The Bolting Integrity aging management program will be consistent with the ten elements of aging management program XI.M18, "Bolting Integrity," specified in NUREG-1801 with the following enhancement:

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program elements:

1. Perform shutdown service water (SX) pump inspection with specific instructions to inspect the condition of all closure bolting for evidence of cracking, loss of material, or loss of preload. Program Elements Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4)

Operating Experience

The following examples of operating experience provide objective evidence that the Bolting Integrity aging management program will be effective in assuring that intended functions are maintained consistent with the CLB during the period of extended operation:

1. In May 2018, ECCS strainer bolts were inspected to ensure that they were not loose. One of the jam nuts was found loose and an issue report was generated. A work order was created, and a diver torqued the loose jam nut to specifications. Subsequently, a second issue report was written because six additional jam nuts were found loose, and these loose nuts were also tightened to specifications. In all cases, the inner nut was secure and there was no loss of intended function.

   This example demonstrates that deficiencies are able to be detected and they are entered into the corrective action program so that appropriate corrective actions can be taken to correct deficiencies.

2. In February 2018, while cleaning the bonnet of a valve, one of the four bonnet bolts was found to be loose. Upon further investigation it was either corroded or sheared off. The body to bonnet bolts were replaced under a separate WO. Further investigation discovered two broken studs, degraded by rust, with two other bonnet studs significantly corroded.

   This example illustrates that deficiencies are identified documented and resolved using appropriate corrective using the corrective action program.

3. In October 2018, a small amount of diesel fuel was noted by operator on the skid near the main fuel pump of the Division 1 emergency diesel generator (EDG). Nearby there was one of the bolts from the main fuel pump. A physical examination confirmed that the bottom bolt holding the pump cover on the pump assembly was missing. This bolt is one of six that hold the pump cover on. The remaining five bolts were verified to be tight, and the pump was continuing to supply fuel to the engine. The loose bolt was clean and did not appear to have any thread sealant on it. An extent of condition identified a bolt on the opposite division EDG that was not properly torqued. Materials Management personnel verified the torque of the closure bolting on other spare pumps in stores and returned two pumps to the manufacturer for retorque.

   This example shows that operator observations and actions are effective in identifying loosened bolts before there is a loss of intended function. It also demonstrates the effective use of extent of condition as part of the corrective action program.

The operating experience relative to the Bolting Integrity aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Bolting Integrity aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Bolting Integrity aging management program will provide reasonable assurance that the loss of material and loss of preload aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.12 Open-Cycle Cooling Water System

Program Description

The Open-Cycle Cooling Water System (OCCWS) aging management program is an existing preventive, mitigative, condition monitoring, and performance monitoring program that manages heat exchangers, piping, piping elements, and piping components in safety-related and nonsafety-related systems that are exposed to a raw water environment for loss of material, wall thinning due to erosion, reduction of heat transfer, and flow blockage. The activities for this program are consistent with commitments to the requirements of NRC Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment," and provide for management of aging effects in raw water cooling systems through tests, inspections, and component cleaning. System and component testing, visual inspections, non-destructive examination, and biocide and chemical treatment are conducted to ensure that identified aging effects are managed such that system and component intended functions are maintained.

The OCCWS includes those systems that transfer heat from safety-related systems, structures, and components to the ultimate heat sink as defined in NRC GL 89-13 as well as those raw water systems which are in scope for license renewal for potential spatial interaction but have no safety-related heat transfer function.

The guidelines of NRC GL 89-13 are utilized for the surveillance and control of bio-fouling for the OCCWS program. Procedures provide instructions and controls for chemical and biocide injection. Periodic inspections are performed, and biocide treatments are applied as necessary.

Periodic heat transfer testing, visual inspection, and cleaning of safety-related heat exchangers with a heat transfer intended function are performed in accordance with commitments to NRC GL 89-13 to maintain heat transfer capabilities. Additionally, safety-related piping segments are examined periodically to ensure that there is no significant loss of material which could cause a loss of intended function. Nonsafety-related piping segments that have the potential for spatial interactions with safety-related equipment will be periodically non-destructively examined.

Routine inspections and maintenance ensure that corrosion, erosion, sediment deposition, and bio-fouling do not degrade the performance of safety-related systems. No credit is taken for protective coatings on safety-related components in the OCCWS program in determining potential aging effects. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Aging Management Program (B.2.1.42) activities are adequate for managing the aging effects of the internal surface coatings for the OCCWS components.

The Buried and Underground Piping and Tanks (B.2.1.28) aging management program activities are adequate for managing the aging effects of external surfaces of buried and underground piping and components. The external surfaces of the aboveground raw water piping and heat exchangers are managed by the External Surfaces Monitoring of Mechanical Components (B.2.1.24) aging management program.

Examination of polymeric materials in systems serviced by the OCCWS program is consistent with examinations prescribed in the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.25) aging management program.

LR-ISG-2012-02 addresses instances of recurring internal corrosion identified during review of plant specific operating experience. The operating experience for Clinton has been reviewed and instances of internal corrosion in the OCCWS have been identified with a frequency that is consistent with the thresholds discussed in LR-ISG-2012-02. This operating experience relates to loss of material due to microbiological induced corrosion (MIC) of carbon steel piping in raw water systems. Inspections are performed to monitor for recurring internal corrosion in both safety-related and nonsafety-related piping.

For the buried piping, visual inspections of the piping interior surfaces will be performed whenever the piping internal surface is made accessible due to maintenance and repair activities. In addition, a portion of the aboveground inspection locations will be selected with process conditions similar to those in the buried piping to use as an indicator of the internal surface condition of the buried piping.

NUREG-1801 Consistency

The Open-Cycle Cooling Water System aging management program is consistent with the ten elements of aging management program XI.M20, "Open-Cycle Cooling Water System," specified in NUREG-1801, as modified by LR-ISG-2012-02 and LR-ISG-2013-01.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Open-Cycle Cooling Water System program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In November 2019, during a system walkdown, a minor leak was observed in the “C” residual heat removal (RHR) room. The leak was estimated at approximately 100 drops per minute. The leak was from the 1VY07C RHR pump room 1C supply fan cooling coil. The “C” RHR system was declared inoperable until the cooler could be isolated, at which time the Technical Specification Limiting Condition for Operation (LCO) was exited, and the subsystem declared operable. The condition was entered into the corrective action process for follow-up actions.

   The cooling coil leak was a pinhole leak caused by wall thinning due to erosion/corrosion in the copper tubing. The ECCS equipment area cooling (VY) room coolers/heat exchangers were identified as part of the Clinton GL 89-13 Program. An extent of condition review was performed. All room coolers (1VY08SA, 1VY08SB, 1VY08AA, 1VY08AB, 1VY08AC, 1VY08AD, 1VY06AA, 1VY06AB, 1VY07AA, 1VY07AB, 1VY01AA, 1VY01AB, 1VY03AA, 1VY03AB, 1VY05AA, 1VY05AB, 1VY04A, 1VY03S ,1VY04S, 1VY01S ,1VY02S, 1VY05S, 1VY06S, 1VH07SA and 1VH07SB) having a similar configuration and similar service conditions were walked down. No leakage issues were identified for the identified inspection scope.

   A section of the failed tubing was removed and sent to Constellation Power Labs for analysis. It was determined that the failure was due to erosion-corrosion caused by turbulence associated with the configuration of the coil and adjacent fitting. No localized corrosion mechanisms, such as pitting or intergranular attack, were observed.

   This example provides objective evidence that the existing GL 89-13 aging management program activities are being effectively implemented to identify and manage aging effects of in scope heat exchangers serviced by raw water, and that the results of inspection activities are used to inform and enhance the program. Deficiencies identified during inspection activities are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct the deficiencies.

2. In October 2018, an issue was entered into the corrective action process by Clinton Engineering personnel to initiate a work request for replacement of a vertical section of piping to the post accident sampling system heat exchanger room cooler, 1VAS20S. The request was based on the two most recent ultrasonic test (UT) results, which indicated the pipe segment was nearing the design minimum wall thickness.

   Clinton Engineering personnel determined the need for the piping replacement based on evaluation of UT results in accordance with the Clinton GL 89-13 program. Degradation rates were calculated, and the resulting projections of when the piping design minimum wall thickness would be reached determined that the conservative decision was to replace the piping segment. A work order (WO) was generated to replace the piping. On May 8, 2019, the piping segment was successfully replaced.

This example provides objective evidence that the existing GL 89-13 aging management program activities are being effectively implemented to identify and manage aging effects of in scope piping in raw water systems. Deficiencies identified during inspection activities are entered into the corrective action program and appropriate corrective actions, including pipe replacements, are performed to correct the deficiencies.

3. In May 2023, a self-assessment of the Clinton raw water program was performed. The assessment reviewed the program implementing procedures and maintenance work order activities to ensure the requirements of the GL 89-13 program were being met. The assessment also reviewed the program against the OCCW aging management program recommendations to determine if any gaps exist when the period of extended operations begins.

   The assessment did not identify any gaps to GL 89-13 or OCCW aging management program requirements. The assessment did identify a number of recommendations, including the following:

   - The need for a tracking and trending tool to facilitate easier review of inspection data, identification of trends in the inspection data, and calculation of corrosion rates and inspection schedules.
   - Procedural enhancements to clarify existing GL 89-13 program requirements.
   - Implementing maintenance work orders that were not rescheduled in a timely fashion.

   The recommendations were entered in the corrective action program for review and corrective action as needed. This example provides objective evidence that the existing GL 89-13 aging management program is being periodically reviewed for compliance and improvement opportunities, and that the existing program will effectively implement the OCCW aging management program requirements during the period of extended operation. Program implementing documents are reviewed, inspections verified as performed at the required frequencies, test results reviewed, and follow-up actions are created, tracked, and implemented via the corrective action program.

The operating experience relative to the Open-Cycle Cooling Water System aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the Open-Cycle Cooling Water System aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing Open-Cycle Cooling Water System aging management program provides reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.13 Closed Treated Water Systems

Program Description

The Closed Treated Water Systems program is an existing mitigative and condition monitoring program that manages the loss of material, wall thinning due to erosion, cracking, and reduction of heat transfer in flexible connections, heat exchangers, piping, piping components, pump casing, tanks, and valve bodies exposed to a closed cycle cooling water environment. The aging management program includes monitoring for microbiological organisms and features water treatment to modify the chemical composition of the water such that the function of the equipment is maintained and such that the effects of corrosion are minimized. Specifically, the program includes (a) a pure water program without chemical additives; (b) an iron corrosion inhibitor with additional additives for copper corrosion inhibition, pH buffering, and a dispersant; (c) chemical testing of the water to ensure that the water treatment program maintains the water chemistry within acceptable guidelines; and (d) inspections to determine the presence or extent of corrosion, stress corrosion cracking, or reduction of heat transfer.

The Closed Treated Water Systems program activities are implemented through station procedures. Mitigative activities include utilizing nitrite-based chemistry controls to minimize the age-related degradation of components exposed to a closed treated water environment. The performance of sample analyses assures water chemistry parameters are maintained within the goal ranges specified by procedures based on EPRI 3002000590, “Closed Cooling Water Chemistry Guideline.” Monitoring of water chemistry parameters also assures contaminants are kept below applicable limits to prevent or limit corrosion. Condition monitoring activities provide for opportunistic visual inspections whenever the system boundary is opened, as well as new periodic inspections, which are effective in detecting applicable aging effects, and the frequency of condition monitoring is adequate to prevent significant age-related degradation.

Based on operating experience, periodic inspection of locations susceptible to wall thinning due to erosion, in a closed treated water environment, will also be managed by this program.

The program will be enhanced, as noted below, to provide reasonable assurance that the Closed Treated Water Systems program will manage the aging effects of loss of material, wall thinning due to erosion, cracking, and reduction of heat transfer during the period of extended operation.

NUREG-1801 Consistency

The enhanced Closed Treated Water Systems aging management program will be consistent with the ten elements of aging management program XI.M21A, “Closed Treated Water Systems,” specified in NUREG-1801, as modified by LR-ISG-2012-02 and LR-ISG-2013-01 with the following exceptions and enhancement.

Exceptions to NUREG-1801

1. A review of plant specific operating experience identified that wall thinning due to erosion is an applicable aging effect/mechanism for closed treated water systems. There are no NUREG-1801 AMR line items that address wall thinning due to erosion in a closed treated water environment and GALL AMP XI.M21A does not manage wall thinning due to erosion. Program Elements Affected: Scope of Program (Element 1), Detection of Aging Effects (Element 4)

   Justification for Exception:

   System locations where wall thinning due to erosion have been identified will be periodically inspected at the reinspection interval established by the corrective action program. These inspections will continue until the cause of erosion has been eliminated. When replacements are performed as a corrective action to eliminate erosion, a baseline inspection will be performed when the component is installed, and another inspection is performed within three cycles to determine the effectiveness of the corrective actions or to establish a wear rate. This inspection methodology is consistent with aging management activities recommended in the XI.M17 Flow-Accelerated Corrosion program.

2. The Closed Treated Water Systems aging management program uses EPRI 3002000590 for control parameters and with diagnostic parameters monitored, operating ranges, and action levels in lieu of EPRI 1007820 as specified in GALL. Program Element Affected: Parameters Monitored or Inspected (Element 3)

   Justification for Exception:

   Use of a more recent revision of the EPRI guide is acceptable. EPRI issued 3002000590, “Closed Cooling Water Chemistry Guideline,” Revision 2 in 2013 from the previous version (1007820). The NRC staff has found this updated EPRI guideline acceptable for use in recent license renewal applications as it represents the latest industry consensus guidance based on reviews of data for closed cooling water system corrosion, including recent industry operating experience. Approved precedents for use of the more recent version of the above guideline are documented in the NRC’s SERs for Turkey Point and Peach Bottom. SLR-ISG-2021-02-Mechanical supports the use of the 3002000590.

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program elements:

1. Perform condition monitoring, including periodic visual inspections and non-destructive examinations to verify the effectiveness of water chemistry control in mitigating aging effects. It will provide for the development of the criteria for identifying a representative sample of piping and components for visual and non-destructive inspections. A minimum of 25 inspections will be performed, with at least two samples of each material type, distributed evenly among the three different closed cooling water chemistries. Inspections will be scheduled at intervals not to exceed 10 years. As applicable, these inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, or other plant-specific inspection guidance by qualified personnel using procedures that are capable of detecting loss of material, wall thinning due to erosion, reduction of heat transfer, or cracking. If visual examination identifies adverse conditions, then additional examinations, including ultrasonic testing, will be conducted. Components inspected will be those with the highest likelihood of corrosion, reduction of heat transfer due to fouling, or cracking. The selection of susceptible locations will also consider plant specific operating experience wherein internal or even recurring internal corrosion has occurred in accordance with LR-ISG-2012-02, “Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation.” Locations identified as being susceptible to wall thinning due to erosion based upon plant specific operating experience will also be inspected. Program Elements Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4).

Operating Experience

The following examples of operating experience provide objective evidence that the Closed Treated Water Systems program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In June of 2016, chemistry sample results for the component cooling water (CCW) demineralizer effluent were determined to be above the goal. Though the result was below the ultimate limit, a negative trend was identified. Consistent with the Monitoring and Trending Program attribute, an Issue Report (IR) was generated to document an increasing trend on the demineralizer conductivity. A second IR was generated to document the CCW demineralizer conductivity being above the goal value. These IRs were closed to a work order that resulted in the replacement of the CCW demineralizer resin.

   The corrective actions were taken based upon proactive monitoring and trending that resulted in a timely replacement of the resin before it was exhausted, thereby preventing a loss of chemistry control in the CCW system. This IR contains notable elements of the following attributes: Parameters Monitored/Inspected, Monitoring and Trending, and Corrective Actions.

This example demonstrates that deficiencies are entered into the corrective action program and trended so that appropriate corrective actions are taken.

2. In April of 2017, an IR was generated to document an adverse trend in chilled water system molybdate concentration. Multiple IR's had been written over the previous 10 years concerning chilled water system molybdate concentration decrease during winter months. Chemistry typically begins a season long (October to April) chemical addition to this system after chilled water system air cooling coils are winterized. As discussed in the program attribute, the data was trended and determined air cooling coil isolation leak by to be the cause for chilled water system volume loss and molybdate loss. A work request was created, and walkdowns performed to determine the cause of system volume loss. The walkdowns identified cooling coil leaks and valves that were not providing tight shutoff. These conditions were corrected, and the system leakage was eliminated.

   This documents consistency with elements of the following attributes: Parameters Monitored/Inspected, Monitoring and Trending, and Corrective Actions.

   This example demonstrates that deficiencies are entered into the corrective action program and trended so that appropriate corrective actions are taken.

3. In June of 2021, an IR was generated to document that the 2021 ultrasonic examination (UT) results for component cooling water (CCW) system piping were lower than expected and below the acceptance criteria. During a previous inspection, an area of readings below the acceptance criteria was identified. This UT inspection looked at piping downstream of a CCW system nonregenerative heat exchanger outlet isolation valve. The cause of the wall loss was attributed to erosion from cavitation due to throttling of the valve. The acceptance criterion was based upon a percentage of the nominal wall thickness. A conservative estimate resulted in a wall loss rate which determined there was approximately 4.5 years of remaining life. The IR recommended repair or replacement of this pipe within the next year to prevent a through wall leak. A work order has been planned to replace this section of piping before reaching end of life.

   This IR demonstrates the use of elements in the following attributes: Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending, Acceptance Criteria, and Corrective Action.

   This example provides objective evidence that the program implements condition monitoring examinations using appropriate methods and examination frequency.

The operating experience relative to the Closed Treated Water Systems aging management program shows that when an adverse trend in performance was identified the program took appropriate steps to evaluate and address the cause. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions are taken to prevent recurrence. The inspection methods being implemented by the program have been proven effective in detecting identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Closed Treated Water Systems aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Closed Treated Water Systems aging management program will provide reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.14 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

Program Description

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program is an existing condition monitoring program that manages the aging effects of loss of material on the bridge, bridge rails, bolting, and trolley structural components for cranes, hoists, and rigging beams in air-indoor uncontrolled and treated water environments. The program evaluates the effectiveness of the maintenance monitoring program and the effects of past and future usage on the structural reliability of cranes and hoists. Rails and girders are visually inspected on a routine basis for degradation; functional tests are performed to assure their integrity. The program also manages loss of preload of associated bolted connections. Procedures and controls implement the guidance on the control of overhead heavy load cranes specified in NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants.” The program utilizes periodic inspections as described in the ASME B30 series of standards for inspection, monitoring and detection of aging effects.

The scope of cranes, hoists, rigging beams, and refueling equipment within the scope of license renewal is based on compliance with NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants.” Overhead lifting equipment that operates over safety-related equipment is included within the scope of license renewal. Also in scope for license renewal are equipment handing systems that handle ‘light’ loads and fuel, over fuel and safety-related equipment within the spent fuel pool and reactor cavity. As a result, five cranes and hoists, and the refueling platforms and associated fuel and equipment handling equipment are managed by the program.

Inspection frequency and scope is consistent with the recommendations for periodic inspection within the ASME B30 series of standards. Periodic inspections are performed annually. For handling systems that are infrequently in service, such as those only used during refueling outages, periodic inspections may be deferred until just prior to use.

The program includes performance of a periodic inspection as defined in the appropriate ASME B30 series standard for all cranes, hoists, and equipment handling systems within the scope of license renewal. The program will be enhanced to consistently include inspection of structural components and bolting for loss of material due to corrosion; rails for loss of material due to wear and corrosion; and bolted connections for loss of preload.

NUREG-1801 Consistency

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program is consistent with the ten elements of aging management program XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," specified in NUREG-1801 with the following enhancement:

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program elements:

1. Provide additional guidance to include inspection of structural components, rails, and bolting for loss of material due to corrosion; rails for loss of material due to wear; and bolted connections for loss of preload. Program Elements Affected: Scope of Program (Element 1), Parameters Monitored/Inspected (Element 3), and Detection of Aging Effects (Element 4)

Operating Experience

The following examples of operating experience provide objective evidence that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. During the inspection of the north turbine building crane in 2015 the crane rail/grinder inspection identified one loose bolt. The bolt was located on the west side of the crane rail upper channel support. The crane was determined to be operable, but was conservatively removed from service, and an issue report was entered into the corrective action program. The bolt was replaced and torqued as specified by site engineering prior to being returned to service.

   This example provides objective evidence that the Clinton inspection, maintenance, and corrective action programs are effective in identifying degraded conditions caused by aging effects and implementing corrective actions to prevent further degradation prior to the condition becoming significant, potentially impacting the intended function.

2. While performing a refuel bridge (F15) walkdown in 2019 the following discrepancies were noted while performing the inspection checklist:

   a. An air line associated with the refuel bridge air compressor had a small leak. The compressor was placed in OFF and the refueling maintenance team was notified.

b. Two conduit lines, one associated with the start/stop module and another associated with the circuit breaker for the refuel bridge air compressor, were loose and rotating freely. The conduit lines needed to be tightened from inside the control boxes.

c. The platform drive right angle gear drive on the west side on the refuel bridge had minor leakage that was substantially worse than the east side right angle drive gear.

Actions were immediately taken at the completion of the walkdown by entering an issue report in the corrective action program for the identified deficiencies. Repairs were made under an existing Work Order and a successful post maintenance test of the refuel bridge was completed.

This example provides objective evidence that the material condition of the cranes, hoists, rigging beams, monorails, and refueling platforms and associated fuel and equipment handling equipment within the scope of license renewal are being maintained in good material condition. Also, the periodic inspection program has been effective in monitoring the condition of the equipment and identifying low-level material condition issues prior to challenging the intended functions.

The operating experience relative to the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of material and loss of preload. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program will provide reasonable assurance that the loss of material and loss of preload aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.15 Compressed Air Monitoring

Program Description

The Compressed Air Monitoring aging management program is an existing condition monitoring program that will be enhanced to assure adequate management of loss of material on piping and components in the compressed air systems. The Compressed Air Monitoring program includes monitoring of air moisture content and contaminants such that specified limits are maintained, and inspection of components for indications of loss of material due to corrosion.

This program is based on the Clinton response to NRC Generic Letter (GL) 88-14, “Instrument Air Supply Problems,” and utilizes guidance and standards provided by ANSI/ISA-S7.3, “Quality Standard for Instrument Air,” INPO’s Significant Operating Experience Report (SOER) 88-01, “Instrument Air System Failures,” and ASME OM-S/G-1998, Part 17, “Performance Testing of Instrument Air Systems in Light-Water Reactor Power Plants.” The Compressed Air Monitoring program activities implement the moisture content and contaminant criteria of ANSI/ISA-S7.3 (incorporated into ISA-S7.0.1-1996).

Program activities include air quality checks at various locations to ensure that dew point, particulates, and hydrocarbons are maintained within the specified limits and periodic inspections of select compressed air system component internal surfaces for signs of loss of material due to corrosion. The effects of corrosion and presence of contaminants are detected during quarterly surveillances, and preventive maintenance inspections of compressors, filters, dryers, and specific compressed air system components. The procedures and maintenance activities for these inspections include specific inspection acceptance criteria. The periodic and opportunistic inspections of accessible internal surfaces of components provide assurance that the systems within the scope of license renewal will perform their intended function.

Results from the periodic inspections are compared with established acceptance criteria to provide for timely detection of aging effects. The monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant age-related degradation. Deficiencies are documented in the corrective action program and evaluations are performed for test or inspection results that do not satisfy established criteria. The corrective action program ensures that the conditions adverse to quality are promptly corrected. The site corrective action program is implemented in accordance with the requirements of the 10 CFR Part 50, Appendix B quality assurance program.

NUREG-1801 Consistency

The Compressed Air Monitoring aging management program will be consistent with the ten elements of aging management program XI.M15, "Compressed Air Monitoring,” specified in NUREG-1801, as modified by LR-ISG-2013-01, with the following exception and enhancement:

Exceptions to NUREG-1801

1. NUREG-1801 states that daily readings of system dew point are recorded and trended. Daily system dew point readings are not recorded or trended. Program Elements Affected: Monitoring and Trending (Element 5)

   Justification for Exception

   NUREG-1801 states that daily readings of system dew point are recorded and trended. ANSI/ISA-7.0.01-1996 Section 5.1 states, "a monitored alarm is preferred; however, if a monitored alarm is unavailable, per shift monitoring is recommended.” The moisture content at the outlet of each Clinton compressed air system dryer is continuously monitored with automatic alarms in the main control room should limits be exceeded. An alarm light on each of the dryer local control panels also indicate high humidity conditions. On a quarterly basis, samples are taken from representative locations and are analyzed for dew point as well as particulates and hydrocarbons, which validates the effectiveness of the compressed air system in line detectors, to supply air within the required quality limits.

   NUREG-1801 provides guidance that the Compressed Air Monitoring aging management program is based on the results of the plant owner’s response to NRC GL 88-14 (as applicable to license renewal). ANSI/ISA-7.0.01-1996, Section 5.1 and Annex C 3.1, identifies continuous monitoring as the preferred method for monitoring dew point. In addition, per NUREG-1801, XI.M24, Element 4 “Detection of Aging Effects,” states: “Typically, compressed air systems have continuous dew point monitoring equipment with automatic alarm capability or daily checks of dew point values to ensure that moisture content is within specifications.” Clinton monitors moisture content continuously. Daily readings of moisture content are not recorded and trended at Clinton because the compressed air system does not have instrumentation to permit daily recording moisture content values. Continuous monitoring of moisture content at each dryer outlet with alarm indication in the main control room allows action to be taken to swap to the spare dryer, isolate the affected dryer, and initiate corrective action for the affected dryer. The compressed air system equipment is validated quarterly when air samples are taken from various locations of the compressed air system and are analyzed for moisture content as well as particulate and hydrocarbons. The plant operating experience has shown that the original design, along with quarterly sampling and continuous automatic alarms for moisture, to be an effective method to monitor the compressed air system dryer outlet to provide reasonable assurance that the components in the compressed air system will continue to perform the specified intended functions.

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program elements:

1. Perform periodic inspections of the internal surfaces of system filters, compressors and internal coolers, and opportunistic inspections of other system components for signs of corrosion and corrosion products. Document unacceptable conditions in the corrective action program. Program Elements Affected: Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4), Acceptance Criteria (Element 6)

Operating Experience

The following examples of operating experience provide objective evidence that the Compressed Air Monitoring program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In March 2015, a corrective action program issue report was initiated to document that the main control room breathing air and automatic depressurization system (ADS) recharge compressor failed to reach -50 degrees F dew point while running the air compressor to obtain a quarterly air sample. The lowest dew point obtained was -47.2 degrees F. To charge the ADS air bottles the dewpoint is required to be less than or equal to -50 degrees F. Maintenance was performed to correct the condition and the subsequent post maintenance test performed in March 2015 was satisfactory.

   This example provides objective evidence that the Compressed Air Monitoring aging management program manages effective sampling for compressed air parameters and takes appropriate actions to correct conditions that do not conform to requirements. The problems identified would not have caused significant impact to the safe operation of the plant, and adequate corrective action was taken.

2. In February 2019, while performing an inspection of dryer desiccant in the dryer towers of the common service air dryer, the as found system cleanliness was very clean. The work order changed the desiccant in the towers. The next occurrence of this preventive maintenance activity found the desiccant again to be clean.

   This example illustrates that station preventive maintenance activities are effective in maintaining system cleanliness, as-found conditions are documented in work orders, and work activities conducted under the Compressed Air Monitoring program are effective at monitoring component conditions to prevent age-related degradation of downstream air system components.

3. In March 2023, a corrective action program issue report (IR) was initiated to document that during an area tour an operator noticed the common air compressor (0SA01D) service air dryer local moisture indicator found on the local panel (0SA02J) was pink indicating high moisture. The automatic bypass and high humidity indicators were also illuminated. The dryer was removed from service and an issue report was entered into the corrective action program. The desiccant was replaced, and the dryer

was returned to service with additional monitoring. The apparent cause of the issue was a valve switching issue that had occurred a month earlier and resulted in moisture intrusion.

This example provides objective evidence that the station corrective action program is effective in identifying issues and takes appropriate actions to evaluate and correct conditions that do not conform to requirements.

The operating experience relative to the Compressed Air Monitoring aging management program confirms that system performance and condition is being monitored effectively. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of material. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Compressed Air Monitoring aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Compressed Air Monitoring aging management program will provide reasonable assurance that the loss of material aging effects will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.16 Fire Protection

Program Description

The Fire Protection aging management program is an existing condition and performance monitoring program that manages the identified aging effects for the fire barriers and the halon and low-pressure carbon dioxide systems and associated components through the use of periodic inspections and functional testing to detect aging effects prior to loss of intended functions. System functional tests and inspections are performed in accordance with guidance from National Fire Protection Association Codes and Standards. The program applies to piping, piping components, tanks (halon and carbon dioxide storage), curbs, and fire barriers (doors and dampers, penetration seals, walls, and slabs), fireproofing, and fire wraps.

The Fire Protection program monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant degradation. The Fire Protection program manages visual inspections of fire barrier penetration seals for signs of degradation such as loss of material, cracking, seal separation from walls and components, separation of layers of material, hardening, and loss of strength through periodic inspection. The program requires performance of visual inspections, for penetration seals, of at least 10 percent of each type of accessible fire barrier penetration seal and at least 12.5 percent of each type of inaccessible fire barrier penetration seal at least once per 18 and 24 months, respectively. The program specifies visual examinations of the fire barrier walls, ceilings and floors in structures within the scope of license renewal at a frequency of at least once per 36 months. Additionally, intersections between fire barriers (i.e., wall-to-wall, wall-to-ceiling, wall-to-floor) in structures within the scope of license renewal are inspected at a frequency of at least once per 24 months. Periodic visual inspections and functional tests are used to manage the aging effects of fire doors. The visual inspection frequency for fire doors is at least once per six months, with functional tests of closing mechanisms and latches for required doors conducted on the same frequency. Fire dampers shall be verified to be functional by visual inspection at least once per 48 months.

The program will also provide for aging management of external surfaces of the halon and low-pressure carbon dioxide fire suppression system components that are within the scope of license renewal through periodic functional tests and visual inspections for corrosion that may lead to loss of material.

These inspections and tests are implemented through station procedures and recurring task work orders. Training requirements for inspection personnel are met via an INPO National Academy for Nuclear Training accredited training program that meets industry standards described in ACAD 92-008, “Guidelines for Training and Qualification of Maintenance Personnel.” Training in this program includes familiarization with fire protection systems and plant fire protection barriers, use of the corrective action program, and use of plant procedures.

The program will be enhanced, as noted below, to provide reasonable assurance that the Fire Protection program aging effects will be adequately managed during the period of extended operation.

NUREG-1801 Consistency

The Fire Protection aging management program will be consistent with the ten elements of aging management program XI.M26, "Fire Protection," specified in NUREG-1801, with the following enhancements:

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program elements:

1. Enhance the fire barrier inspection program to perform periodic visual inspection of combustible liquid spill retaining curbs for signs of cracking, spalling, or loss of material that could impede the functionality of the curb. Program Elements Affected: Scope of Program (Element 1), Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4), Acceptance Criteria (Element 6).

2. Enhance halon and carbon dioxide tests to perform periodic visual piping inspections for identification of corrosion that may lead to loss of material on the external surfaces of the halon and low-pressure carbon dioxide fire suppression systems. Program Elements Affected: Scope of Program (Element 1), Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4), Acceptance Criteria (Element 6).

3. Provide additional inspection guidance to identify aging effects as follows:

    a. Fire barrier walls, ceilings, and floors degradation from spalling and loss of material that may be caused by freeze-thaw, chemical attack, and reaction with aggregates.

    b. Elastomeric fire barrier material degradation such as increased hardness, shrinkage, and loss of strength.

    c. Grout fire barrier material degradation such as concrete cracking and spalling.

    d. Silicates and subliming compound fire barrier degradation such as change in material properties, cracking and delamination, loss of material, and separation.

Program Elements Affected: Scope of Program (Element 1), Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4), Acceptance Criteria (Element 6).

Operating Experience

The following examples of operating experience provide objective evidence that the Fire Protection program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. For the second half of 2022, the program health report for the Fire Protection program identified an overall decrease in program health from yellow to red status, which is the lowest performance category. This condition was entered into the corrective action program, evaluated, and brought to the attention of the Program Health Committee (PHC). Major contributors to the deficient program condition were discussed with the PHC and a recovery strategy for the Fire Protection program was subsequently devised. In 2023 the Fire Protection Program health was upgraded to yellow status based on overall program improvement.

   This example provides objective evidence that the corrective action program is effective in identifying deficient program conditions and that appropriate recovery actions are strategized and implemented when deficient program conditions are identified.

2. In October 2016, multiple fire doors were found with minor maintenance deficiencies such as dents, loose skins, and small holes created by missing screws, during the semi-annual fire door operability inspection. The subject fire doors all remained operable (i.e., able to close and latch); however, the degraded conditions for these doors were entered into the corrective action program for evaluation. As a result, a work order was initiated for repair of the degraded doors, such that continued degradation would not cause an inoperable condition. The doors were repaired in November 2016.

   This example provides objective evidence that visual inspections and functional testing performed in accordance with the Fire Protection program are adequate to identify deficient conditions and that adequate compensatory measures are taken when deficient conditions are identified.

3. In February 2015, a structural steel beam in the control building was found to have less than the minimum required fireproofing on the beam baseplate during a routine structural fireproofing surveillance. The beam was determined to be a 1.9-hour fire barrier, for which no portion of the baseplate is allowed to be visible. This condition was entered into the corrective action program, evaluated by engineering and the Fire Protection Manager, and scheduled for subsequent repair. Hourly fire watches were initiated until the degraded fire proofing could be repaired. The fireproofing was repaired in May 2015.

   This example provides objective evidence that visual inspections performed in accordance with the Fire Protection program are adequate to identify deficient conditions and that adequate compensatory measures are taken when deficient conditions are identified.

The operating experience relative to the Fire Protection program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Fire Protection aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Fire Protection aging management program will provide reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.17 Fire Water System

Program Description

The Fire Water System aging management program is an enhanced condition monitoring, performance monitoring, and preventive program that manages the loss of material in raw water, condensation, air - outdoor, and air - indoor, environments for water-based fire protection systems that consist of sprinklers, nozzles, fittings, valve bodies, fire pump casings, hydrants, hose stations, standpipes, and aboveground and buried piping and components. Fire Water System component materials consist of carbon steel, ductile iron, stainless steel, galvanized steel, gray cast iron, and copper alloys.

These components are tested in accordance with the applicable National Fire Protection Association (NFPA) codes and standards with deviations as described in the NRC approved Clinton fire protection program. Flow testing, visual inspections, and volumetric examinations are performed to ensure that loss of material due to general, pitting and crevice corrosion, microbiologically influenced corrosion (MIC), or fouling, and flow blockage due to fouling is adequately managed.

By review of site-specific operating experience (OE), recurring internal corrosion is not occurring in the fire water system. Inspections will be performed on the carbon steel fire water piping for corrosion and degradation of the piping internal surfaces. Abnormal or unacceptable results are entered into the corrective action program for review and resolution.

The Fire Water System program does not manage the external aging effects of buried piping. The buried pipe aging effects are managed by the Buried and Underground Piing and Tanks (B.2.1.28) program.

The Fire Water system program includes replacement or testing of a representative sample of sprinklers before they reach 50 years of service. Fifty-year sprinkler head testing will be conducted using the guidance provided in NFPA 25, “Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.” The testing will occur every ten years on a new sample population.

The CPS design does not include water-based fire protection systems that are normally dry but periodically subject to flow and cannot be drained. Therefore, augmented testing in addition to that specified in NFPA 25 is not required. There are no in scope dry pipe sprinkler systems. In scope preaction sprinkler systems are pressurized with air and a supervisory air pressure alarm is provided in the control room. The preaction systems are trip tested dry and the program will be enhanced to perform internal visual inspections for corrosion that could cause flow blockage. Engineering walkdowns were performed to verify proper draining of dry preaction sprinkler systems and deluge systems.

The water-based fire protection system is normally maintained at required operating pressure and monitored such that loss of system pressure is immediately detected and corrective actions initiated. The system flow testing, visual inspections and volumetric inspections assure that aging effects are managed such that the system intended functions are maintained. Flow testing results are reviewed and trended to identify degrading trends prior to loss of system function. The program ensures that testing and inspection activities have been performed and documented. Abnormal results are entered into the corrective action program for review and resolution.

Inspections and tests are performed by personnel qualified in accordance with station procedures and programs to perform the specified task. The inspections and tests follow station procedures that include inspection parameters for items such as lighting, distance, offset, presence of protective coatings, and cleaning processes.

External surfaces of buried fire main piping are evaluated as described in the Buried and Underground Piping (B.2.1.28) aging management program. Fire water system components subject to selective leaching are evaluated as described in the Selective Leaching (B.2.1.22) aging management program.

The program will be enhanced, as noted below, to provide reasonable assurance that the Fire Water System aging effects will be adequately managed during the period of extended operation.

NUREG-1801 Consistency

The Fire Water System aging management program is an enhanced program that will be consistent with NUREG-1801 aging management program XI.M27, Fire Water System as modified by LR-ISG-2012-02 and LR-ISG-2013-01 with the following exception and enhancements:

Exceptions to NUREG-1801

1. NUREG-1801, Element 4 states that all water-based fire protection system components are subject to flow testing, other testing, and visual inspections. It also states that the testing and visual inspections are performed in accordance with the sections of NFPA 25 that are cited in GALL, Table 4a. Table 4a invokes Section 13.2.5 of NFPA 25 which requires: “A main drain test shall be conducted annually at each water-based fire protection system riser to determine whether there has been a change in the condition of the water supply piping and control valves.”

   The current Clinton Fire Protection program does not perform main drain tests.

Justification for Exception

The current CPS fire protection program implements various testing and inspection requirements promulgated by NFPA codes, regulations, and insurers. The purpose of main drain testing is discussed in both NFPA 25 and the Nuclear Electric Insurance Limited (NEIL) Loss Control Manual (LCM). Both sources indicate that the intent of the test is to identify major obstructions. However, the two documents differ in the application of the requirement. The NFPA code does not include any allowances because it is written for general applicability (i.e. usage outside of the highly regulated nuclear industry) and typically applies to facilities that do not own and control the fire water supply from the water source to the individual suppression systems. The NEIL LCM; however, includes an allowance to omit main drain testing.

Both NFPA 25 and the NEIL LCM agree that the purpose of main drain testing is to identify major obstructions in the flow path (e.g. dropped valves and valve misalignment). NFPA 25 Annex A provides explanatory information regarding the intent of the requirements. The section discusses that main drain testing is used to determine whether there is a major obstruction in the system and provides several examples of what could cause a major obstruction. None of the examples provided are the result of age related degradation or failures of passive components. The discussion also states that a satisfactory test does not, necessarily, mean that the pipe is unobstructed and cannot be relied upon without additional verifications such as valve position inspections. In addition to the clarifications in the NFPA code, the Interpretation Guidance provided in the NEIL LCM also indicates that the purpose of main drain testing is to identify major blockage. Therefore, by review of the NFPA explanatory material and the NEIL Interpretation Guidance, the intent of the test is to verify valve alignment in the fire water supply, which in non-nuclear applications is not usually controlled by the system owner, or to identify other major obstructions in the fire water supply. The intent is not to identify partial restriction of supply piping, which would be indicative of age-related degradation, by the measurement of increased hydraulic resistance of the flow path.

While NFPA 25 and the NEIL LCM agree that the intent of main drain testing is to identify valve misalignment or other major obstructions, the application of the test differs between the two sources. The NEIL LCM, written specifically for the highly regulated nuclear industry, identifies the potential hazardous and unique challenges associated with performing main drain testing of nuclear power plant fire suppression systems and includes an allowance to omit main drain testing. The allowance requires the performance of various other tests and inspection (e.g. valve position verification and cycling, flow tests, flushes, and suppression system inspection) which, in place of the main drain test, ensures that no major obstructions exist in the fire suppression system piping.

By review of the friction loss equations, the capability of main drain testing is limited to identification of major obstructions because the flow rates achieved during main drain testing are relatively low due to the small size of the main drain valves as compared to system supply headers and risers. As such, main drain testing is not an effective method to identify age-related flow blockage which typically results in partial restriction of supply piping and increased hydraulic resistance of the flow path due to fouling. While main drain testing is not an effective method to detect age-related flow blockage, the NRC approved CPS Fire Protection Program includes full flow testing of the system supply headers which would adequately identify partial restrictions of supply piping and increased hydraulic resistance of the system. The results of the systemwide flow testing are trended and compared to the system hydraulic analysis to ensure that adequate flow is available to fire suppression systems.

Clinton Power Station manages the fire water supply and performs testing and inspections in accordance with its NRC approved Fire Protection Program as supplemented by additional NEIL requirements. A review of CPS OE did not identify a history of major obstructions in fire water piping that would be detectable by main drain tests. Therefore, given the rigorous regime of alternative tests and inspections and OE, reasonable assurance is provided that major obstructions would be identified without the addition of main drain testing.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

1. Perform external visual inspections of in scope sprinkler piping and sprinklers for corrosion, loss of material, leaks, and proper sprinkler orientation. External visual inspections of the accessible in scope sprinklers and system piping will be performed annually. Guidance will direct the inspection for corrosion, loss of material, leaks, and proper sprinkler orientation. Corroded, leaking, or damaged sprinklers shall be replaced. Program Element Affected: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4)

2. Perform external visual inspections of the in scope above ground fire main supply piping every two years to identify excessive corrosion, loss of material, leaks, and physical damage. Program Element Affected: Parameters Monitored or Inspected (Element 3)

3. Perform internal visual inspections of sprinkler and deluge system piping to identify internal corrosion, foreign material, and obstructions to flow. Follow-up volumetric wall thickness examinations will be performed if internal visual inspections detect an unexpected level of degradation due to corrosion and corrosion product deposition. If organic material, foreign material, or internal flow blockage that could result in failure of system function is identified, then an obstruction investigation will be performed within the corrective action program. The obstruction investigation includes the removal of the material, an extent of condition determination, a review for increased inspection frequencies, follow-up examinations, and a flush consistent with the guidance provided in NFPA 25 Annex D.5, Flushing Procedures.

   The internal visual inspections will consist of the following:

   a. Wet pipe sprinkler systems - 50 percent of the wet pipe sprinkler systems in scope for license renewal will have internal visual inspections of piping by removing a hydraulically remote sprinkler, performed every five years, consistent with NFPA 25, 2011 Edition, Section 14.2. During the next five-year inspection period, the alternate systems previously not inspected shall be inspected.

   b. Preaction sprinkler systems - preaction sprinkler systems in scope for license renewal will have internal visual inspections of piping by removing a hydraulically remote nozzle, performed every five years, consistent with NFPA 25, 2011 Edition, Section 14.2.

   c. Deluge systems - perform an external visual inspection on a refueling outage frequency of the accessible piping and spray spargers inside the filter plenums to assure they are in their proper position and spray patterns are not obstructed. This will be in addition to the air-flow tests that are currently performed to ensure there is no flow blockage. In addition, the program will be enhanced to include internal visual inspections of piping around the flanged spool piece during air-flow testing.

Program Element Affected: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Acceptance Criteria (Element 6)

4. Perform a minimum flow duration of one minute after the hydrant valve is fully open during the fire hydrant inspection and flush test to remove all foreign material. Program Element Affected: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4)

5. Utilize the corrective action program to determine an increased test frequency when established test criteria are not met or when significant degraded trends that could adversely affect system intended function are identified during the underground fire main flow test. When test results pass the established test criteria, the test frequency may be extended to a five-year frequency in accordance with NFPA 25 and allowed by NEIL and site specific procedures. Program Element Affected: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4)

6. Perform flow tests for hose stations at the hydraulically most limiting locations for each zone of the system on a five-year frequency to demonstrate the capability to provide the design pressure at required flow. Program Element Affected: Detection of Aging Effects (Element 4)

7. Perform volumetric testing of the pipe when unexpected levels of degradation and irregularities are detected during visual inspection. Program Element Affected: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Acceptance Criteria (Element 6)

8. Improve restoration procedure guidance for the in scope preaction systems to ensure piping is completely drained after actuation. Program Element Affected: Detection of Aging Effects (Element 4)

9. Prior to 50 years of service and every 10 years after, remove a representative sample of sprinklers and submit for testing to a recognized laboratory. Program Element Affected: Detection of Aging Effects (Element 4)

Operating Experience

The following examples of operating experience provide objective evidence that the Fire Water System program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In December 2013, during demolition for an engineering change that was unrelated to fire protection, a “mud” like substance was discovered in the piping of the fuel building railway bay preaction system. The corrective action program was used to document the condition and identify subsequent actions. The substance was determined to be sediment that settled out of solution and the build-up was determined to not cause a loss of function. The condition was attributed to the improper design and installation of the preaction system which prevented adequate draining after the system was charged. By review of operating experience (OE), no inadvertent or deliberate system charges were identified in the past 10 years. Corrections were made to the system design, in the form of a modification, to add a new low point drain and an extent of condition evaluation was performed. This OE was aligned with investigations performed to address NRC Information Notice 2013-06, “Corrosion in Fire Protection Piping Due to Air and Water Interaction,” and demonstrates

that the existing program and the existing station procedures are sufficient to manage aging in the fire water system during the period of extended operation. This OE demonstrates that issues are identified, corrected, and that extent of condition evaluations are performed to ensure conditions are not prevalent or pervasive. Restoration procedure guidance for the in scope preaction systems will be enhanced to ensure piping is completely drained after actuation.

2. Two Issue Reports, one from January, 2019 and another from March, 2022, identified instances where pipe cap threads beyond the secondary valve in a drain connection were corroded to the point of having through wall holes. However, in both cases, the corrosion did not present a leakage concern as it was not part of the system pressure boundary during normal operation. These failures were within sections of pipe that are periodically wetted for testing purposes and not maintained full of water. The periodic wetting accelerated the corrosion and caused a failure that did not impact the function of the system. By review of site-specific OE, recurring internal corrosion is not occurring in the fire water system. These OE examples demonstrate that the existing program is capable of detecting and correcting conditions in the fire water system.

3. In October of 2014, the station identified clogged deluge system nozzles during the performance of regularly scheduled transformer deluge system flow tests. Three deluge spray nozzles initially did not spray any water and one additional nozzle was dribbling water (partial blockage). One of the three nozzles did eventually spray full flow. The cause was determined to be insect nests which is not an aging issue.

   The transformer deluge systems are not in scope system. However, the testing identified one of the exact issues it was meant to identify which exemplifies the adequacy of the program. In scope normally dry systems are not subject to periodic wetting as the transformer deluge systems. As such, they are not subject to the same level of accelerated corrosion.

The operating experience relative to the Fire Water aging management program did not identify an adverse trend in performance. Recurring internal corrosion was not identified. The inspection methods being implemented by the program have been proven effective in detecting aging effects including identified. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Fire Water aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Fire Water aging management program will provide reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.18 Aboveground Metallic Tanks

Program Description

The Aboveground Metallic Tanks aging management program is a new condition monitoring program that manages aging effects associated with in-scope outdoor aboveground metallic tanks constructed on concrete and sand. The reactor core isolation cooling (RCIC) storage tank is the only tank in the scope of this program. The RCIC storage tank is fabricated from aluminum alloy plates that are not coated and are not susceptible to cracking. The internal environment of the tank is treated water and condensation. Insulation is installed on the exterior shell of the tank. The program includes caulking/sealant at the tank interface with the tank foundation as a preventive measure to mitigate corrosion.

The program manages loss of material by conducting periodic internal and external visual and volumetric inspections each 10-year period including the pre-PEO period. Cracking is not a predicted aging effect due to the aluminum alloy construction. Visual inspections of sealant and caulking will be supplemented with physical manipulation to detect degradation. Thickness measurements of tank bottoms are conducted to ensure that significant degradation is not occurring, and the component intended function will be maintained during the period of extended operation. Visual and volumetric examinations of the tank walls and roof are performed to inspect for loss of material. Inspections are conducted in accordance with plant-specific procedures for visual and ultrasonic inspection techniques.

Inspections required during the period of extended operation will be based on the results of the initial inspections occurring during the 10-year period prior to period of extended operation in accordance with NUREG-1801 AMP XI.M29, as modified by LR-ISG-2012-02 Table 4a.

These inspections and examinations will ensure that significant degradation is not occurring and that the intended function of the RCIC Storage Tank is maintained during the period of extended operation.

NUREG-1801 Consistency

The Aboveground Metallic Tanks aging management program will be consistent with the ten elements of aging management program XI.M29, "Aboveground Metallic Tanks," specified in NUREG-1801, as modified by LR-ISG-2012-02 and LR-ISG-2013-01.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Aboveground Metallic Tanks program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2017, an inspection of RCIC storage tank (1RI01T) was performed to examine degradation of the tank bottom and determine if any corrective actions were necessary. This was a one-time inspection performed as part of a fleet wide response to Nuclear Event Report (NER) NC-10-056, “Ineffective Implementation of the Ground Water Protection Initiative with Respect to the Tank PCM Template Execution.” The results of this inspection on the RCIC storage tank bottom showed that eight top surface floor locations were identified as suspect by eddy current testing. Follow-up UT examination was performed on these areas to further quantify these indications. Of the eight indications, two were determined to require repairs by welding patch plates over the indications. Repairs were performed, and post maintenance testing was completed satisfactorily. For the indications that were not repaired, evaluation determined that re-inspection was not required for 34 years. Additional inspections were performed on internal welds where the inner wall meets the tank bottom baseplate. Two weld locations were evaluated to require repairs in order to ensure weld integrity beyond 10 years. Aluminum weld repairs were completed and post maintenance testing was satisfactory.

   This event demonstrates the effective use of the corrective action program to identify degraded conditions, perform extent of condition reviews, and take timely corrective action to preserve the ability of the tank to perform its intended function. This also provides evidence that the proposed methods of managing aging for this tank will be effective in identifying deficiencies in a timely manner.

2. In June 2010, at Constellation’s LaSalle County Station, samples of rain water captured in the Unit 1 condensate storage tank (CST) berm were identified to contain tritium. This condition was entered into the corrective action program for evaluation. Subsequent investigations determined the source of the tritium to be the CST. No leaks were obvious from visible external tank surfaces and the tank was drained for further inspection. The inspection revealed three locations where corrosion from the underside of the tank caused through-wall leaks. Samples of the tank bottom as well as samples of the sand at the leak locations were removed for chemical and metallurgical analysis. The cause of the corrosion was determined to be attributable to chlorides in the sand. The entire bottom of the tank was volumetrically examined and thinned areas were repaired by welding patch plates over the degraded locations. This event resulted in an internal corporate operating experience report that drove additional inspection activities at other Constellation fleet sites, including inspection of the Clinton RCIC storage tank. These inspections resulted in similar patch plate repairs in two locations. In addition, two weld repairs were

completed at the tank bottom to wall interface. Future tank monitoring plans were established based on engineering evaluations.

This event demonstrates the effective use of industry and fleet operating experience and the corrective action program to identify degraded conditions, perform extent of condition reviews, and take timely corrective action to preserve the ability of the tanks to perform their intended functions.

These events demonstrate the effective use of the corrective action program to identify degraded conditions, perform extent of condition reviews, and take timely corrective action to preserve the ability of the tank to perform its intended function. They also provide evidence that the proposed methods of managing aging for this tank will be effective in identifying deficiencies in a timely manner.

The operating experience relative to the Aboveground Metallic Tanks aging management program does not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting the aging effects of loss of material due to pitting and crevice corrosion. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the Aboveground Metallic Tanks aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new Aboveground Metallic Tanks aging management program will provide reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.19 Fuel Oil Chemistry

Program Description

The Fuel Oil Chemistry aging management program is an existing mitigative and condition monitoring program that includes activities which provide assurance that contaminants are maintained at acceptable levels in fuel oil for systems and components within the scope of license renewal. The Fuel Oil Chemistry program manages loss of material in piping, piping elements, piping components and tanks in a fuel oil environment. The fuel oil tanks within the scope of license renewal are maintained by monitoring and controlling fuel oil contaminants in accordance with the Technical Specifications and the guidelines of the American Society for Testing Materials (ASTM) Standards D4057-95, D1298-99, D0975-06b, D4176-93, and D6217-98. Fuel oil sampling and analysis is performed in accordance with approved procedures for new fuel oil and stored fuel oil. Fuel oil tanks are periodically drained of accumulated water and sediment, cleaned, and internally inspected. These activities effectively manage the effects of aging by maintaining potentially harmful contaminants at low concentrations.

NUREG-1801 Consistency

The Fuel Oil Chemistry aging management program will be consistent with the ten elements of aging management program XI.M30, "Fuel Oil Chemistry," specified in NUREG-1801, as modified by LR-ISG-2013-01 with the following enhancements:

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

1. Enhance diesel fuel sampling procedures to include adding biocides to stored fuel when periodic sampling identifies the presence of microbiological activity in a fuel storage tank. Program Elements Affected: Preventive Actions (Element 2)

2. Perform periodic (quarterly) sampling and analysis for the levels of microbiological organisms for diesel fire pump fuel oil day tanks 0DO01TA and 0DO01TB. This enhances the sampling and analysis scope of these tanks which currently checks for water, sediment content, and particulate concentration. Program Elements Affected: Parameters Monitored/ Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5)

3. Perform periodic (quarterly) sampling and analysis for water and sediment content, particulate concentration, and the levels of microbiological organisms for diesel generator fuel oil day tanks 1DG01TA, 1DG01TB, and 1DG01TC. Program Elements Affected: Parameters Monitored/ Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5)

4. Perform periodic (quarterly) sampling and analysis for the levels of microbiological organisms and for water and sediment content for diesel fuel oil storage tanks 1DO01TA, 1DO01TB, and 1DO01TC. This enhances the sampling and analysis scope of these tanks which currently checks for water and sediment content yearly and particulate concentration monthly. Program Elements Affected: Parameters Monitored/ Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5)

5. Perform periodic internal inspections of diesel fire pump fuel oil day tanks 0DO01TA and 0DO01TB, diesel generator fuel oil day tanks 1DG01TA, 1DG01TB, and 1DG01TC, diesel fuel oil storage tanks 1DO01TA, 1DO01TB, and 1DO01TC at least once during the 10-year period prior to the period of extended operation, and at least once every 10 years during the period of extended operation. Each diesel fuel tank will be drained and cleaned, the internal surfaces visually inspected (if physically possible), and, if evidence of degradation is observed during inspections, or if visual inspection is not possible, these diesel fuel tanks will be volumetrically inspected. Program Element Affected: Detection of Aging Effects (Element 4)

6. Perform periodic (quarterly) trending of water and sediment content, particulate contamination concentrations, and the levels of microbiological organisms for stored fuel oil in all fuel oil tanks within the scope of the program. Program Element Affected: Monitoring and Trending (Element 5)

Operating Experience

The following examples of operating experience provide objective evidence that the Fuel Oil Chemistry program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2019, the off-site analysis of new fuel oil found that the cloud point for the delivered fuel oil did not meet the American Standard Test Method D0975 specification. The maximum cloud point is -15 degrees C and the result of the analysis was -12 degrees C. All required Technical Specification (TS) parameters were satisfactory. Cloud point is not a required parameter for Technical Specifications. This was entered into the corrective action program. Samples were subsequently taken from the Division 1 and Division 2 diesel generator storage tanks and the test results showed that the cloud point for both tanks was satisfactory due to the mixing of the quantity of fuel oil added to the large volume of fuel oil already existing in the tanks.

This example provides objective evidence that routine periodic surveillance is effective in identifying nonconforming conditions and that fuel oil analyses that do not meet acceptance criteria are entered into the corrective action program for evaluation and the identification of corrective actions.

2. In 2015, indications related to the integrity of the internal coating of the Division 2 diesel generator fuel oil storage tank were found during the periodic inspection of the tank. This was entered into the corrective action program. The conditions were evaluated by engineering. It was determined that the identified conditions did not compromise the structural integrity of the tank to maintain its intended design function. Additionally, it was determined that leaving the affected areas un-repaired until the next scheduled cleaning was acceptable based on small size of the affected areas, that there was no credible indication of pitting on metal, that there was no credible indication of heavy rust/corrosion observed, and that overall condition of the tank was good condition.

   This example provides objective evidence that periodic visual inspection of internal surfaces of fuel oil tanks is performed to assess loss of material due to corrosion and that identified degraded conditions are entered into the corrective action program for evaluation and the identification of corrective actions.

3. In 2020, the preliminary diesel fuel oil sample results for diesel fuel being delivered to site revealed that sulfur content was not within ASTM specifications. While sulfur content is not a TS required parameter for off loading, the delivery was rejected as Surveillance Requirement 3.8.3.3 would require that other properties of the new fuel be within limit within 31 days after adding the new fuel to storage tanks. Rejection of the delivery was made based on the known out of specification sulfur content parameter to prevent entry into TS Limiting Condition for Operation 3.8.3.

   This example provides objective evidence that testing of diesel fuel for delivery to site is effective in identifying the presence of contaminants prior to permitting new fuel into plant storage tanks and that fuel oil analyses that do not meet acceptance criteria are entered into the corrective action program for evaluation and the identification of corrective actions.

4. In 2013, a self-assessment of emergency diesel generator fuel oil practices and procedures was performed and identified two potential non-compliances with Regulatory Guide (RG) 1.137, “Fuel Oil Systems for Emergency Power Supplies.” Firstly, it was determined that there was no specific guidance for water removal from the diesel generator storage tanks after a one-hour engine run per RG 1.137. Procedures were revised to perform water removal activities after engine runs rather than during engine pre-start checks. Secondly, it was determined that procedures did not have any cautions or guidance to limit sediment agitation during fuel oil addition activities with an engine in operation (e.g.,

during a LOOP/LOCA) per RG 1.137. A caution was added to warn that fuel filter differential pressure could rise during tank filling.

This example provides objective evidence that the station uses the corrective action program to identify and resolve regulatory non-compliance matters related to diesel fuel practices as they relate to aging management of diesel fuel oil storage tanks.

5. In the fourth quarter of 2022, a fleet self-assessment was conducted to ensure all stations are maintaining their aboveground storage tanks and underground storage tanks containing chemicals and petroleum in accordance with applicable federal and state environmental regulatory requirements. Clinton found no deficiencies. One station and one fleet recommendation were identified for Clinton which recommends all station tank program owners to review the predefines/PMs to ensure that tracking actions are not set up with grace periods/late dates that would result in an action taking place outside of a regulatory deadline.

   This example provides objective evidence that the station performs self-assessments to identify and resolve regulatory non-compliance matters related to diesel fuel storage tank practices as they related to aging management of diesel fuel oil storage tanks.

The operating experience relative to the Fuel Oil Chemistry aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of material. Appropriate guidance is provided when nonconforming conditions are identified. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Fuel Oil Chemistry aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Fuel Oil Chemistry program will provide reasonable assurance that the loss of material aging effect will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.20 Reactor Vessel Surveillance

Program Description

10 CFR Part 50 Appendix H requires that each nuclear plant have a reactor vessel material surveillance program to monitor changes in the fracture toughness properties of ferritic materials in the beltline region of the reactor vessel resulting from exposure to neutron irradiation and the thermal environment. Prior to 2003, Clinton complied with surveillance regulations by maintaining its own Appendix H program that complied with ASTM E 185, "Standard Practice for Design of Surveillance Programs for Light-Water Moderated Nuclear Power Reactor Vessels."

In 2003, the NRC approved Clinton participation in the BWR Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP), as described in BWRVIP-78 and BWRVIP-86, Revision 1-A. The NRC approved Technical Specification Amendment 157 to operating license NPF-62 that permitted the use of the BWRVIP ISP for demonstrating compliance with the requirements of 10 CFR 50, Appendix H. The BWRVIP ISP was established as a program that combines surveillance materials from the existing programs and materials from the Supplemental Surveillance Program to make sufficient materials available to improve compliance with 10 CFR 50 Appendix H. Instead of using the plant-specific surveillance data from a given plant, the data from all BWR surveillance programs have been evaluated to select the "best" representative material to monitor radiation embrittlement for that plant. Selection of the best representative materials for a particular plant considers heat number, similar chemistries, common fabricator, and the availability of unirradiated data. In matching the available surveillance plates and welds, some capsule materials are good representatives for the limiting materials of multiple plants. Clinton is designated as an ISP non- host plant and will utilize plate and weld material information from River Bend. River Bend is scheduled to withdraw and test an ISP capsule in 2025 and an ISP(E) capsule in 2030. The schedule for withdrawal and testing of surveillance capsules in the ISP has also been approved by the NRC. Changes to the ISP withdrawal schedule will be approved by the NRC prior to implementation.

The program is a condition monitoring program that measures the increase in Charpy V-notch 30 foot-pound (ft-lb) transition temperature (adjusted reference temperatures) and the drop in upper-shelf energy as a function of neutron fluence and irradiation temperature. RPV beltline material test results provide reactor vessel material fracture toughness data for the neutron irradiation embrittlement time-limited aging analyses (TLAAs) (e.g., adjusted reference temperatures, upper-shelf energy, and pressure-temperature limits evaluations). See Section 4.2 of the LRA for discussion of the TLAAs associated with neutron irradiation embrittlement. The program is effectively providing fluence and materials data necessary for managing the effects of loss of fracture toughness due to neutron irradiation embrittlement during the period of extended operation.

NUREG-1801 Consistency

The Reactor Vessel Surveillance aging management program is consistent with the ten elements of aging management program XI.M31, "Reactor Vessel Surveillance," specified in NUREG-1801 with the following exception:

Exceptions to NUREG-1801

1. The NUREG-1801, Chapter XI.M31, Reactor Vessel Surveillance aging management program, Element 4, Detection of Aging Effects, states that "the program withdraws one capsule at an outage in which the capsule receives a neutron fluence of between one and two times the peak reactor vessel wall neutron fluence at the end of the period of extended operation and tests the capsule in accordance with the requirements of ASTM E 185-82." The neutron fluence value for the Clinton ISP(E) surveillance plate and weld materials, as planned in BWRVIP-86, Revision 1-A, is not consistent with this fluence range criterion. Clinton is an ISP non-host plant and utilizes plate and weld material from River Bend capsules. The Clinton ISP(E) surveillance plate and weld materials are in a River Bend capsule that has an ISP(E) estimated fluence exposure of 4.49×10^{18} n/cm2 (E>1 MeV) for the scheduled withdrawal in 2030. This is less than one times the 60-year peak (0T) fluence value of 8.65×10^{18} n/cm2 (E>1 MeV) projected for the Clinton vessel ID at the end of the period of extended operation, 52 effective full power years (EFPY). Program Elements Effected: Detection of Aging Effects (Element 4)

   Justification for Exception:

   Clinton is an ISP non-host plant and the heat numbers for the representative weld and plate materials in the River Bend Integrated Surveillance Program Extended (ISP(E)) capsules do not match the heat numbers of the limiting Clinton beltline weld and plate materials. In these cases, the adjusted reference temperature (ART) is computed using the method specified in BWRVIP-135, latest addition, procedure number 2, "Recommended Guidance for the Use of ISP Surveillance Data When Vessel Material and Surveillance Material Heat Numbers Do Not Match." This method determines the chemistry factor (CF) using Tables 1 and 2 of Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," (Regulatory Position 1.1) based upon the copper and nickel content of the actual Clinton vessel weld and plate materials.

   The Clinton ART calculations are not affected by the fact that the representative ISP(E) River Bend surveillance capsule applicable to Clinton has a planned fluence exposure value outside of the range specified in NUREG 1801 Revision 2, AMP XI.M31, program element 4.

   There is insufficient data available for some Clinton shell plates to establish an initial upper shelf energy (USE) for all beltline materials. Therefore, to demonstrate an acceptable margin of safety, the USE Equivalent Margin Analysis (EMA) due to 60 years operation for the limiting beltline plate was evaluated using methods consistent with the BWR Owners' Group Topical Report on Upper Shelf Energy Equivalent

Margin Analysis, BWRVIP-74-A. The EMA was performed for the limiting beltline plate materials for 60 years of operation and compared against the limits defined in BWRVIP-74-A. It was determined the USE values for the reactor vessel beltline materials meet the requirements of 10 CFR 50 Appendix G or meets the requirement of EMA provided in BWRVIP-74-A (percent USE decreases are 11.5 percent and 12.0 percent for shell plates number 1 and number 3, respectively, which is less than the BWRVIP-74-A allowable.) for 60 years of operation (52 EFPY). The analysis applied information from the River Bend ISP capsules. The ¼ T fluence on the plates evaluated in the EMA is less than the River Bend capsule plate material. The USE calculations are not affected by the fact that the representative ISP(E) River Bend surveillance capsule applicable to Clinton has a planned fluence exposure value outside of the range specified in NUREG-1801 Revision 2, AMP XI.M31, program element 4.

Therefore, the Clinton embrittlement calculations are not affected by the fact that the representative ISP(E) River Bend surveillance capsule applicable to Clinton has a planned fluence exposure value outside of the range specified in NUREG-1801 Revision 2, AMP XI.M31, program element 4. The Reactor Vessel Surveillance aging management program will satisfactorily manage loss of fracture toughness due to neutron irradiation embrittlement for the Clinton reactor vessel through the period of extended operation with this program exception in place.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Reactor Vessel Surveillance program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. 10 CFR Part 50 Appendix H requires that each nuclear plant have a reactor vessel material surveillance program to monitor changes in the fracture toughness properties of ferritic materials in the beltline region of the reactor vessel resulting from exposure to neutron irradiation and the thermal environment. A material surveillance program was developed and initiated at the beginning of nuclear operation at Clinton that was designed to be in conformance with the requirements of 10 CFR 50 Appendix H and that complied with ASTM E 185. There were originally three surveillance capsules in the Clinton reactor; capsules containing plate, weld metal, and dosimeter flux wires are located at the 3 degrees, 177 degrees, and 183 degrees azimuths. GEH also provided a separate neutron dosimeter so that fluence measurements could be made at the vessel inner diameter after the first fuel cycle of operation to verify the predicted fluence at an early date in plant operation. After the first cycle of operation in 1989, the separate dosimeter was removed and measured and determined to have a lower fluence then the original calculated design value. The data was used to develop pressure-temperature (P-T)

curves for original plant life, 32 EFPY. This demonstrates the program is effectively providing fluence and materials data necessary for managing the effects of loss of fracture toughness due to neutron irradiation.

2. In 2003, the NRC approved Clinton participation in the BWRVIP Integrated Surveillance Program (ISP), which is managed by EPRI/BWRVIP, as described in BWRVIP-86, Revision 1-A. The NRC approved Technical Specification Amendment 157 to operating license NPF-62 that permitted using the BWRVIP ISP to demonstrate Clinton compliance with the requirements of 10 CFR 50, Appendix H.

   In 2023, an updated pressure-temperature (P-T) curve basis report was developed for 52 EFPY (60 years operation). The updated P-T curve basis report was established to the requirements of 10 CFR 50, Appendix G to assure that brittle fracture of the reactor vessel is prevented by accounting for irradiation embrittlement effects. The method used to account for irradiation embrittlement is described in Regulator Guide 1.99, Revision 2. New ART values are based upon revised fluence projections and material information from the BWRVIP ISP. The projected fluence (E > 1 MeV) was calculated by GEH using the NRC-approved methodology in accordance with Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," independent of the P-T curve analysis. The latest information from the BWR Vessel and Internals Project (BWRVIP) Integrated Surveillance Program that was applicable to Clinton was utilized including plant specific and BWRVIP ISP material chemistries. The new P-T curves will be submitted to the NRC prior to exceeding 32 EFPY. This operating experience demonstrates that the program is providing the necessary fluence and materials data to determine the effects of neutron fluence on limiting reactor vessel materials for the extended period of operation, 52 EFPY.

The operating experience relative to the Reactor Vessel Surveillance aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of fracture toughness due to neutron irradiation embrittlement. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the Reactor Vessel Surveillance aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing Reactor Vessel Surveillance aging management program provides reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.21 One-Time Inspection

Program Description

The One-Time Inspection aging management program is a new condition monitoring program that will be used to verify the system-wide effectiveness of the Water Chemistry (B.2.1.2) program, Fuel Oil Chemistry (B.2.1.19) program, and Lubricating Oil Analysis (B.2.1.26) program, which are designed to prevent or minimize aging to the extent that it will not cause a loss of intended function during the period of extended operation. The AMP is a condition monitoring program consisting of a one-time inspection of selected components to verify: (a) the system-wide effectiveness of an AMP that is designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the period of extended operation; (b) the insignificance of an aging effect; and (c) that long-term loss of material will not cause a loss of intended function for steel components exposed to environments that do not include corrosion inhibitors as a preventive action.

The elements of the program will include: (a) determination of the sample size of components to be inspected based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience, (b) identification of the inspection locations in the system or component based on the potential for the aging effect to occur, (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined, and (d) an 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 program includes inspections that are focused on locations that are isolated from the flow stream, that are stagnant, or have low flow for extended periods and are susceptible to the gradual accumulation or concentration of agents that promote certain aging effects. The inspections will include a representative sample of the system population and will focus on the bounding or lead components most susceptible to aging due to time in service, and severity of operating conditions. Twenty percent of the population with a maximum sample of 25 constitutes a representative sample size. A technical justification of the methodology used for determining sample size and for selecting components for inspection will be included in the One-Time Inspection Sample Basis Document. The program verifies either that unacceptable degradation is not occurring or triggers additional actions that will assure the intended function of affected components will be maintained during the period of extended operation.

One-time inspections that do not meet acceptance criteria are evaluated in accordance with the corrective action program. If the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment, additional inspections are conducted if one of the inspections does not meet acceptance criteria. The number of increased inspections is determined in accordance with the corrective action program; however, no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination is inspected, whichever is less. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of inspections.

Periodic inspections instead of this program will be used for structures or components with known age-related degradation mechanisms. Inspections not conducted in accordance with ASME Code Section XI requirements will be conducted in accordance with plant-specific procedures including inspection parameters such as lighting, distance, offset, and surface conditions.

The new One-Time Inspection program will be implemented prior to the period of extended operation. The one-time inspections will be performed within the 10 years prior to entering the period of extended operation.

NUREG-1801 Consistency

The One-Time Inspection aging management program is consistent with the ten elements of aging management program XI.M1, "One-Time Inspection," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the One-Time Inspection program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. Reactor Water Sulfates exceeded industry standard limits of 3.0 parts per billion (ppb). Between May and August of 2022, sulfates exceeded Action Level 1 (AL-1) concentrations (> 5.0 ppb) on four occasions. Continued operation at higher than nominal sulfate levels increases the possibility of Intergranular Stress Corrosion Cracking (IGSCC), limiting the usable life of the reactor vessel and challenging long-term continued operation of the plant. Increased sulfate levels were caused by degraded tank liner materials mixing in with the condensate polisher resin beds resulting in foreign rubber material leaching sulfates when exposed to operating temperatures. Degrading resin transfer components allowed the contaminated resin to be crushed to fines and bypass the resin traps into reactor feedwater. The sulfates from the bypassed resin entered the feedwater (FW) process stream and concentrated in the reactor pressure

vessel (RPV). The issue was entered into the Clinton corrective action program and evaluated to determine the cause and necessary corrective actions to prevent re-occurrence. Corrective actions were implemented to correct and eliminate the root cause of the high reactor water sulfate levels, including design changes to eliminate the rubber liner vulnerability, replacing the resin in all nine condensate polishers, developing and implementing a preventative maintenance strategy to prevent resin intrusion, implementing a case study to address any organization weaknesses, revising the templates for tanks, including guidance for inspections of tanks with lining materials and specifying the inspection frequency and methodology for lining material.

The One-Time Inspection aging management program will verify the effectiveness the Water Chemistry aging management program such that degradation does not jeopardize an intended function before the end of the period of extended operation.

2. In the fourth quarter of 2022, a fleet self-assessment was conducted to ensure all stations are maintaining their aboveground storage tanks and underground storage tanks containing chemicals and petroleum in accordance with applicable federal and state environmental regulatory requirements. Clinton found no deficiencies.

   The One-Time Inspection aging management program will verify the effectiveness the Fuel Oil Chemistry aging management program such that degradation does not jeopardize an intended function before the end of the period of extended operation.

3. In February 2017, the lubricating oil analysis for the ‘B’ standby liquid control pump trend indicated a decrease in viscosity and an increase in water content. A corrective action program issue report was initiated identifying that the nominal viscosity should be between 91 and 112 centistokes (cSt) and the last results indicate a viscosity of 92.4cSt and the water content was trending up. The water should be less than 1000 parts per million (ppm) and was currently at 1500 which is lower than the alert range of 2000 ppm. This trend information was used to prompt an oil change in the next available system window.

   The One-Time Inspection aging management program will verify the effectiveness the Lubricating Oil Chemistry aging management program such that degradation does not jeopardize an intended function before the end of the period of extended operation.

The operating experience relative to the One-Time Inspection aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the One-Time Inspection aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new One-Time Inspection aging management program will provide reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.22 Selective Leaching

Program Description

The Selective Leaching aging management program is a new condition monitoring program which ensures the integrity of the components that may be susceptible to loss of material due to selective leaching by demonstrating the absence of selective leaching. Susceptible materials are gray and ductile cast iron and copper alloy with greater than 15 percent zinc. Service environments of susceptible components within the scope of license renewal include raw water, closed cycle cooling water, treated water, waste water, and soil. There are no aluminum bronze in scope components with greater than eight percent aluminum in any environment. The aging management program includes visual examination, supplemented by hardness measurement or other appropriate examination methods, of a representative sample of components to determine whether loss of material by the preferential removal of one of the alloying elements from a material in an aqueous environment is occurring.

Inspections will be performed on a representative sample of the susceptible components and will focus on the bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and other bounding conditions. Twenty percent of the population with a maximum sample of 25 for each susceptible material and environment combination constitutes a representative sample size. For buried components, sample sizes may be determined based on the guidance provided in LR-ISG-2015-01. A technical justification of the methodology and sample size used for selecting components for inspection will be defined in the Selective Leaching Inspection Sample Basis Document. If selective leaching is found, the program will require an evaluation of the aging effect on the ability of the affected components to perform their intended function(s) during the period of extended operation. The sample size for each material and environment combination group may be expanded based on the results of the evaluation and laboratory testing. This confirmatory condition monitoring program will provide adequate inspection methods that are effective in demonstrating the absence of selective leaching.

The selective leaching process involves the preferential removal of one of the alloying elements from the material, which leads to the increased concentration of the remaining alloying elements. Dezincification (loss of zinc from brass) and graphitization (removal of iron from cast iron) are examples of such a process. Susceptible materials, high temperatures, stagnant-flow conditions, and a corrosive environment, such as acidic solutions for brasses with high zinc content and dissolved oxygen, are conducive to selective leaching. These environmental and material conditions are considered when choosing samples for inspection.

In treated water and closed cycle cooling water environments, chemistry is monitored in accordance with the Water Chemistry (B.2.1.2) and Closed Treated Water Systems (B.2.1.13) aging management programs to control corrosive contaminants and pH minimizing dissolved oxygen. In some cases, corrosion-inhibiting additives are used. These activities are considered effective in reducing the occurrence of selective leaching.

The new Selective Leaching aging management program will be implemented prior to the period of extended operation. One-time inspections for selective leaching will be conducted within the five years prior to entering the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching aging management program will be consistent with the ten elements of aging management program XI.M33, "Selective Leaching," specified in NUREG-1801, as modified by LR-ISG-2011-03, LR-ISG-2015-01, and LR ISG 2012 02 with the following exception:

Exceptions to NUREG-1801

1. The NUREG-1801 aging management program XI.M33, Selective Leaching, Element 4 states, "Twenty percent of the population with a maximum sample of 25 constitutes a representative sample size." A sample size of 20 percent of susceptible components will be subjected to a one-time inspection with a maximum of 25 inspections for copper with greater than 15 percent zinc components in water environments and gray and ductile cast iron components in soil environment; however, sample size of 15 susceptible components will be subjected to a one-time inspection for gray and ductile cast iron components in water environments. Program Elements Affected: Detection of Aging Effects (Element 4)

   Justification to Exception

   The gray and ductile cast iron population includes components in treated water environments, e.g., closed cycle cooling water, and untreated water environments, e.g., raw water. The inspection locations are a representative sample of the system population and focuses on the bounding or lead components most susceptible to aging due to severity of operating conditions, i.e., the sample population only includes locations in raw water and waste water environments. Due to a limited total population of gray and ductile cast iron components in raw water and waste water, a sample population of 15 provides reasonable assurance selective leaching can be detected prior to entering the period of operation.

Enhancements

None.

Operating Experience

The following example of operating experience provide objective evidence that the Selective Leaching program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. The Selective Leaching aging management program is a new program for Clinton. 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 descriptions. Plant-specific operating experience was reviewed to ensure that the operating experience discussed in the NUREG 1801 Chapter XI.M33 Selective Leaching aging management program is bounding (i.e., that there is no relevant plant-specific operating experience in addition to that described in NUREG-1801). The Clinton corrective action program and component history databases were searched to determine if selective leaching has been identified to date for components in the applicable material and environment combinations. In addition, the failure analysis database of the Constellation Power Labs (the research facility which performs detailed failure and metallurgical analyses for Constellation nuclear facilities) was researched to determine if selective leaching has been identified for components at Clinton. No occurrences of selective leaching were identified in an extensive search of Clinton historical information and operating experience.

The operating experience relative to the Selective Leaching aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of material. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the Selective Leaching aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new Selective Leaching aging management program will provide reasonable assurance that the loss of material aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.23 One-time Inspection of ASME Code Class 1 Small-Bore Piping

Program Description

The One-time Inspection of ASME Code Class 1 Small-Bore Piping aging management program is a new conditioning monitoring program that augments the existing ASME Code, Section XI requirements. The program will manage cracking of piping in a reactor coolant environment. The program will perform one-time inspection of a sample of ASME Code Class 1 piping less than nominal pipe size (NPS) 4-inches and greater than or equal to NPS 1-inch. The program includes pipes, fittings, branch connections, and full penetration (butt) welds and partial penetration (socket) welds. The program provides for a one-time inspection of a sample of the population of welds (butt welds or socket welds) for plants that have not experienced cracking or have experienced cracking but have implemented corrective actions, such as a design change, to effectively mitigate the cause(s) of the cracking. The program provides for periodic inspection of a sample of the population of welds (butt welds or socket welds) that have experienced cracking and have not implemented corrective actions to effectively mitigate the cause(s) of the cracking. There have been no instances of cracking of ASME Code Class 1 small-bore piping at Clinton over 35 years of operation and this one-time inspection program is applicable and adequate to manage this aging effect during the period of extended operation. Program inspections will augment ASME Code, Section XI requirements.

For the current fourth 10-year interval, the ISI program applies the requirements of ASME Code, Section XI, 2013 Edition. Risk Informed Inservice Inspection (RISI) alternative requirements to Examination Categories for Class 1 welds as approved by relief request. Any deviation from ASME Code, Section XI requirements must be approved by the NRC per a relief request. The One-time Inspection of ASME Code Class 1 Small-Bore Piping program will also include inspection of socket welds by using a volumetric examination technique demonstrated to be capable of detecting cracking. If such a volumetric examination technique is not available by the time of the inspections, the examination method will be by destructive examination. If destructive examinations are performed, each examination will be credited as equivalent to two volumetrically examined socket welds.

Clinton has been operating for more than 35 years without experiencing cracking of ASME Code Class 1 small-bore piping due to stress corrosion, cyclical (including thermal, mechanical, and vibration fatigue) loading, or thermal stratification and thermal turbulence. The inspection sample size will include at least three percent of the population of program butt welds with a maximum of 10 program butt welds and at least three percent of the population of program socket welds with a maximum of 10 program socket welds. This methodology results in nine butt welds, and nine socket welds selected for one-time inspection. This ensures an adequate sample size to provide confidence that the aging effect of cracking is not an issue at Clinton. Sample locations will be selected based on susceptibility for cracking due to stress corrosion cracking and fatigue, consequence of failure, inspectability, dose considerations, operating experience, and limiting locations of the total population of ASME Code Class 1 small-bore piping locations. The program includes controls to implement an alternate plant-specific periodic inspection aging management program should evidence of ASME Class 1 small bore piping cracking caused by intergranular stress corrosion cracking (IGSCC) or fatigue be revealed by review of Clinton operating experience prior to the period of extended operation, or by the examinations performed as part of this program. The new One-time Inspection of ASME Code Class 1 Small-Bore Piping program will be implemented prior to the period of extended operation. One-time inspections will be performed within the six years prior to entering the period of extended operation. A tabulation of Class 1 small-bore piping welds that are greater than or equal to NPS 1-inch, and less than NPS 4-inches; sorted by weld type, the total number of welds in the population, and the number of welds to be inspected is as follows:

Number of Welds (1 inch ≤ NPS < 4 inch)		
	Total Welds in the Population	**Number of Welds to be Inspected per this Program**
Butt Welds	299	9 (3%)
Socket Welds	305	9 (3%)

NUREG-1801 Consistency

The One-time Inspection of ASME Code Class 1 Small-Bore Piping aging management program is consistent with the ten elements of aging management program XI.M32, "One-time Inspection of ASME Code Class 1 Small-Bore Piping," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the One-time Inspection of ASME Code Class 1 Small-Bore Piping program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. During 2017 refueling outage, per the ISI Program an ultrasonic examination was performed on reactor recirc dissimilar (DM) Weld N1B-W-1 to meet the augmented program requirements of the IGSCC program. During the examination, a planar indication (embedded

discontinuity) was discovered in the weld. The planar indication is considered a subsurface indication. This indication is not connected to the inner diameter (ID) surface. This indication is 0.80 inches long and has a through wall dimension of 0.45 inches. The top of the indication is located 0.45 inches from the outside surface. Per the ISI Program this weld was evaluated per IWB-3514. Based on the thickness of the pipe wall (excluding cladding) of 1.54 inches an aspect ratio calculation was performed. This calculation showed that this indication exceeded the allowable limits specified in Section XI, therefore, was unacceptable. This weld was examined in accordance with the requirements of ASME Section XI, Appendix VIII. This item was evaluated as acceptable prior to completion of the outage. As required by IWB-2420 an ultrasonic examination was performed during the 2019 refueling outage, and results were compared with the previous outage results. No measurable change was observed.

No ASME Code Class 1 small-bore piping failures or degradation issues were identified; however, this example provides objective evidence that the measures in place to detect cracking of ASME Code Class 1 small-bore piping, caused by IGSCC and fatigue, will be effective.

2. A search of the License Event Database found no evidence of failure or degradation of any Clinton ASME Code Class 1 Small-Bore piping. Operating experience relative to the One-time Inspection of ASME Code Class 1 Small-Bore Piping aging management program did not identify an adverse trend in performance. A review of plant operating experience was performed to determine if Unit 1 has experienced cracking of ASME Code Class 1 small-bore piping caused by IGSCC or fatigue during its operating history. The review included a key word search of the corrective action program database, a review NRC correspondence, and an interview with the Clinton ISI program owner for input as to whether cracking of Class 1 small-bore piping has occurred. The review did not identify any cracking of ASME Code Class 1 small-bore piping caused by age-related IGSCC or fatigue that has occurred during the Unit 1 operating history.

   Periodic volumetric examinations of ASME Code Class 1 small-bore piping butt welds and visual external surface examinations of ASME Code Class 1 small-bore piping socket welds have been performed in accordance with the Risk Informed ISI program since 2002 on Unit 1 with no unacceptable examination results. Prior to 2002, ASME Code Class 1 small-bore piping butt welds and socket welds received periodic visual external surface examination per ASME Code, Section XI, Table IWB-2500-1 Examination Category B-J, Item Nos. B9.21, B9.32, and B9.40.

   This example provides objective evidence that a one-time inspection program is appropriate. Based on the results of these inspections, it will determine if a periodic program is required during the period of extended operations.

The operating experience relative to the One-time Inspection of ASME Code Class 1 Small-Bore Piping aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including cracking. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the One-time Inspection of ASME Code Class 1 Small-Bore Piping aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new One-time Inspection of ASME Code Class 1 Small-Bore Piping aging management program will provide reasonable assurance that the aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.24 External Surfaces Monitoring of Mechanical Components

Program Description

The External Surfaces Monitoring of Mechanical Components aging management program is a new condition monitoring program that directs visual inspections of external surfaces of components be performed during system inspections and walkdowns. The program consists of periodic visual inspection of metallic, fiberglass, and polymeric components such as piping, piping components, ducting, and other components within the scope of license renewal exposed to air–indoor uncontrolled, air–outdoor, and condensation environments. The program manages the aging effects of cracking, hardening and loss of strength, loss of material, and reduced thermal insulation resistance of metallic and polymeric materials through visual inspection of external surfaces for evidence of loss of material, cracking, and changes in material properties. When appropriate for the component and material, visual inspections are supplemented by physical manipulation to detect hardening and loss of strength of polymers.

The External Surfaces Monitoring of Mechanical Components aging management program includes visual inspection of the metallic jacketing on thermal insulation to ensure that the jacketing is performing its function to protect the insulation from damage, such as in-leakage of moisture, that could reduce the thermal resistance of the insulation.

The program includes periodic representative inspection of outdoor insulated components except tanks; and indoor insulated components and tanks where the process fluid temperature is below the dew point. The inspections require removal of insulation to detect loss of material due to corrosion under the insulation. These inspections will be conducted during each 10-year period of the period of extended operation. The representative sample includes 20 percent of the piping length or 20 percent of the surface area for components other than piping for each material type. Alternatively, 25 components or 25 one-foot axial length sections of piping may be inspected for each material type. Inspections are conducted for each material and environment combination where condensation or moisture on the surfaces of the component could occur routinely or seasonally.

For indoor tanks, the representative inspection includes 20 percent of the surface area or 25 one-square-foot sections. The inspection areas will be distributed to include tank domes, sides, near bottoms, at points where structural supports or instrument nozzles penetrate the insulation and where water is most likely to collect.

If the initial representative inspection verifies no loss of material beyond that which could have been present during initial construction, then subsequent inspections will consist of inspection of the external surface of the insulation for indications of damage or evidence of water intrusion through the insulation to the component surface. If insulation damage or evidence of water intrusion through the insulation is identified, then periodic inspection of the component surface under the insulation will continue.

The program does not require removal of tightly adhering insulation that is impermeable to moisture unless there is evidence of damage to the moisture barrier. Instead, the program includes visual inspection of the entire population of piping and components during each 10-year period of the period of extended operation.

Materials of construction inspected under this program include aluminum, carbon steel, ductile cast iron, polymers, gray cast iron, galvanized steel, copper alloys, fiberglass, and stainless steel. Examples of components this program inspects are piping and piping elements, ducting, heat exchangers, tanks, pumps, compressors, insulation jacketing, and other components. The parameters monitored by visual inspection for metallic components will include evidence of rust, corrosion, and material wastage; leakage from or onto external surfaces; worn, flaking, or oxide-coated surfaces; corrosion stains, deterioration, or damage of thermal insulation; cracking, flaking, and blistering of protective coatings; and leakage for detection of cracks on the external surfaces of stainless steel components exposed to an outdoor air environment. The parameters monitored by visual and tactile inspections for polymeric components will include surface cracking, crazing, scuffing, dimensional change (e.g., “ballooning” and “necking”); discoloration; exposure of internal reinforcement for reinforced polymers; and hardening as evidenced by a loss of suppleness during manipulation where the component and material are appropriate for manipulation.

Inspections, with the exception of inspections performed to detect corrosion under insulation, are performed at a frequency not to exceed one refueling cycle. This frequency accommodates inspections of components that may be in locations that are normally only accessible during outages. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at such intervals that would ensure the components' intended functions are maintained. Inspections performed to detect corrosion under insulation will be conducted during each 10-year period of the period of extended operation.

Any visible evidence of degradation will be evaluated for acceptability of continued service. Acceptance criteria will be based upon component, material, and environment combinations. Deficiencies will be documented and evaluated under the corrective action program.

The external surfaces of components that are buried are inspected via the Buried and Underground Piping and Tanks (B.2.1.28) program. The external surfaces of aboveground tanks are inspected via the Aboveground Metallic Tanks (B.2.1.18) program. This program does not provide for managing aging of internal surfaces. The new External Surfaces Monitoring of Mechanical Components aging management program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The External Surfaces Monitoring of Mechanical Components aging management program is consistent with the ten elements of aging management program XI.M36, "External Surfaces Monitoring of Mechanical Components," specified in NUREG-1801, as modified by LR-ISG-2011-03 and LR-ISG-2012-02.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the External Surfaces Monitoring of Mechanical Components aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. During a 2021 walkdown of the demineralized water makeup system, an operator noticed water leaking by the insulation on a backwash pump discharge check valve. When the insulation was removed to investigate the leak source, it was discovered to be a through wall leak. This condition was entered into the corrective action program for follow up action. The associated equipment is scheduled to be abandoned.

   This example provides objective evidence that the visual inspections performed in system walkdowns, which will be utilized for the External Surfaces Monitoring of Mechanical Components program, are effective in identifying degraded conditions of metallic components; and that the corrective action program is effectively used to assess and monitor degraded conditions which are identified and to perform corrective actions when appropriate.

2. During a walkdown in 2020 of the residual heat removal system, there was a pin-hole size leak identified on the residual heat removal (RHR) A pump on the emergency core cooling system (ECCS) RHR heat exchanger room 1A coil cabinet. The condition was entered into the corrective action program for evaluation. The extent of the condition was a cooling coil leak found with a pin-hole size through wall leak associated with wall-thinning due to erosion-corrosion in tubing between the manifold and the cooling tubes for cooling coil. In addition, actions were taken to repair and replace the coil.

This example provides objective evidence that external visual inspections can identify loss of material, and that the corrective action program is an effective tool for evaluating degraded conditions, addressing the extent of condition, and establishing appropriate corrective actions.

3. During a drywell cooling system (VP) insulation walkdown in 2019, there were minor problems observed for the VP piping insulation in the drywell. The walkdown identified portions of insulation were missing on components associated with the VP system. This condition was entered into the corrective action program for follow up action. Follow up determined the minor degradation does not impact the ability of VP to perform its intended function of maintaining the drywell temperature.

   This example provides objective evidence that the visual inspections performed in system walkdowns, which will be utilized for the External Surfaces Monitoring of Mechanical Components aging management program, are effective tool used to identify and fix degraded conditions.

The operating experience relative to the External Surfaces Monitoring of Mechanical Components aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that the implementation of the External Surfaces Monitoring of Mechanical Components aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new External Surfaces Monitoring of Mechanical Components aging management program will provide reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.25 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Program Description

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program is a new condition monitoring program that will consist of inspections of the internal surfaces of metallic, elastomeric, and polymeric components such as piping, piping components and piping elements, ducting components, tanks, heat exchanger components, and other components that are exposed to environments of air, closed cycle cooling water, condensation, diesel exhaust, treated water, raw water, and waste water. These internal inspections will be performed during the periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection. At a minimum, in each 10-year period during the period of extended operation, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) or a maximum of 25 components per population will be inspected. Where practical, the inspections will focus on the bounding or lead components most susceptible to aging because of time in service and severity of operating conditions. Opportunistic inspections will continue in each period even after meeting the sampling limit.

The program will manage the aging effects of loss of material, reduction of heat transfer, flow blockage, and cracking for metallic components. The program will also manage the aging effects of loss of material and hardening and loss of strength for elastomeric and polymeric components. The program will include visual inspections to ensure that existing environmental conditions are not causing material degradation or flow blockage that could result in a loss of the component’s intended function. For certain materials, such as elastomers, physical manipulation to detect hardening or loss of strength will be used to supplement the visual examinations conducted under this program.

The new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program will be consistent with the ten elements of aging management program XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” specified in NUREG-1801, as modified by LR-ISG-2012-02 and LR-ISG-2013-01.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In May 2017, while performing maintenance on a main steam isolation valve, a VT-3 examination of the internal surfaces of the valve found several indications. The inspection results were entered into the corrective action program for evaluation. The evaluation concluded that there were no adverse impacts associated with the flaws identified. The vendor reviewed the reported indications and concluded that they do not affect the valve design. Furthermore, the vendor concurred that no further rework of the valve was required.

   This example demonstrates that deficiencies are entered into the corrective action program and appropriate corrective actions are taken to adequately evaluate the material condition of plant components.

2. In October 2021, during an inspection of a containment building HVAC damper it was found that water had been entering the associated ducting and that there was considerable corrosion and rusting present. The source of water was from condensation on a chilled water line above the ducting. The chilled water pipe insulation was found degraded which allowed the condensation to occur. The condition was entered into the Corrective Action Program and a work order was created to repair or replace the corroded ductwork. Repairs are currently scheduled for 2024.

   This example demonstrates that deficiencies are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct deficiencies.

The operating experience relative to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program indicates that the inspection methods that will be implemented by the program will be effective in detecting aging effects including cracking, hardening and loss of strength, loss of material, reduction of heat transfer, and flow blockage. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program will provide reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.26 Lubricating Oil Analysis

Program Description

The Lubricating Oil Analysis aging management program is an existing condition monitoring program that provides monitoring of oil condition to manage loss of material and reduction of heat transfer in gearboxes, piping, piping components, heat exchangers, and tanks within the scope of license renewal exposed to a lubricating oil environment. Sampling, analysis, and condition monitoring activities identify specific wear products and verify that the contamination levels (primarily water and particulates) and the physical properties of lubricating oil are maintained within acceptable limits to ensure that component intended functions are maintained. The presence of water or particulates may also indicate in-leakage and corrosion product buildup.

The program directs condition monitoring activities (sampling, analyses, and trending), thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer. The lubricating oil testing (sampling and analysis) and condition monitoring activities identify detrimental contaminants such as water, sediments, specific wear elements, and elements from an outside source. The contaminant levels (e.g., water and particulates) are trended in the program's database, and recommendations are made when adverse trends are observed, which could include in-leakage and corrosion product buildup.

The Lubricating Oil Analysis program applies monitoring methods that are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant degradation.

NUREG-1801 Consistency

The Lubricating Oil Analysis aging management program will be consistent with the ten elements of aging management program XI.M39, "Lubricating Oil Analysis," specified in NUREG-1801 with the following enhancement:

Exceptions to NUREG-1801

None.

Enhancements

1. Perform lubricating oil analysis of the old oil following periodic oil changes for the control room HVAC chilled water pumps A and B, and the fire protection jockey pump. Program Elements Affected: Preventive Actions (Element 2), Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4)

Operating Experience

The following examples of operating experience provide objective evidence that the Lubricating Oil Analysis aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing bases during the period of extended operation:

1. In January 2014, oil analysis results identified a large rise in direct read (DR) ferrous wear particle counts (WPC) for the high pressure core spray (HPCS) water leg pump. A corrective action program issue report was initiated. Additionally, there was a small increase in iron and no increase in chrome, nickel, and lead. There was a slight increase in tin. Since neither chrome nor nickel was identified, the ball bearings and race were deemed not affected, concluding that the wear must be from the pump and/or bearing housing. Monthly vibration data has not identified any problem or negative trend and the quarterly in-service testing pump data has been acceptable. Since the oil analysis did not identify any bearing or race damage and the monthly vibration reading is within acceptance criteria the HPCS water leg pump was considered acceptable for continued operation. It was recommended to generate a work order and schedule an additional oil sample and oil change which was completed in October 2014.

   This example provides objective evidence that the Lubricating Oil Analysis aging management program effectively samples for critical lubricating oil parameters, which results in detection of potential conditions adverse to quality and appropriate actions to correct the conditions. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence.

2. In February 2017, the lubricating oil analysis for the 'B' standby liquid control pump trend indicated a decrease in viscosity and an increase in water content. Nominal viscosity should be between 91 and 112 Centistokes (cSt) with test results indicating a viscosity of 92.4 cSt. The water content was measured at 1500, lower than the fault value of 2,000 ppm, but in the alert range and trending up. An issue was generated and entered into the correction action program. The oil was determined to be acceptable for short term continued operation. A work order was generated, and the oil was replaced in March of 2017.

   This example provides objective evidence that the Lubricating Oil Analysis aging management program effectively samples for critical lubricating oil parameters, which results in detection of potential conditions adverse to quality and appropriate actions to correct the conditions. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence.

3. In the October 2019 refueling outage, the lubricating oil analysis of the “B” reactor recirculation pump motor inboard bearing oil indicated elevated copper levels of 57 ppm which is in the fault level per lubricating program procedure guidance. A corrective action program issue report was initiated stating the copper levels have been at the fault level for three of the last five oil samples dating back to 2011, all other wear metals are at the low detection limit of 1 ppm or lower, the wear particle concentration is low (less than one third the guideline limit), and the particle count of the oil was acceptable. The lower guide bearing is made of steel, bronze and babbit material. Since no other metals such as iron, lead, tin or nickel were present, it was believed that the source of the copper was the oil cooler. The oil cooler is made of copper tubing with aluminum fins. This condition was discussed with the lubricating oil program owner and it was determined that there was no cause for concern with the motor bearing condition. The oil was drained and replaced in the refueling outage.

   This example provides objective evidence that the Lubricating Oil Analysis aging management program effectively samples for critical lubricating oil parameters, which results in detection of potential conditions adverse to quality and appropriate actions to correct the conditions. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence.

The operating experience relative to the Lubricating Oil Analysis aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of material and reduction of heat transfer. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Lubricating Oil Analysis aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation .

Conclusion

The enhanced Lubricating Oil Analysis aging management program will provide reasonable assurance that the loss of material and the reduction of heat transfer aging effects will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.27 Monitoring of Neutron-Absorbing Materials Other than Boraflex

Program Description

The Monitoring of Neutron-Absorbing Materials Other than Boraflex aging management program is an existing condition monitoring program that includes periodic inspection and analysis of Metamic test coupons of the neutron-absorbing material in the spent fuel storage racks to determine if the neutron-absorbing capability of the material has degraded in a treated water environment. Racks containing Boral material will be managed utilizing the guidance of NEI 16-03-A, “Guidance for Monitoring Fixed Neutron Absorbers in Spent Fuel Pools.” The Monitoring of Neutron-Absorbing Materials Other than Boraflex aging management program ensures that a five percent sub-criticality margin in the spent fuel pool is maintained during the period of extended operation by monitoring for loss of material, changes in dimension, and loss of neutron-absorption capacity of the material.

The Monitoring of Neutron-Absorbing Materials Other than Boraflex aging management program includes monitoring of changes in physical characteristics of the material in the spent fuel storage racks through visual inspections, dimensional measurements, neutron-attenuation testing, and weight and specific gravity measurements of test coupons. Results of each coupon surveillance are documented and retrievable for purposes of trending. Acceptance criteria thresholds are established as indicators of potential adverse trends in the condition of the neutron-absorbing material to ensure corrective actions are taken prior to compromising the five percent sub-criticality margin as contained within the spent fuel pool criticality analysis.

NUREG-1801 Consistency

The Monitoring of Neutron-Absorbing Materials Other Than Boraflex aging management program will be consistent with the ten elements of aging management program XI.M40, "Monitoring of Neutron-Absorbing Materials Other Than Boraflex,” specified in NUREG-1801 with the following enhancement:

Exceptions to NUREG-1801

None.

Enhancements

1. Perform NES rack (Boral material) inspections and testing per NEI 16-03-A guidance at a frequency not to exceed 10 years during the period of extended operation to assure proper neutron attenuation is maintained. Scope of Program (Element 1), Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), and Acceptance Criteria (Element 6)

Operating Experience

The following examples of operating experience provide objective evidence that the Monitoring of Neutron-Absorbing Materials Other Than Boraflex aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. Work orders document the Metamic inspections performed in January 2009, August 2011, and September 2019, respectively. Visual inspections of these coupon indicated no signs of bubbling, blistering, cracking, or flaking was observed. All dimensional measurements were within the acceptance criteria.

   Results from each post-irradiated coupon surveillance were compared to the original pre-irradiated data for evidence of blistering, swelling (bulging), loss of material, and decrease in boron-10 areal density to determine if there has been any loss of neutron-absorption capability, and it was confirmed that no significant deterioration or degradation had occurred. These examples provide objective evidence that the Monitoring of Neutron Absorbing Materials Other Than Boraflex program effectively monitors the parameters that are indicators of the ability of the Metamic to perform its intended function. The existing program contains acceptance criteria that will identify adverse trends in the ability of the Metamic material to absorb neutrons prior to a loss of intended function to ensure the assumptions in the spent fuel pool criticality analysis remain valid.

2. Management of NES Racks containing Boral is based on operating experience of other facilities utilizing Boral that have coupons installed and that are routinely inspected and ongoing participation in the Electric Power Research Institute (EPRI) Neutron Absorber Users Group (NAUG) and its' related programs. To date, no issues have been identified concerns of Boral due to aging.

The operating experience relative to the Monitoring of Neutron-Absorbing Materials Other Than Boraflex aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including reduction of neutron absorbing capacity; change in dimensions and loss of material. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Monitoring of Neutron-Absorbing Materials Other Than Boraflex aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Monitoring of Neutron-Absorbing Materials Other Than Boraflex aging management program will provide reasonable assurance that the reduction of neutron absorbing capacity; change in dimensions and loss of material aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.28 Buried and Underground Piping and Tanks

Program Description

The Buried and Underground Piping and Tanks aging management program is an existing condition monitoring program that manages the aging effect of loss of material associated with the external surfaces of buried piping. It addresses piping composed of steel and cast iron exposed to soil.

There are no buried or underground tanks or underground piping within the scope of license renewal. There is no cementitious, polymeric, or stainless-steel piping within the scope of license renewal.

The program manages aging through preventive and mitigative actions (i.e., coatings, backfill quality, and cathodic protection), and relies on inspection activities, including visual examination of coated buried and underground piping, electrochemical verification of the effectiveness of the cathodic protection system, nondestructive evaluation of pipe wall thicknesses, and performance monitoring of fire mains. The number of inspections is based on the effectiveness of the preventive and mitigative actions. Annual cathodic protection surveys are conducted. The program uses the -850mV relative to copper/copper sulfate reference electrode (CSE), instant off criterion specified in NACE SP0169, “Control of External Corrosion on Underground or Submerged Metallic Piping Systems,” for acceptance criteria for steel piping and determination of cathodic protection system effectiveness in performing cathodic protection surveys. The program includes an upper limit of -1200mV on cathodic protection pipe-to-soil potential measurements of coated pipes to preclude potential damage to coatings. For steel components, where the acceptance criteria for the effectiveness of the cathodic protection is other than -850 mV instant off, loss of material rates are measured. The program allows for soil corrosion probes to be used to demonstrate cathodic protection effectiveness during the annual surveys.

Inspections are conducted by qualified individuals. Where the coatings, backfill, or the condition of exposed piping does not meet acceptance criteria such that the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material rate is projected to the end of the period of extended operation, the sample size will be increased. Degraded conditions such as loss of material, damaged coatings, non-conforming backfill, or improper cathodic protection system voltage are evaluated under the corrective action program. If a reduction in the number of inspections recommended in NUREG-1801 AMP XI.M41, as modified by LR-ISG-2015-01, Table XI.M41-2, is claimed based on a lack of soil corrosivity, as determined by soil testing, then soil testing is conducted once in each 10-year period, starting 10 years prior to the period of extended operation.

Aging management of the buried Fire Protection System piping will be accomplished through monitoring the activity of the jockey pump. This program does not address loss of material due to selective leaching. The Selective Leaching (B.2.1.22) program is used to manage loss of material due to selective leaching of susceptible materials.

The program will be enhanced prior to the period of extended operation as described below to provide reasonable assurance that buried and underground piping and components will perform their intended function during the period of extended operation.

NUREG-1801 Consistency

The Buried and Underground Piping and Tanks aging management program will be consistent with the ten elements of aging management program XI.M41, "Buried and Underground Piping and Tanks," specified in NUREG-1801, as modified by LR-ISG-2015-01 with the following exception and enhancements:

Exceptions to NUREG-1801

1. Section 3.2 subsection f requires backfill to be consistent with SP0169-2007, Section 5.2.3 or NACE RP0285-2002, "Corrosion Control of Underground Storage Tanks Systems by Cathodic Protection," Section 3.6. The NRC considers backfill that is located within 6 inches of the component that meets ASTM D 448-08, "Standard Classification for Sizes of Aggregate for Road and Bridge Construction," size number 67 to meet the objectives of NACE SP0169-2007 and NACE RP0285-2002. The aggregate size for Clinton allows for material which is larger than the one inch specified in ASTM D 448-08 Size 67.

   Justification for Exception:

   Based on the original design specification and drawings, the aggregate size for Clinton allows for material which is larger than the one inch specified in ASTM D 448-08 Size 67. The specification allows for an aggregate size of no larger than three inches; however, any aggregate near safety related pipe is listed with a maximum size of 1-1/2 inches. This maximum size would be the next sieve size up in the ASTM standard and would meet the requirements of Size 57. This difference in size still meets the intent of the backfill requirements provided in both NACE standards SP0169-2007 and NACE RP0285 and does not substantially impact the risk to piping. The backfill is a homogenous material that is compatible with the coating and cathodic protection system and is free of rocks, trash, debris, ice, and other non-homogeneous materials. Additionally, past buried piping inspections have identified no damage to the coating system as a result of this difference in backfill size.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

1. Perform extent of condition inspections as follows: When measured pipe wall thickness, projected to the end of the period of extended operation, does not meet the minimum pipe wall thickness requirements due to external environments, the number of inspections within the affected piping categories will be doubled or increased by five, whichever is smaller. If adverse indications are found in the expanded sample, an analysis will be conducted to determine the extent of condition and extent of cause. The size of the follow-up inspections will be determined based on the analysis. Timing of any additional inspections will be based on the severity of the identified degradation and the consequences of leakage or loss of function. Any additional inspections will be performed within the same 10-year inspection interval in which the original degradation was identified, or within four years after the end of the 10-year interval if the degradation was identified in the latter half of the 10-year interval. Expansion of sample size may be limited by the extent of piping subject to the observed degradation mechanism or if the piping system or portion of the system is replaced or otherwise mitigated within the same 10-year inspection interval in which the original degradation was identified or within four years after the end of the 10-year interval, if the degradation was identified in the latter half of the 10-year interval. Program Elements Affected: Monitoring and Trending (Element 5), Acceptance Criteria (Element 6), and Corrective Actions (Element 7)

2. Perform annual system monitoring of the cathodic protection system to ensure effective protection of buried piping. Program Element Affected: Preventive Actions (Element 2)

3. Perform direct visual inspections of buried piping in accordance with LR-ISG-2015-01, “Changes in Buried and Underground Piping and Tank Recommendations,” Table XI.M41-2, during each 10-year interval, beginning 10 years prior to the period of extended operation. The inspection quantities to be performed on buried piping are determined based on the as-found results of cathodic protection system availability and effectiveness as recommended in LR-ISG-2015-01, Table XI.M41-2. The length of piping sections for each inspection will be based on the guidance in LR-ISG-2015-01, section 4 paragraph c. Program Element Affected: Detection of Aging Effects (Element 4)

Operating Experience

The following examples of operating experience provide objective evidence that the Buried and Underground Piping and Tanks aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2022, it was identified that tasks associated with annual buried water pipe inspections were not able to be performed as scheduled. The inspections required vendor support for guided wave activities, but the vendor was not contacted to support the tasks. A gap was identified that a work order task was not created that directed maintenance personnel to contact applicable vendors. This has created a miscommunication between maintenance and engineering personnel which ultimately led to the non-communication to the applicable vendor to support work order tasks documented in the work order.

   As a response to this, actions were created and completed to ensure that future inspections are completed as scheduled. These actions included rescheduling the work, adding appropriate steps in the work order to ensure the vendor is contacted, transferring the work contract to the appropriate group and discuss with the involved groups the roles and responsibilities as documented in the chain of custody documentation. Guided wave inspections assist with identifying areas that may require additional inspections such as external visual or UT examinations.

   This example provides objective evidence that the site adequately identifies and responds to issues that are identified in the corrective action program.

2. Inspections at Clinton were performed starting in 2013 to comply with NEI 09-14, “Nuclear Buried Piping Integrity Initiative.” These inspections required excavations and assessments to develop reasonable assurance of the leakage/structural integrity of buried piping. These inspections included multiple systems which also included two systems which are part of license renewal.

   Assessments driven by this initiative included evaluation of external corrosion susceptibility based upon materials of construction, soil conditions, coatings effectiveness, and cathodic protection system health. These excavations provided for direct visual observation of the external coatings and surfaces of piping and allowed for the assessment of conditions. The direct inspections noted that significant external general corrosion was not occurring as a result of the effectiveness of the preventative actions of the coatings, backfill, and cathodic protection.

   As an example of one of these inspection requirements, 2014 non-destructive examination (NDE) ultrasonic (UT) inspections were performed on the 30-inch “A” shutdown service water line, resulting in wall thickness readings that were lower than surrounding readings. Based upon projected wear rates at that location, the condition was entered into the corrective action program with a recommendation to perform an additional inspection in 2020. The follow up inspection showed that very minimal wear had occurred at that location since the previous inspection.

This example provides objective evidence that a comprehensive buried piping inspection program, that performs indirect and direct inspections focusing on high risk buried piping, has been implemented. Upon discovery of adverse indications, the program appropriate corrective actions are implemented. This example demonstrates that the inspection techniques implemented in this program are capable of detecting age-related degradation prior to a loss of the component intended function. This example also provides evidence that industry operating experience (NEI 09-14) is incorporated into the aging management program.

3. In December of 2022, a cathodic protection annual survey was performed by a vendor and a report was submitted to the station in early 2023. The report provided several short-term and long-term recommendations including rectifier trouble shooting, adding test locations, replacing depleted anodes, and other general CP system upgrades. The results of the report were entered into the corrective action program. Degraded equipment issues at CPS have resulted in a red sub-indicator for the cathodic protection health parameter under the equipment cornerstone of the health report. A contract has been approved for a vendor to perform some of the short-term recommendation work. The station will also evaluate additional work that will be required to address the long-term recommendations.

   This example provides objective evidence that although the current state of the cathodic protection system is degraded, measures to maintain and enhance the cathodic protection system are being implemented to ensure adequate preventive measures are in place to protect buried piping during the second period of extended operation.

The operating experience relative to the Buried and Underground Piping and Tanks aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Buried and Underground Piping and Tanks aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Buried and Underground Piping and Tanks aging management program will provide reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.29 ASME Section XI, Subsection IWE

Program Description

The scope of the ASME Section XI, Subsection IWE aging management program is an existing condition monitoring program based on ASME Code and complies with the provisions of 10 CFR 50.55a. The program consists of periodic visual and volumetric examination of pressure-retaining components of steel and concrete containments for signs of degradation, and assessment of damage. The program includes aging management of surfaces and components such as the steel and stainless steel containment liner plate surfaces and components, including its integral attachments, penetration sleeves and closures, pressure-retaining bolting for containment closure, personnel airlock and equipment hatches, reinforced concrete structure and other pressure-retaining components for loss of material, loss of preload, loss of leaktightness, and loss of sealing in air–indoor uncontrolled and treated water environments. Acceptability of inaccessible areas of steel containment shell is evaluated when conditions found in accessible areas indicate the presence of, or could result in, flaws or degradation in inaccessible areas.

The ASME Section XI, Subsection IWE aging management program is an existing condition monitoring program based on ASME Code and complies with the provisions of 10 CFR 50.55a. The program consists of periodic visual and volumetric examination of pressure-retaining components of steel and concrete containments for signs of degradation, and assessment of damage.

The current program complies with ASME Section XI, Subsection IWE, 2013 Edition, supplemented with the applicable requirements of 10 CFR 50.55a. In accordance with 10 CFR 50.55a(g)(4), the in-service inspection (ISI) program is updated each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified 18 months before the start of the inspection interval. The ASME Code edition consistent with the provisions of 10 CFR 50.55a will be used during the period of extended operation.

The Clinton primary containment is a BWR Mark III concrete containment. High strength containment closure bolting susceptible to cracking is not used; therefore, surface examination to detect cracking is not applicable. Environments include air-indoor uncontrolled and treated water. The scope of the ASME Section XI, Subsection IWE program is consistent with the scope identified in Subsection IWE-1000 and includes the Class MC pressure-retaining components and their integral attachments including wetted surfaces of submerged areas of the pressure suppression chamber, containment pressure-retaining bolting, and metal containment surface areas, including welds and base metal. Containment seals and gaskets are included in the scope of the 10 CFR Part 50, Appendix J (B.2.1.32) program. Service Level I coatings are included in the scope of the Protective Coating Monitoring and Maintenance Program (B.2.1.36).

The program utilizes inspections that detect degradation before loss of intended function. The program implements the requirements of IWE by providing visual examinations (General Visual and VT 3) and augmented inspections (VT-1) for evidence of aging effects that could affect structural integrity or leak tightness of the primary containment. Areas subject to augmented inspection are subject to visual inspection (VT-1) and volumetric (ultrasonic) examination techniques as required by engineering. The program addresses the E-A, E-C and E-G examination categories described in Table IWE-2500-1 and as approved per 10 CFR 50.55a. The program specifies examinations of accessible surfaces to detect aging effects as addressed in IWE-3500. The frequency and scope of examinations specified is in accordance with 10 CFR 50.55a, and ASME Section XI, Subsection IWE 2400.

The ASME Section XI, Subsection IWE program complies with ASME Section, XI Subsection IWE for inspection of Class MC and metallic shell and penetration liners of Class CC pressure-retaining components and their integral attachments, in accordance with the provisions of 10 CFR 50.55a. The monitoring methods have been demonstrated effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant aging. The concrete portions of the primary containments are inspected in accordance with ASME Section XI, Subsection IWL program.

The ASME Section XI, Subsection IWE program provides for periodic inspections for the presence of age-related degradation on all accessible surfaces of the containment on a scheduled basis. When examination results require an evaluation or the component is repaired and is found to be acceptable for continued service, the areas containing such flaws, degradation, or repair are reexamined during the next inspection period, in accordance with examination category E-C.

The acceptance criteria for the ASME Section XI, Subsection IWE program are in accordance with the requirements of the ASME Code, Subsections IWE-3000 and IWE-3500.

Category E-A examinations are conducted by a qualified VT-3 examiner; and Category E-C examinations are conducted by a qualified VT-1 examiner. Indications are evaluated and compared to acceptance standards. The IWE responsible individual is responsible for evaluation of examination results. Unacceptable conditions are recorded and documented in accordance with the corrective action program and supplemental examinations are performed in accordance with IWE-3200. Conditions which do not meet the acceptance criteria are accepted by an engineering evaluation or corrected by repair or replacement in accordance with IWE-3122.

Repairs and reexaminations, when required, are performed in accordance with IWA-4000 as required by IWE-3124 and the components are repaired or replaced to the extent necessary to meet the acceptance standards of IWE-3500. Component reexaminations are conducted in accordance with the requirements of IWA-2200 and the results are recorded to demonstrate that the repair meets the owner defined acceptance standards per IWE-3500.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWE aging management program will be consistent with the ten elements of aging management program XI.S1, "ASME Section XI, Subsection IWE," specified in NUREG-1801 with the following enhancement:

Exceptions to NUREG-1801

None.

Enhancements

1. Provide guidance for proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting consistent with EPRI NP-5067 and TR-104213. Also, provide guidance for storage, lubricant selection, and bolting and coating material selection consistent with Section 2 of Research Council on Structural Connections (RCSC) publication “Specification for Structural Joints Using High-Strength Bolts.” Program Elements Affected: Preventive Action (Element 2)

Operating Experience

The following examples of operating experience provide objective evidence that the ASME Section XI, Subsection IWE aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. During the 2017 refueling outage, containment inspections identified minor surface conditions such as flaking and peeling paint, rust, light corrosion, coating damage, missing and incomplete coatings. None of the examinations found any loss of metal and there were no adverse effects to the functionality of the containment structure. The station reviewed the result in accordance with a site specific procedure and determined no indications required further evaluations in accordance with the ASME Section XI and 10 CFR 50.55a.

   This example demonstrates that ASME Section XI, Subsection IWE program examinations are effective in identifying uncoated areas with light surface corrosion, and that corrective actions are implemented prior to a loss of intended function.

2. In May 2016, the NRC identified that Clinton had no acceptance criteria defined for containment visual examinations as required by the ASME Section XI code. The inspectors were concerned that without acceptance standards, unacceptable containment degradation may be returned to service and adversely affect containment leakage or structural integrity. The 2004 Edition of the ASME Code Section XI, Articles IWE.3510.1 "General" and IWE.3511.1 "General," required in part "The Owner shall define acceptance criteria for visual examination of containment surfaces." In response to this issue, Clinton generated and implemented

a site-specific procedure to provide guidance for review and disposition of inspection results. The new site procedure defines site specific acceptance standards in accordance with the requirements in ASME Code Section XI, IWE-3500.

This example demonstrates that the ASME Section XI, Subsection IWE aging management program is continually refined and updated to adhere to requirements of 10 CFR Part 50.55a(g)(4) as they relate to ASME Section XI. Therefore, the ASME Section XI, Subsection IWE aging management program is effective in identifying loss of material and other indications, and that those indications are evaluated before there is a loss of intended function.

3. During the 2010 refueling outage, containment inspections identified specific locations inside and outside containment with various surface conditions (flaking paint, light rust, missing coating). These conditions were reviewed by station engineering and concluded there was no loss of material or structural damage. These conditions were documented in the corrective action program and various locations received a coating touchup application.

   This example demonstrates that ASME Section XI, Subsection IWE aging management program examinations are effective in identifying uncoated areas with light surface corrosion, and that corrective actions are implemented prior to a loss of intended function.

The operating experience relative to the program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including cracking, loss of leak tightness, and loss of material. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced ASME Section XI, Subsection IWE aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced ASME Section XI, Subsection IWE aging management program will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.30 ASME Section XI, Subsection IWL

Program Description

The ASME Section XI, Subsection IWL aging management program is an existing condition monitoring program which implements examination requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWL for Class CC Concrete Components of Light-Water Cooled Plants, as mandated by 10 CFR 50.55a. The scope of the program includes reinforced concrete. The primary containment Mark III design does not include a prestressing system.

The current program complies with ASME Section XI, Subsection IWL, 2013 Edition, supplemented with the applicable requirements of 10 CFR 50.55a(b)(2). This program is consistent with provisions in 10 CFR 50.55a that specify use of the ASME Code edition in effect 18 months prior to the start of the inspection interval. Clinton will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation. In accordance with 10 CFR 50.55a(g), the ISI program is updated each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified 18 months before the start of the inspection interval.

The primary inspection method is a visual examination. Inspection methods, inspected parameters, and acceptance criteria are in accordance with ASME Section XI, Subsection IWL as approved by 10 CFR 50.55a. Accessible concrete surfaces are subject to general visual examination to detect deterioration and distress such as defined in ACI 201.1R, "Guide for Making a Condition Survey of Existing Buildings," and ACI 349.3R, "Report on Evaluation and Repair of Existing Nuclear Safety-Related Concrete Structures." Concrete surfaces that exhibit deterioration and distress, when identified by general visual examination, are subject to detailed visual examination to determine the magnitude and extent of deterioration and distress.

The ASME Section XI, Subsection IWL aging management program utilizes periodic inspections that effectively detect degradation before loss of intended function. The monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant age-related degradation.

The program will provide reasonable assurance that the aging effects addressed by the ASME Section XI, Subsection IWL aging management program will be adequately managed during the period of extended operation.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWL aging management program is consistent with the ten elements of aging management program XI.S2, "ASME Section XI, Subsection IWL," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the ASME Section XI, Subsection IWL aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. NRC Information Notice 2013-04 was issued to inform licensees of the occurrence of laminar subsurface cracks in the reinforced concrete shield building of the containment system at another plant caused by moisture intrusion and freezing. During construction of the shield building access opening to replace the reactor pressure vessel head in late 2011, the plant discovered laminar subsurface cracking in the shield building. Through impulse response testing and confirmatory core borings, it was determined that the extent of cracking was along the outer rebar mat in the shield building flute shoulders, at the top of the shield building near the junction with the roof, and at the shield building main steam line penetrations. The plant was able to demonstrate via rigorous and conservative structural calculations that the shield building remained structurally adequate for the controlling load cases and remained capable of performing its design safety functions. During shield building monitoring inspections performed in August of 2013, visual core examinations indicated that the shield building laminar cracks may be propagating. A comprehensive technical cause assessment was conducted to identify the cause(s) of the crack propagation. The Full Apparent Cause Evaluation was sent to the NRC. Based on the evidence for the causes of laminar crack propagation, the plant concluded the apparent cause of the crack to be ice wedging.

   Clinton is located in a region where weathering conditions are considered severe, as addressed in ASTM C33, "Standard Specification for Concrete Aggregates." The primary containment walls and dome are not exposed to a groundwater/soil or air – outdoor environment and is, therefore, not susceptible to cracking due to freeze-thaw cycles. However, the basemat that primary containment sits on is exposed to a groundwater/soil environment. Inspection results and subsequent operating experience has not shown any indications of degradation that could be related to ice-wedging or laminar cracking.

2. During the 2010 outage, Containment ISI IWL visual examinations were completed of all primary containment accessible concrete exterior surfaces. The concrete was found to be satisfactory. Minor degradation around containment penetrations and degraded coatings were found and documented in the corrective action program. No degradation was identified as requiring further evaluation. It was determined that the conditions were related to surface corrosion and flaking or missing coatings and did not identify any loss of concrete material.

   This example demonstrates that the that the condition of the primary containment reinforced concrete which is enclosed by the metal siding of the gas control boundary, the auxiliary building, and the fuel building is not degrading.

3. During the 2015 outage, Containment ISI IWL concrete examinations were completed of all primary containment accessible concrete exterior surfaces. The concrete was found to be satisfactory. Minor indications of flaking and peeling paint and degradation around containment penetrations. Degraded coatings were identified and documented in the corrective action program. It was determined that the conditions were only related to the surface paint and coatings and no loss of the surface material was identified.

   This example demonstrates that the that the condition of the primary containment reinforced concrete which is enclosed by the metal siding of the gas control boundary, the auxiliary building, and the fuel building is not degrading.

4. In 2018, a self-assessment was performed on the ISI Program. The assessment concluded that the program was sufficient with one identified deficiency based on a lost work order task that could not be found. A corrective action report was generated to locate this missing item.

   This example demonstrates that periodic self-assessments of the ASME Section XI, Subsection IWL aging management program are performed to identify and correct program elements that need improvement to maintain the quality performance of the program.

5. In 2019, Containment ISI IWL visual examinations were completed of all Primary Containment accessible concrete exterior surfaces. The concrete was found to be satisfactory.

   This example demonstrates that the condition of the primary containment reinforced concrete which is enclosed by the metal siding of the gas control boundary, the auxiliary building, and the fuel building is not degrading and that no significant changes have occurred from previous inspections.

6. In 2020, Nuclear Oversight personnel performed an engineering programs audit that included the Clinton ISI program. The audit found the program to be satisfactory. The only minor issue was a fleet wide item that instrumentation usage was not documented properly resulting in loss of reverse traceability. An issue report was created and assigned to the maintenance department. It was determined that hard-copies of work order packages were causing the issue and the use of electronic work order packages reduced the risk that reverse traceability would be lost in the future.

   This example illustrates that audits are conducted to independently verify the ASME Section XI, Subsection IWL aging management program identifies and corrects program elements that need improvement to maintain the quality performance of the program.

The operating experience relative to the ASME Section XI, Subsection IWL aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the ASME Section XI, Subsection IWL aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing ASME Section XI, Subsection IWL aging management program provides reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.31 ASME Section XI, Subsection IWF

Program Description

The ASME Section XI, Subsection IWF aging management program is an existing condition monitoring program that consists of visual examination of ASME Section XI Class 1, 2, 3, and MC piping and component support members for loss of material, loss of mechanical function, and loss of preload in air-indoor uncontrolled or treated water environment. Bolting for supports is also included with these components and inspected for loss of material and loss of preload by inspecting for missing, detached, or loosened bolts and nuts. The program utilizes procedures that are consistent with industry guidance to ensure proper specification of bolting material, lubricant, and installation torque to prevent or minimize loss of bolting preload or other loss of structural integrity. Indications of degradation are entered in the corrective action program for evaluation or correction to ensure the intended function of the piping and component support is maintained.

The current program complies with ASME Section XI, Subsection IWF, 2013 Edition as approved in 10 CFR 50.55a. In accordance with 10 CFR 50.55a(g)(4), the in-service inspection (ISI) program is updated each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified eighteen months before the start of the inspection interval. The ASME Code edition consistent with the provisions of 10 CFR 50.55a will be used during the period of extended operation. The monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant degradation.

The ASME Section XI, Subsection IWF program utilizes inspections that detect degradation before loss of intended function. Preventive measures associated with structural bolts are addressed in implementing procedures.

The program will be enhanced, as noted below to provide reasonable assurance that the ASME Section XI, Subsection IWF program aging effects will be adequately managed during the period of extended operation.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWF aging management program will be consistent with the ten elements of aging management program XI.S3, ASME Section XI, Subsection IWF, specified in NUREG-1801 with the following enhancements:

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

1. Add the MC component support examinations for the fuel transfer tube and for containment penetrations spanning from the containment wall to the drywell wall for: reactor water cleanup, feedwater, residual heat removal, reactor core isolation cooling, and main steam drain to the scope of the program. Program Element Affected: Scope of Program (Element 1)

2. Provide guidance, regarding the selection of supports to be examined in subsequent inspection intervals, when a support that is acceptable for continued service as defined in IWF-3400, is restored in accordance with the corrective action program. The enhanced guidance will ensure that the sample is increased to include another support, of the same type and function, that has not been restored to correct the observed condition. Program Element Affected: Monitoring and Trending (Element 5)

Operating Experience

The following examples of operating experience provide objective evidence that the ASME Section XI, Subsection IWF program will be effective in assuring that intended functions are maintained consistent with the current licensing basis during the period of extended operation:

1. In 2021, during a visual examination (VT-3) of a variable spring support, a recordable indication of a loose jam nut was identified. In accordance with ASME Section XI Paragraph IWF-3122.3, Acceptance by Evaluation or Test, a component support or a portion of a component support containing relevant conditions that do not meet the acceptance standards of IWF-3410 shall be acceptable for service without corrective actions if an evaluation or test demonstrate that the component support is acceptable for service. Design engineering reviewed the condition and VT-3 results and provided the following input: 1) the jam nut is non-load bearing; 2) the hot and cold settings are within the travel range; 3) the hanger is functional as designed; and 4) no repairs are necessary. Although immediate repair was not necessary, a new task was created to tighten the loose jam nut during the outage.

   This example provides objective evidence that the VT-3 examination method specified by the ASME Section XI, Subsection IWF aging management program has proven effective in identifying loosened support items. Actions were taken to tighten the jam nut and reinspect.

2. In 2019, a shutdown service water (SX) system support lock nut was identified as loose during a visual examination (VT-3). This locknut/jam nut was evaluated and determined to be a non-load carrying member of the support and does not affect structural integrity. Per the VT-3 report and discussion with a level III inspector no other parts on this support are loose. Per ASME Section XI Paragraph, IWF-3410 this is a non-relevant condition, and it is acceptable since the jam nut does not carry any load. Engineering programs personnel recommended tightening this jam nut, a work request was created, and the issue was repaired in the same outage.

This example provides objective evidence that the VT-3 examination method specified by the ASME Section XI, Subsection IWF aging management program has proven effective in identifying loosened support items. Actions were taken to tighten this lock nut associated with an SX support.

3. In 2018, an assessment of the ISI Program execution and implementation including the IWF program implementation was performed. The assessment reviewed the results of inspections performed in the 2016 and 2017 outages where results were considered appropriate. The assessment team also reviewed NRC inspection findings of the ISI implementation at other stations. None of the findings against other stations had applicability for the Clinton program. The assessment determined that the ISI (IWF) program was acceptable and would support successful execution of the inspections in the 2018 outage.

   This example shows objective evidence that periodic assessments of the IWF aging management program are performed to identify and correct program elements that need improvement to maintain the quality performance of the program.

4. In 2011, during the outage, ISI examinations were performed on the RPV support skirt. During the VT-3 examination 100 precent of the code required area was examined with no recordable indications being observed. An image of the RPV skirt and three-inch ASME SA-540 bolt was documented. Results were indicative of all studs and nuts showing light rust around the threaded areas. No immediate or recommended actions were reported. The three-inch RPV pedestal to skirt bolting were fabricated from SA 540, Class 4, Grade B23 low alloy steel. The certified material test report of these bolts determined that the yield strength is below the 150 ksi parameter set by NUREG-1801 to identify high strength bolting susceptible to stress corrosion cracking.

   This example provides objective evidence that the VT-3 examination method specified by the ASME Section XI, Subsection IWF aging management program has proven effective in identifying and detecting any aging effects of nonexempt components and their associated supports including the RPV support skirt, and the three-inch ASME SA-540 RPV pedestal to skirt bolting.

The operating experience relative to the ASME Section XI, Subsection IWF aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced ASME Section XI, Subsection IWF aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced ASME Section XI, Subsection IWF aging management program will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.32 10 CFR Part 50, Appendix J

Program Description

The 10 CFR Part 50, Appendix J aging management program is an existing performance monitoring program that monitors leakage rates through the drywell and containment pressure boundary, including the containment liner, associated welds, penetrations, fittings, and other access openings, in order to detect age-related degradation of the containment pressure boundary. Corrective actions are taken if leakage rates exceed acceptance criteria. The program provides for aging management of pressure boundary degradation due to aging effects from the loss of material, loss of sealing, loss of leak tightness, loss of preload, or cracking in various systems penetrating containment in air-indoor uncontrolled, air-outdoor, and treated water environments.

Consistent with the current licensing basis, the containment leak rate tests are performed in accordance with the regulations and guidance provided in 10 CFR Part 50, Appendix J, Option B; Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," NEI 94-01, Revision 2-A and Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," and ANSI/ANS 56.8, "Containment System Leakage Testing Requirements."

Containment leak rate tests are performed to assure that leakage through the containment, and systems and components penetrating primary containment, does not exceed allowable leakage limits specified in the Technical Specifications (TSs). An integrated leak rate test (ILRT) is performed during a period of reactor shutdown at a frequency based on the historical performance of the overall containment system. Local leakage rate tests (LLRT) are performed on containment isolation valves and containment access penetrations at frequencies that comply with the requirements of 10 CFR 50 Appendix J, Option B.

NUREG-1801 Consistency

The 10 CFR Part 50, Appendix J aging management program is consistent with the ten elements of aging management program XI.S4, "10 CFR Part 50, Appendix J," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the 10 CFR Part 50, Appendix J aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. The adjusted as-left leakage rate for Clinton, Unit 1 following the 2008 ILRT was 0.226 La. The indicated test result is well below the maximum limit of 0.75 La (where La is the maximum allowed as-left primary containment leakage rate in percent weight per day) allowed by the TSs. These results show that the in-scope components that make up the primary containment boundary are being adequately maintained and that significant safety margin is maintained between the TSs allowable limits and the as-tested values.

   This example provides objective evidence that the 10 CFR Part 50, Appendix J aging management program effectively manages leakage from the primary containment, and systems and components that penetrate primary containment to ensure that the measured leakage rates do not exceed allowable leakage rate values as specified in the TSs and associated Bases.

2. In May of 2015, excessive leakage was identified during the LLRT for the containment building exhaust inboard and outboard isolation valves. The as-found leakage was measured at 7500 standard cubic centimeters per minute (sccm), exceeding its TS leakage criteria limit. Previous test results had recorded this value at 3000 sccm. The issue was entered into the station's corrective action program. A work order was written to trouble shoot the excessive leakage, resulting in an adjustment of the valve's closed stop. After maintenance the local leakage rate testing was reperformed with successful results. A program engineer evaluated the results and concluded that the leakage was acceptable and that the penetration and isolation valves are operable. In addition, an action was created to investigate a maintenance strategy improvement for these valves.

   This example provides objective evidence that components exceeding the allowable leakage rate acceptance criteria are being entered into the corrective action program, evaluated, repaired, enhanced, as needed, and subsequently retested in accordance with the 10 CFR Part 50, Appendix J program.

3. A focused area self-assessment (FASA) for the Clinton 10 CFR Part 50, Appendix J aging management program was conducted in 2022 in conjunction with the rest of the fleet. No issues were identified that affected the operability of plant equipment or that had regulatory impact. The purpose of the FASA was to evaluate compliance of the program with the regulatory requirements of 10 CFR 50 Appendix J Option B, Regulatory Guide 1.163, ANSI/ANS 56.8, NEI 94-01, Revision 2-A and Revision 3-A and Constellation procedural requirements. Plant operating experience was considered in performance of the assessment. The

conclusion was that for the areas reviewed the program implementation was per the program requirements.

This example provides objective evidence that periodic self-assessments of the 10 CFR Part 50, Appendix J aging management program are performed to identify and correct program elements that need improvement to maintain the quality performance of the program.

4. In September of 2019, local leakage rate tests (LLRTs) were performed for the main steam isolation valves (MSIVs). The minimum pathway leakage rate (MNPLR) for each main steam line (MSL) and the total for all four lines met the TS requirements, however, the maximum pathway leakage rate (MXPLR) did not meet the TS limit and four valves were identified for repair and retest. These repairs consisted of performing in-body work which were retested with satisfactory results. In addition, program engineering personnel performed a review of the maintenance strategy regarding the MSIVs, including past performance of Clinton valves as well as overall fleet and industry practices.

   This example provides objective evidence that components exceeding the leakage rate acceptance criteria are entered into the corrective action program, corrective actions are taken to repair, and subsequently retested in accordance with the primary containment leakage rate testing program. In addition, the program continually reviews its strategies for testing and performing repairs against the fleet and industry.

5. NRC Information Notice 92-20, "Inadequate Local Leak Rate Testing," was issued to alert licensees to problems with local leak rate testing of two-ply stainless steel bellows. In response, Clinton installed a modification to the inclined fuel transfer system containment penetration to address the issue of bellows ply separation and the ability to fully challenge the bellows with a type B test. The modification consists of a steel cylinder attached to the bellows and the fuel transfer tube with test connection valves allowing pressurization of the volume between the cylinder and the transfer tube and bellows and allows Clinton to fully challenge the bellows assembly in accordance with 10 CFR 50, Appendix J, Option B, Type B testing.

   This example provides objective evidence that industry operating experience is being reviewed and evaluated to confirm that station testing procedures are effective to maintain containment integrity.

The operating experience relative to the 10 CFR Part 50, Appendix J aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of material, loss of leak tightness, cracking, loss of sealing and loss of preload. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the 10 CFR Part 50, Appendix J aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing 10 CFR Part 50, Appendix J aging management program provides reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.33 Masonry Walls

Program Description

The Masonry Walls aging management program is an existing condition monitoring program implemented as part of the current Structures Monitoring program. It is based on guidance provided in NRC IE Bulletin 80-11, "Masonry Wall Design," and NRC Information Notice 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11," and is implemented through station procedures.

The Masonry Walls aging management program manages loss of material and cracking due to age-related degradation in indoor and outdoor air environments of all masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. The program also inspects for separation and gaps between the supports and the masonry walls. The program relies on periodic visual inspections by qualified inspection personnel on an interval not to exceed five years to monitor and maintain the condition of masonry walls within the scope of license renewal. When degraded conditions of masonry walls are found they are entered into the corrective action program. Masonry walls that are considered fire barriers are also managed by the Fire Protection program.

The Masonry Walls aging management program utilizes periodic inspections that effectively detect degradation before loss of intended function. The monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant age-related degradation.

The program will provide reasonable assurance that the aging effects addressed by the Masonry Walls aging management program will be adequately managed during the period of extended operation.

NUREG-1801 Consistency

The Masonry Walls aging management program is consistent with the ten elements of aging management program XI.S5, "Masonry Walls," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Masonry Walls aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis during the period of extended operation:

1. In October 2019, a gap was identified in a masonry wall in the control building. The wall is a rated fire barrier but is not relied on for separation of safe shutdown areas. A fire watch was put into place until it was determined that there was no impact on station safe shutdown. A walkdown determined that the gap was not through-wall and that the other side of the wall was intact providing an acceptable fire barrier. An action was created to fill the gap to return the wall to full design qualification and was completed in December 2019. An extent of condition review was performed that confirmed there were no additional similar deficiencies.

   This example provides objective evidence that deficiencies in masonry walls are entered into the corrective action program and appropriate actions are taken to evaluate and correct identified issues.

2. In April 2008, minor vibrations were felt in the Clinton main control room. A corrective action program issue report was written. Station procedures were entered in response and determined the earthquake magnitude was well below the operating basis earthquake level. Action was taken by engineering personnel to conduct plant walkdowns to assess structures and components for damage. Specifically, a walkdown inspection was performed in the power block to assess potential damage to masonry block walls in the fuel, auxiliary, and control buildings. No damage or unusual conditions were observed.

   This example provides objective evidence that the condition of masonry walls is assessed for damage and other possible degradation following unusual station events.

3. An assessment of the Maintenance Rule program for the period of May 30, 2017 through May 21, 2018 was performed. The scope of the assessment was to evaluate the performance and condition monitoring activities of the program. The assessment considered, where practical, industry-wide operating experience. The Masonry Wall program is included in the Maintenance Rule program as part of the Structures Monitoring program and provides for periodically evaluating the condition of masonry structures. The assessment did not identify any deficiencies associated with the Masonry Wall program.

   This example shows objective evidence that periodic assessments of the Masonry Wall aging management program are performed to identify and correct program elements that need improvement to maintain the quality performance of the program.

The operating experience relative to the Masonry Walls aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the Masonry Walls aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing Masonry Walls aging management program provides reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.34 Structures Monitoring

Program Description

The Structures Monitoring aging management program is an existing condition monitoring program that was developed to implement the requirements of 10 CFR 50.65 and is based on NUMARC 93-01, “Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” and Regulatory Guide 1.160, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.” The structures and structural components are inspected by qualified personnel in accordance with station procedures consistent with ACI 349.3R, “Report on Evaluation and Repair of Existing Nuclear Safety-Related Concrete Structures.” Concrete structures are inspected for indications of deterioration and distress including evidence of leaching, loss of material, cracking, and a loss of bond, as defined in ACI 201.1R, “Guide for Making a Condition Survey of Existing Buildings.” Steel components are inspected for loss of material due to corrosion. Environments include air outdoor, air-indoor uncontrolled, treated water, water-flowing, and groundwater and soil.

The program also includes provisions for periodic testing and assessment of groundwater chemistry and inspection of inaccessible below grade concrete structures when available. A de-watering system is not relied upon to control settlement and porous concrete was not used in the design of foundations.

Inspection interval for the in-scope structures does not exceed five years, with provisions for more frequent inspections when conditions are observed that have a potential for impacting an intended function. Unacceptable conditions, when found, are evaluated or corrected in accordance with the corrective action program.

Protective coatings are not relied upon to manage the effects of aging for structures included in the scope of this program.

The Structures Monitoring aging management program utilizes periodic inspections that effectively detect degradation before loss of intended function. The monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant age-related degradation.

The program will provide reasonable assurance that the aging effects addressed by the Structures Monitoring aging management program will be adequately managed during the period of extended operation.

NUREG-1801 Consistency

The Structures Monitoring aging management program will be consistent with the ten elements of aging management program XI.S6, "Structures Monitoring," specified in NUREG-1801 with the following enhancements:

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented to the following program elements:

1. Include the following structures:
    a. Yard Structures

Program Elements Affected: Scope of Program (Element 1)

2. Include the following components and commodities:
    a. Pipe whip restraints and jet impingement shields
    b. Missile barriers
    c. Panels, racks, cabinets, and other enclosures
    d. Sliding surfaces
    e. Sump and pool liners
    f. Outdoor electrical cable trays and conduits
    g. Doors
    h. Penetration seals and sleeves
    i. Tube Tracks
    j. Gaskets and seals
    k. Hatches, plugs, handholes, and manholes
    l. Metal components (decking, vent stack, and miscellaneous steel)

Program Elements Affected: Scope of Program (Element 1)

3. Require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R with respect to knowledge of inservice inspection of concrete and visual acuity requirements. Program Elements Affected: Detection of Aging Effects (Element 4), and Acceptance Criteria (Element 6)

4. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of license renewal. Program Elements

Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3), and Detection of Aging Effects (Element 4)

5. Monitor concrete for increase in porosity and permeability. Program Elements Affected: Parameters Monitored or Inspected (Element 3)

6. Include inspection of accessible sliding surfaces for indication of significant loss of material due to wear or corrosion and that debris or dirt will not restrict or prevent sliding. Program Elements Affected: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Acceptance Criteria (Element 6)

7. Monitor elastomeric vibration isolators and structural sealants for indication of loss of material, cracking or hardening resulting in loss of sealing or function. Program Elements Affected: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4) and Acceptance Criteria (Element 6)

8. Clarify that loose bolts and nuts and cracked high strength bolts, not subject to stress corrosion cracking, are not acceptable unless accepted by engineering evaluations. Program Elements Affected: Acceptance Criteria (Element 6)

Operating Experience

The following examples of operating experience provide objective evidence that the Structures Monitoring aging management program will be effective in assuring that intended functions will be maintained consistent with the current licensing basis during the period of extended operation:

1. In 2019, Clinton performed required Structures Monitoring inspections. The site's guidance and acceptance criteria were used for the inspection and evaluation of results. The inspection process included a review of previous inspection results to determine if changes had occurred in conditions being monitored. A total of 33 issue reports were generated as a result of the inspections. Typical issues identified were degraded coatings on steel surfaces leading to the development of light surface rust, minor surface wear of concrete, or landscaping issues. The conclusion of the inspection and evaluation was that all the structural elements within the identified structures monitoring scope are acceptable / acceptable with deficiencies. Actions were created to correct deficient conditions. A portion of the items have been completed by cleaning and recoating surfaces, concrete repair, or landscaping work. The remainder are scheduled commensurate with safety impact.

   This example demonstrates that deficiencies are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct deficiencies.

2. In 2014, during a structures monitoring inspection, it was observed that vegetation and trees have grown outside of the diesel generator building wall. The condition was assessed to not have any impact to the concrete

walls and structural steel framing based on smaller sizes of the trees, but allowing the trees to grow may have potential to cause damage to the concrete foundation. An action was put into place to cut and remove the vegetation and trees and to spray herbicides to prevent future growth. This action was completed in 2014.

This example demonstrates that deficiencies are entered into the corrective action program and appropriate actions are taken to evaluate and correct degraded conditions.

3. In 2011, during a review of a Constellation corporate Nuclear Event Bulletin, written as a result of INPO Event Report (IER) 11-1, “Fukushima Da-ichi Nuclear Station Fuel Damage Caused by Earthquake and Tsunami,” it was identified that flood seals at Clinton were not being routinely inspected. An issue report (IR) was written and entered into the corrective action program. In response Clinton engineering personnel, reviewed industry/site experience and implemented a flood seal inspection procedure in March 2013 which then included 560 designated flood seals.

   Subsequently, in February 2017, the NRC issued a Non-cited Violation (NCV) to Clinton for failure to demonstrate the condition of flood seals was being effectively controlled. The NCV was a result of not having inspected flood seals as required by the Maintenance Rule and the corporate procedure and was entered into the corrective action program. It was identified that the initial issue of the inspection procedure did not include a complete list of flood seals which led to some seals not being inspected within the required interval. In response to the NCV, Clinton inspected over 700 additional flood seals not identified in the procedure. No unacceptable seal degradation was found. A design review was also completed and identified all safety-related and nonsafety-related flood seals. The results of this review were incorporated into the inspection procedure and implemented in December 2017.

   This example demonstrates that deficiencies are entered into the corrective action program and appropriate actions are taken to evaluate and correct degraded conditions.

4. In 2009, during performance of required structures monitoring inspections, an IR was written to document deficiencies with the stairway used to enter the screen house. Stairway handrail post connections were observed to be rusted at several locations and the connection welds were missing in some areas. The condition was evaluated to be acceptable at the time, but further degradation may pose a potential safety hazard. In response to the IR, a work request was created and the stairs and handrails were repaired.

   This example demonstrates that deficiencies are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct degraded conditions.

5. A periodic assessment of the Maintenance Rule program for May 30, 2017 through May 21, 2018 was performed. The scope of the assessment was to evaluate the performance and condition monitoring activities and associated goals. The evaluations took into account, where practical, industry-wide operating experience. A portion of the Structures Monitoring program is included in the Maintenance Rule program and provides for periodically evaluating the condition of Clinton structures. The assessment did not identify any deficiencies associated with the Structures Monitoring program.

   This example shows objective evidence that periodic assessments of the Structures Monitoring aging management program are performed to identify and correct program elements that need improvement to maintain the quality performance of the program.

6. In 2011, Clinton reviewed the impact of NRC Information Notice (IN) 2011-20, "Concrete Degradation by Alkali-Silica Reaction," on on-site concrete structures. The IN was written to inform the industry of the occurrence of alkali-silica reaction (ASR) induced concrete degradation of a Category 1 structure at another plant. ASR is a slow chemical process in which alkalis (predominantly from the cement) react with certain types of silica in the aggregate when moisture is present. After observing concrete cracking patterns typical of ASR, the licensee performed petrographic examinations and compressive strength and modulus of elasticity testing of concrete core samples removed from below-grade portions of the control building (a seismic Category I structure) that confirmed that ASR had caused the cracking. Clinton reviewed their documentation from the Structures Monitoring program along with documented photos from the inspections and no similar ASR induced cracking patterns had been observed. Although the potential for ASR exists, on-going inspections per the Structures Monitoring program are in place and occur per procedure at a frequency adequate to identify ASR induced degradation, should it occur. If a condition similar to ASR degradation is visually observed, the issue would be entered into the corrective action program and actions created to properly evaluate, classify, and address observed concrete degradation.

   This example shows objective evidence that the Structures Monitoring aging management program reviews and responds to external industry documents to identify and correct program elements that need improvement to maintain the quality performance of the program.

The operating experience relative to the Structures Monitoring aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Structures Monitoring aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Structures Monitoring aging management program will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.35 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

Program Description

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program is an existing condition monitoring program that addresses age-related deterioration, degradation due to environmental conditions, and the effects of natural phenomena that may affect water-control structures. The program is implemented in association with the existing implementing procedures for the Structures Monitoring (XI.S6) program. The structures within the scope of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program include the screen house and the in-scope portions of the cooling lake (ultimate heat sink (UHS), submerged dam, baffle dike, and UHS discharge structure). Structural components and commodities monitored under the program include reinforced concrete members, concrete, precast concrete panels, steel components (hatches/plugs, bolting, and miscellaneous steel), and earthen water-control structures (dams and dikes). There are no surface dams, canals, steel or wood piles and sheeting, or sluice gates within the scope of the program.

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program addresses age-related degradation, and degradation due to extreme environmental conditions and the effects of natural phenomena that may affect the safety function of the water-control structures. The program manages loss of material, cracking, distortion, loss of bond, loss of material (spalling, scaling), increase in porosity and permeability, and loss of strength. Environments include air-indoor uncontrolled, air-outdoor, water-standing, water-flowing, groundwater and soil. Elements of the program effectively detect the applicable aging effects at a frequency adequate to prevent significant age-related degradation and take corrective action to prevent a loss of intended function.

NUREG-1801 Consistency

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program will be consistent with the ten elements of aging management program XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," specified in NUREG-1801 with the following enhancements:

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

1. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of license renewal. Program Elements Affected: Detection of Aging Effects (Element 4)

2. Require inspection of accessible in-scope portions of the cooling lake and screen house immediately following the occurrence of significant natural phenomena, which includes hurricanes, tornadoes, large floods, and intense local rainfalls. Program Elements Affected: Detection of Aging Effects (Element 4)

3. Document current practices in implementing procedure for inspection of the cooling lake baffle dike. Program Elements Affected: Acceptance Criteria (Element 6)

Operating Experience

The following examples of operating experience provide objective evidence that the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. Inspections of the UHS shoreline, submerged dam, baffle dike, and underwater concrete structures (exterior portions of the intake screen house and the UHS discharge structure) are performed annually. Clinton uses a multi-beam sonar which collects data to create a three-dimensional view of the underwater structures. This data is compared to the previous years' data to determine if there is degradation. The 2022 inspections identified minor issues, but concluded that:

    - The shoreline erosion was similar compared to recent years with no large shoreline collapses or large loss areas.
    - The submerged dam is in excellent shape.
    - There are no concerns with the structural condition and function of the baffle dike.
    - The screen house is in good overall condition and there are no structural concerns.
    - The underwater concrete structures do not have any structural concerns.

    Clinton procedures require review of the UHS report to verify its operability. The review was satisfactorily completed and concluded that the as-found equipment condition is as expected and satisfactory. The UHS volume was also found to be satisfactory.

This report demonstrates that the systems, structures and components (SSCs) being managed by the program are in good material condition relative to the aging effects managed by the program. The periodic inspections of the structures are effective in the identification of structural concerns or degrading conditions. The corrective action program is effectively used to evaluate the inspection data so that actions can be taken prior to loss of intended function.

2. The UHS monitoring procedure performs a periodic survey as required to effectively maintain the required UHS volume. The survey measures the sediment buildup in the UHS and is scheduled based upon as-left results from dredging, accumulation rates, recent trends, and the latest projections. Global positioning system (GPS) and a fathometer are used to record survey points along the UHS cross sections. This data is processed through hydrographic survey software to create a digital terrain model (DTM) of the UHS bottom and the total volume is computed for the UHS. The 2021 survey concluded that the UHS volume is satisfactory, with excess capacity to accommodate sedimentation before the design volume is threatened.

   This report demonstrates that the SSCs being managed by the program can perform its design function. The periodic inspections of the UHS are effective in the identification of degraded conditions. The corrective action program is effectively used to evaluate the inspection data so that corrective action can be taken prior to loss of intended function.

3. External and internal operating experience related to UHS monitoring has provided opportunities for critical review of Clinton processes. In 2014, an incident at Braidwood Station regarding UHS hydrographic surveillance data was reviewed for applicability at Clinton. Discrepancies between high-point and low-point elevation measurements raised concerns regarding available UHS margin at Braidwood. Unlike high- or low-point topographic surveillance performed at Braidwood, the volume computation at Clinton is based on level ground. The methodology used to measure sedimentation at Clinton UHS is by 1) average of 30 lead line points, and 2) GPS and fathometer data through hydrographic survey software. Both methods are being used to compute the total volume below elevation 675 feet comprising the UHS. Therefore, the issue identified at Braidwood was determined to not be applicable at Clinton. In 2015, an incident reported by the Columbia Generating Station was reviewed for applicability to Clinton. Errors discovered at Columbia involved taking an arithmetic average of levels in two spray ponds to satisfy requirements of that facility's Technical Specifications (TSs) regarding UHS water level. As Clinton only has a single UHS volume (formed by the submerged baffle dike and submerged dam in Lake Clinton), no arithmetic average is taken to satisfy requirements in TSs regarding UHS water volume.

The above examples provide objective evidence that industry operating experience is being reviewed and evaluated to confirm that the station procedures are effective in condition monitoring for SSCs being managed by the program.

The operating experience relative to the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of material, cracking, distortion, loss of bond, loss of material (spalling, scaling), increase in porosity and permeability, and loss of strength. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.36 Protective Coating Monitoring

Program Description

The Protective Coating Monitoring and Maintenance aging management program is an existing condition monitoring program which manages the aging effect of loss of coating or lining integrity of Service Level I coatings inside the primary containment (as defined in NRC Regulatory Guide (RG) 1.54, Revision 1, “Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants”) in an air-indoor environment. The program is comparable to a monitoring and maintenance program for Service Level I protective coatings as described in RG 1.54, Revision 2. The program monitoring methods are effective in detecting the applicable aging effect and the frequency of monitoring is adequate to prevent significant age-related degradation. The failure of the Service Level I coatings could adversely affect the operation of the emergency core cooling systems (ECCS) by clogging the ECCS suction strainers. Proper maintenance of the Service Level I coatings ensures that coating degradation will not impact the operability of the ECCS systems. The Protective Coating Monitoring and Maintenance aging management program includes coating system selection, application, inspection, assessment, maintenance, and repair for any condition that adversely affects the ability of Service Level I coatings to function as intended.

Service Level I coatings will prevent or minimize the loss of material due to corrosion but these coatings are not credited for managing the effects of corrosion for the carbon steel containment liner and components. This program ensures only that the Service Level I coatings maintain adhesion so as to not adversely affect the intended function of the ECCS suction strainers.

The program also provides controls over the amount of unqualified coating which is defined as coating inside the primary containment that has not passed the required laboratory testing, including irradiation and simulated design basis accident (DBA) conditions, or has inadequate quality documentation, or both. Unqualified coating may fail in a way to adversely affect the intended function of the ECCS suction strainers. Therefore, the quantity of unqualified coating is controlled to ensure that the amount of unqualified coating in the primary containment is kept within allowable limits.

NUREG-1801 Consistency

The Protective Coating Monitoring and Maintenance aging management program is consistent with the ten elements of aging management program XI.S8, "Protective Coating Monitoring and Maintenance Program,” specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Protective Coating Monitoring and Maintenance aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2023, in preparation of license renewal application, it was discovered that calculated cumulative dose values for certain environmental zones in containment exceeded the design criteria. An issue report was generated by the site to document this issue. Coatings failures from containment can get into the suppression pool and clog the ECCS strainer. The clogging of the strainer can impact net positive suction head (NPSH) for the ECCS pumps and could render them inoperable. The plant has established administrative limits for quantity of unqualified and degraded coatings in containment. This administrative limit is managed by the Clinton protective coating program. The coatings in containment are inspected every outage by qualified coatings inspectors. An engineering technical evaluation was performed for this issue in accordance with station procedures. This technical evaluation concluded that there is adequate margin for the ECCS suction strainers, and this condition will not jeopardize operability of the ECCS function.

   This operating experience demonstrates that when conditions are identified that could impact the Service Level I coating performance, there is a systematic process in place to address such conditions. These conditions are evaluated and dispositioned to ensure that the ECCS design functions are maintained.

2. In 2018, a coatings program self-assessment was conducted to evaluate the effectiveness of the Protective Coatings (Service Level I) Program. The assessment reviewed 10 percent (minimum) of the Coating Program notebook for any missing activity and procedure compliance. The assessment also reviewed 50 percent (minimum) of the coatings log and inspection reports to ensure they are retained in plant databases. Additionally, this assessment reviewed various coating inspection reports and recorded results. These coating inspection reports concluded that Level 1 Coatings were being applied properly and were in good condition. The coatings inspector met the qualification requirement by being certified in accordance with ANSI 45.2.6, “Qualification of Inspection, Examination, and Testing Personnel for Nuclear Power Plants.” During this assessment a recommendation was made to have the site coatings coordinator train an individual within the programs engineering group as a back-up site coating coordinator. The assessment concluded that overall, the Clinton coatings program is in compliance with regulatory and Constellation procedural requirements.

This operating experience demonstrates that Clinton performs coatings program assessments that ensure regulatory and procedural compliance. This operating experience also demonstrates that Service Level I coatings are inspected during refueling outages by qualified coating inspectors, inspection results are evaluated by the site coatings coordinator, and coating maintenance is initiated to ensure continued operability of ECCS systems.

3. In the spring 2017 outage, a coating inspection and assessment of the interior surfaces of the primary containment and drywell was conducted. The inspection included visual inspection of coatings and an assessment of all accessible surfaces. A report was prepared with photographic documentation of various coating conditions throughout different elevations within the primary containment and drywell. This report concluded that there were no current coating conditions that impact structural integrity, plant operations or the safe shutdown of the plant. The report also noted that accumulated degraded and unqualified coatings (including this outage) of 2275 pounds (lbs.) were well below the allowable limit of 20,000 lbs. This report further concluded that adequate coatings margin was available for ECCS suction strainers.

   This operating experience demonstrates that Clinton performs coatings program inspections that ensure regulatory and procedural compliance. This operating experience also demonstrates that Service Level I coatings are inspected during refueling outages by qualified coating inspectors, inspection results are evaluated by the site coatings coordinator, and coating maintenance is initiated to ensure continued operability of ECCS systems.

4. In the fall 2013 outage, loose, rusting and delaminated coatings were identified on the liner plates at various locations in primary containment. Several floor areas were also observed with minor coating degradation. Because there was no immediate concern from the coating degradation, the identified coatings were systematically restored to meet Service Level 1 criteria later in the fall of 2013 during online operations. This repair prevented any further rust or degradation and maintained the structural integrity of the liner plates. Approximately 42 square feet were removed and restored, equivalent to 116 lbs. The requirements of Clinton procedures were followed for the work performed.

   This example demonstrates that when conditions are identified that could impact the Service Level I coating integrity that there is a systematic process in place to repair this condition. These conditions are evaluated and dispositioned to ensure that the ECCS design functions are maintained.

The operating experience relative to the Protective Coating Monitoring and Maintenance aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of coating or lining integrity. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the Protective Coating Monitoring and Maintenance aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing Protective Coating Monitoring and Maintenance aging management program provides reasonable assurance that the loss of coating or lining integrity aging effect is adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.37 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is a new condition monitoring program that will be used to manage the effects of reduced insulation resistance of the insulation material for non-EQ cables and connections within the scope of license renewal that are subject to adverse localized environments caused by heat, radiation, or moisture.

In most areas of Clinton, the actual ambient environments (e.g., temperature, radiation, or moisture) are less severe than the plant design environment. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service environment for the cable or connection. Conductor insulation materials used in electrical cables and connections may degrade more rapidly than expected in these adverse localized environments.

Accessible cables and connections located in adverse localized environments are managed by visual inspection of the insulation. These cables and connections will be visually inspected at least once every 10 years for indications of reduced insulation resistance, such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination that could indicate incipient conductor insulation aging degradation from temperature, radiation, or moisture. This is an adequate inspection frequency to preclude failures of the cable and connection insulation since experience shows that aging degradation is a slow process. Additional inspections, repairs or replacements are initiated as appropriate under the corrective action program.

This new program will be implemented prior to the period of extended operation. The first inspections for license renewal will be completed prior to the period of extended operation.

NUREG-1801 Consistency

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is consistent with the ten elements of aging management program XI.E1, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2013, the cover of a pullbox was removed. The left section of the pullbox had cables that were found with the insulation cracked. Cracking and oxidation of the shields suggest that these cables were exposed to heat over a long period which resulted in a release of chlorine from chloro-sulfonated polyethylene jacket. The cables were determined to be operable and acceptable to perform their intended function unless manipulated or bent. Corrective actions implemented included preforming diagnostic testing on a portion of the cables that run through the left compartment of the pullbox and replacing cables as needed.

   This operating experience provides objective evidence that existing maintenance practices effectively identify observable cable jacket deficiencies and subsequently implement effective corrective actions.

2. In 2013, cable insulation condition walkdowns were performed in response to Institute of Nuclear Power Operations (INPO) guidance for cable condition monitoring. The purpose of the walkdowns is to identify cables that have been exposed to potentially adverse environments/conditions in the plant. Walkdowns have been performed in non-outage accessible areas and in outage accessible areas. The results of the walkdowns did not identify aging of insulation material due to adverse localized environments. Evaluations of insulation condition observations indicated that the cables are in environments within their design parameters and that the existing conditions are acceptable.

   These walkdowns provide objective evidence of the on-going robustness of the current cable condition monitoring efforts to identify and assess potential aging of cable and connection insulation materials in potentially adverse localized environments.

3. In 2017, cable insulation condition walkdowns were performed in response to INPO guidance for cable condition monitoring. The purpose of the walkdowns is to identify cables that have been exposed to potentially adverse environments/conditions in the plant. Walkdowns have been performed in non-outage accessible areas. Outage accessible area walkdowns will be performed during future outages. The results of the walkdowns did not identify aging of insulation material due to adverse localized environments. Evaluations of insulation condition observations

indicated that the cables are in environments within their design parameters and that the existing conditions are acceptable.

These walkdowns provide objective evidence of the on-going robustness of the current cable condition monitoring efforts to identify and assess potential aging of cable and connection insulation materials in potentially adverse localized environments.

The operating experience relative to the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program will provide reasonable assurance that the aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.38 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

Program Description

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits aging management program is a new condition monitoring program that will be used to manage the effects of reduced insulation resistance of non-EQ cable and connection insulation in instrumentation circuits with sensitive, high-voltage, low-level current signals. The in scope instrumentation circuits include:

Portions of the Neutron Monitoring System and Reactor Protection:

- Source range monitors (SRMs)

Portions of the Process Radiation Monitoring System:

- Main control room air intake radiation monitors
- SGTS exhaust gas radiation monitors
- Vent stack monitors

The circuits for these instruments are located in areas where the cables and connections could be exposed to adverse localized environments caused by temperature, radiation, or moisture. These adverse localized environments can result in reduced insulation resistance causing increases in leakage currents. Other instrument circuits in the Neutron Monitoring and Reactor Protection System, Process Radiation Monitoring System, Containment Monitoring System, and Area Radiation Monitoring System are not in scope of this aging management program either because they are managed by the Environmental Qualification (EQ) of Electric Components program; they do not perform a license renewal intended function; or they are not sensitive to high voltage, low-level signal circuits.

Calibration testing will be performed for the in scope circuits when the cables are included as part of the calibration circuit. The calibration results will be reviewed to provide an indication of the existence of aging effects based on acceptance criteria for instrumentation circuit performance. Review of results obtained during normal calibration may detect severe aging degradation prior to the loss of the cable and connection intended function. A proven cable test (such as insulation resistance tests, time domain reflectometry tests, or other testing judged to be effective in determining cable system insulation condition) will be performed for the in scope circuits when the cables are not included as part of the calibration.

This new program will be implemented prior to the period of extended operation. In addition, the first review of calibration or surveillance results and cable test results will be completed prior to the period of extended operation. Cable test frequency will be based on engineering evaluation and will be performed at least once every 10 years. Calibration and assessment of results will be performed at least once every 10 years during the period of extended operation.

NUREG-1801 Consistency

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits aging management program is consistent with the ten elements of aging management program XI.E2, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In December 2012, a neutron monitor channel was spiking/reading high and a work order was performed to troubleshoot this issue. A capacitor discharge test was performed per the neutron monitor testing procedure and the high reading dropped to be consistent with the other intermediate range monitors (IRMs). After 30 minutes, the reading rose back to the high reading level. After contacting the under-vessel workers, it was discovered the neutron monitor detector connector was slightly loose and they were able to push on the cable and tighten a grommet under the connector sleeve. The neutron monitor detector was found satisfactory after the connector was tightened.

   This operating experience, although not attributed to a cable or connection insulation aging effect, provides evidence that existing maintenance practices and the corrective action program effectively identify and correct observed instrument deficiencies.

2. In October 2014, while performing a work order on a radiation monitor, the as found data for the channel high range detector was found to be out of tolerance. The detector stopped counting then started counting erratically when exposed to the source. The Geiger-Muller (G-M) tube was replaced using a work order. This fixed the detector, and the detector was returned to operability.

   This operating experience, although not attributed to a cable or connection insulation aging, provides evidence that existing maintenance practices and the corrective action program effectively identify and correct observed instrument deficiencies.

3. In December 2021, during troubleshooting of alarms for a radiation monitor, technicians noticed the cable sheathing was brittle and cracking. Technicians covered the cables with electrical tape to protect the wires. The technicians also looked at adjacent detector cables and determined they were brittle and must be replaced. The cables were replaced with a work order.

   This operating experience shows that existing maintenance practices and the corrective action program effectively identify and correct cable degradation.

The operating experience relative to the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits aging management program will provide reasonable assurance that the aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.39 Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is a new condition monitoring program that will be used to manage the effects of reduced insulation resistance of non-EQ, in scope, inaccessible power cables. For this program, power is defined as greater than or equal to 400 volts (V). These inaccessible power cables may at times be exposed to significant moisture. Power cable exposure to significant moisture may cause reduced insulation resistance that can potentially lead to failure of the cable's insulation system.

Periodic actions will be taken to prevent inaccessible cables from being exposed to significant moisture. Significant moisture is defined as periodic exposure to moisture that lasts more than a few days (e.g., cable wetting or submergence in water). Periodic exposures that last less than a few days (e.g., normal rain and drain) are not significant. This aging management program will implement actions that can prevent cable exposure to significant moisture by inspecting manholes / cable vaults for the non EQ, in scope, inaccessible power cables for water collection and subsequent draining or other corrective action, as needed.

Prior to the period of extended operation, the frequency for inspections for accumulated water will be established and adjusted based on plant specific operating experience with cable wetting or submergence. The inspections are performed periodically based on water accumulation over time.

- Manholes / cable vaults equipped with solar powered monitoring and alarms will be inspected at least once annually.
- Manholes / cable vaults equipped with 120 VAC powered level monitoring and alarms that result in consistent, subsequent pump out of accumulated water prior to wetting or submergence of cables will be inspected at least once every five years.

Clinton has 17 manholes / cable vaults containing License Renewal in scope cables, of which 10 are safety-related and seven are nonsafety-related. All 10 safety-related manholes / cable vaults are equipped with SmartVault and SmartCover monitoring, level indication and dewatering hardware supplied by 120 VAC. The 10 safety-related manholes / cable vaults equipped with SmartVault and SmartCover monitoring, will be inspected on a five-year frequency. The first inspections for license renewal will be completed prior to the period of extended operation.

The seven nonsafety-related manholes / cable vaults are equipped with solar powered level monitoring, indication and dewatering hardware. The seven nonsafety-related manholes / cable vaults will be inspected on an annual inspection frequency until sufficient site-specific operating experience is obtained to justify extending to a longer interval between inspections.

The first inspections for license renewal will be completed prior to the period of extended operation.

Inspections for water accumulation will also be performed after event driven occurrences such as heavy rain or flooding. Plant specific parameters are established for the initiation of an event-driven inspection.

- The seven manholes / cable vaults equipped with solar powered monitoring and alarms will be inspected following event driven occurrences, such as heavy rain or flooding.
- The 10 manholes / cable vaults equipped with 120 VAC powered level monitoring and alarms, will be inspected following event driven occurrences, such as heavy rain or flooding, when level monitoring indicates water is accumulating.

The cables within the scope of this program will be tested using one or more proven tests for detecting reduced insulation resistance of the cable's insulation system due to wetting or submergence, such as dielectric loss (dissipation factor or power factor), AC voltage withstand, partial discharge, step voltage, time domain reflectometry, insulation resistance and polarization index, line resonance analysis, or other testing that is state of the art at the time the test is performed. The cables will be tested at least once every six years. More frequent testing may occur based on test results and operating experience.

NUREG-1801 Consistency

The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is consistent with the ten elements of aging management program XI.E3, "Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," specified in NUREG-1801 with the following exception:

Exceptions to NUREG-1801

1. NUREG-1801 recommends, as a preventive measure, periodic actions to prevent inaccessible power cables from being exposed to significant moisture, such as inspecting for water collection in cable manholes / cable vaults and conduits and draining water, as needed. Inspections for water accumulation and manhole / cable vault condition are to occur at least once annually. Additionally, inspections for water accumulation are also to be performed after event driven occurrences, such as heavy rain or flooding.

At Clinton:

- Manholes / cable vaults equipped with 120 VAC powered level monitoring and alarms that result in consistent, subsequent pump out of accumulated water prior to wetting or submergence of cables will be inspected at least once every five years, as supported by plant operating experience.
- Manholes /cable vaults equipped with 120 VAC powered level monitoring and alarms, will be inspected following event driven occurrences, such as heavy rain or flooding, when level monitoring indicates water is accumulating.

Program Elements Affected: Preventive Actions (Element 2)

Justification for Exception:

As described in NUREG-1801 XI.E3 guidelines, the purpose of this element is to prevent exposing inaccessible non-EQ power cables to significant moisture.

In 2016, Clinton initiated a configuration change to provide permanent power and ultrasonic indication for safety-related cable vaults. The change installed SmartVault and SmartCover monitoring, level indication and dewatering hardware supplied by 120 VAC in the 10 safety-related manholes / cable vaults.

A review of the CPS corrective action program following modification of the safety related cable vault dewatering system shows several instances where the SmartCover system notified operators of a cable vault condition or dewatering system issue requiring operator intervention. Only one occurrence was identified where a dewatering system failure resulted in cables becoming wetted. This site-specific operating experience demonstrates the SmartVault and SmartCover monitoring, level indication and dewatering hardware maintaining water levels in the 10 SR manholes / cable vaults at an acceptable level.

With the installation of the SmartVault and SmartCover monitoring, level indication and dewatering hardware supplied by 120 VAC the 10 Clinton safety-related manholes / cable vaults will be visually inspected at least once every five years. Additionally, the SmartCover continuous monitoring and alarms preclude the need for event driven inspections. The ability to continuously monitor manhole / cable vault water accumulation and implement manual or automatic pump out prior to wetting or submergence of cables justifies not performing visual inspections at least once a year or in the event of severe weather. If operating experience indicates increasing water accumulation rates as indicated by more frequent level alarms or cables are found wetted or submerged when performing manual pump outs, the issue is entered into the corrective action program. Corrective actions consider, as appropriate, interim compensatory actions and increasing the frequency of visual inspections until there is sustained operating experience to support resuming every five year inspection frequency.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2007, the NRC issued Generic Letter (GL) 2007-01, “Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients,” requesting failure histories and associated information describing cable inspection, testing and monitoring programs to detect the degradation of inaccessible power cables, for circuits that are in scope for Maintenance Rule. The purpose of the GL was to inform licensees that the failure of certain power cables can affect the functionality of multiple accident mitigation systems or cause plant transients, inform licensees that the absence of adequate monitoring of cable insulation could result in abrupt failures, and request information about current associated test practices. The GL was entered into the operating experience and corrective action programs. Clinton specific operating experience was documented in the Constellation corporate response to the GL. In reviewing plant-specific operating experience related to inaccessible power cables, no history of failures of inaccessible or underground power cables were identified. The review examined the plant corrective action program, Maintenance Rule database, and maintenance records to identify power cable failures. In addition, the cable condition monitoring program was described. The cable monitoring program takes advantage of motor testing that is typically performed from the switchgear; therefore, motor feeder cables are tested along with the motors. Testing includes resistance, polarization index, and step voltage. If the screening indicates a problem with a cable, then appropriate diagnostic cable testing is implemented. This evaluation of medium voltage, generation significant, and safety-related circuits provides objective evidence that inaccessible power cable industry operating experience is assessed and incorporated into maintenance and testing practices.

2. In 2008, Significant Event Notification (SEN) 272 was issued, documenting how a degraded underground cable resulted in a phase-to-ground fault and loss of offsite power to safety-related buses, at another plant. Significant aspects of the event included: loss of an offsite power supply resulting in plant shutdown, a 20-day forced outage to replace six damaged and 24 additional power cables, and periodic testing in lieu of cable replacements was not effective in predicting cable degradation or preventing cable failure. The SEN was entered into the operating

experience and corrective action programs. The specific evaluation performed addressed several factors for cable condition monitoring. As a result of this evaluation, the inaccessible medium voltage cables were identified and documented with their cable functions and the associated potential consequence of failure. The evaluation determined that the identified inaccessible medium voltage cables were nonsafety-related, with no history of failure. It was determined that based on the functions supported by the inaccessible cables that no additional actions were currently warranted. This evaluation of medium voltage, generation significant, and safety-related circuits provides objective evidence that inaccessible power cable industry operating experience is assessed and incorporated into maintenance and testing practices.

3. In 2010, a Constellation fleet-wide operating experience item was issued for the cable condition monitoring program. Corporate wide actions, tracked in the corrective action program were assigned to identify cables subject to wetted environments and assess and subsequently improve associated manhole configurations. Corrective actions included:

   - Identifying inaccessible, underground cables
   - Identifying which of these cables are in scope for maintenance rule and license renewal
   - Identifying current inspection or de-watering strategy for underground structures and manholes / cable vaults
   - Developing a schedule for inspection and if needed dewatering of underground structures and manholes / cable vaults
   - Ranking of cables in underground structures and manholes / cable vaults with respect to their safety or generation critical functions
   - Developing a long term plan for condition monitoring of safety-related or generation critical cables routed in underground structures considering testing, rerouting or replacement.

   These actions provide a cable condition monitoring program that implements cable testing and uses the test results to determine if additional testing or corrective actions may be required. These actions also provide for periodic manhole / cable vault inspections and an associated improvement initiative to manholes / cable vaults to prevent exposing inaccessible power cables to significant moisture, i.e., installation of dewatering devices. These actions are included in the corrective action program. These corrective actions remain in place as follows:

   - Recurring work orders are in place to inspect cable vaults
   - Based on industry practices and Clinton cable design, state of the-art cable testing methodologies have been implemented with cable testing already performed on two in scope inaccessible power cables.

- Implemented a strategy for dewatering manholes / cable vaults containing Maintenance Rule and security cables including installation of 17 solar powered sump pumps to address high and medium voltage cables for safety-related shutdown service water pumps and recirculation pumps.

This corporate wide initiative provides objective evidence that inaccessible power cables are being tested and that manholes / cable vaults with water accumulation are identified and evaluated with subsequent effective corrective actions included in the corrective action program.

4. Clinton has site specific operating experience with cable vault flooding since becoming aware of the vulnerability through industry operating experience. The site has taken action on several occasions to improve the cable vault flooding issue.

   In 2007, Clinton identified cables subject to constant submergence and developed a long-term asset management strategy to improve cable vault conditions. The corrective actions included installing solar-powered dewatering pumps and monitoring equipment in the cable vaults. The solar-powered pumps were able to pump water continually and automatically from the vaults as needed, assuming adequate sunlight. The result being a large drop off in the number of vaults found with high water level.

   In 2016, Clinton revisited cable vault dewatering with a focus on lowering the need for emergent cable vault pumping evolutions to lower the burden on operations, chemistry, and radiation protection resources. Although the solar-powered pumps had improved cable vault dewatering, in all but summer months available sunlight was inadequate to maintain water levels acceptable. Cable vault water levels frequently reached the high alarm setpoint necessitating emergent activities to sample and pump out the accumulated water. Occasionally cable vault water levels were observed to reach the high-high set point requiring the vault to be visually inspected. Based on the site experience, Clinton initiated a configuration change to provide permanent power and ultrasonic indication for safety-related cable vaults. The change replaced the solar powered sump pumps and float controllers with new sump pumps powered by 120VAC power. Each new sump pump was controlled by a digital level controller to determine when to start and stop the pump based on two strain gauge level sensors inside the cable vault.

   The configuration change also included a new SmartVault ultrasonic level monitoring system for each cable vault. The ultrasonic level monitoring system transmits the water level to vendor data processing center via the Iridium satellite system. The water level for each cable vault can be automatically displayed on a dedicated web page for trending. If a high water level is detected or a fault is detected in the system, a text message or email is sent automatically to plant personnel.

A review of the Clinton corrective action program following modification of the safety-related cable vault dewatering system shows several instances where the SmartCover system notified operators of a cable vault condition or dewatering system issue requiring operator intervention. Only one occurrence was identified where a dewatering system failure resulted in cables becoming wetted.

This operating experience provides objective evidence of Clinton using site specific operating experience to identify design deficiencies and then develop corrective actions to drive hardware improvements to eliminate the condition via the corrective action program.

The operating experience relative to the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program did not identify an adverse trend in performance. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence. Assessments are performed when system degradation is found to identify areas that need improvement to maintain the quality performance of the in scope cables and connections. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that the implementation of the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program will effectively identify degradation prior to failure or loss of intended function during the period of extended operation.

Conclusion

The new Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program will provide reasonable assurance that the reduced insulation resistance aging effects will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.40 Metal Enclosed Bus

Program Description

The Metal Enclosed Bus aging management program is an existing condition monitoring program to manage the identified aging effects of in scope metal enclosed bus during the period of extended operation. The internal portions of the accessible bus enclosure assemblies are inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The bus insulation is visually inspected for signs of reduced insulation resistance, such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination which may indicate overheating or aging degradation. The internal bus insulating supports are visually inspected for structural integrity and signs of cracks. External surfaces are visually inspected for loss of material due to general, pitting, and crevice corrosion. Enclosure assembly elastomers are visually inspected for surface cracking, crazing, scuffing, dimensional change, shrinkage, discoloration, hardening, and loss of strength. A sample of accessible bolted connections is inspected for increased resistance of connection using a state-of-the-art method such as micro-ohmmeter. The sample will be of 20 percent of the accessible metal enclosed bus bolted connection population with a maximum sample size of 25.

Metal enclosed buses are to be free from unacceptable visual indications of surface anomalies which suggest degradation exists. Additionally, unacceptable indications of external or internal material condition or contamination should not be present. An unacceptable indication is defined as a noted condition that, if left unmanaged, could lead to a loss of intended functions. External surfaces are to be free from general, pitting and crevice corrosion that result in loss of material. Enclosure assembly elastomers are to be free from unacceptable visual indications of degradation. The selected sample of bolted connections inspected by resistance measurements will be confirmed to be within the acceptance criteria established in program implementing procedures. Unacceptable results are subject to an evaluation under the corrective action program.

The inspections and resistance measurements are performed at least once every 10 years for indications of aging degradation. The first inspections for license renewal will be completed prior to the period of extended operation.

NUREG-1801 Consistency

The Metal Enclosed Bus aging management program is consistent with the ten elements of aging management program XI.E4, "Metal Enclosed Bus," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Metal Enclosed Bus aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In November 2009, Significant Event Report (SER) 5-09 was issued for a 6.9 kV non-segregated bus failure at another plant. Corporate engineering initiated review of this industry operating experience within the Constellation fleet using the corrective action program. Clinton has not experienced similar issues with plant metal enclosed bus. In response to this industry operating experience, activities were initiated to incorporate the lessons learned from this event, specifically additional hi-pot testing and connection torque checks. The initial evaluation and subsequent actions were driven to closure using the corrective action program. Enhanced non-segregated bus inspections, based on the lessons learned from SER 5-09, were performed including torque checks and ductor measurements. These actions provide objective evidence of industry operating experience being used to improve condition monitoring of the metal enclosed bus and prevent events that have occurred at other plants.

2. In December 2011, during performance of non-segregated bus inspections, a U-bracket was identified to be degraded in the unit auxiliary transformer (UAT) non-segregated bus. The inspection was being performed to check the tightness of bolting based on recommendations in SER 5-09. An issue report was generated in the station corrective action program to document the observed condition, initiate an engineering review and drive actions to correct the condition. The broken U-bracket was replaced to eliminate the observed condition. These actions provide objective evidence of Clinton detecting a degraded condition and taking corrective action to restore the component prior to an adverse impact to system functionality.

3. In March 2018, Clinton generated a corrective action program issue report to drive electromagnetic interference (EMI) survey testing of the outdoor sections of the UAT non-segregated busses. An EMI survey is an online, non-invasive test using temporary placement of a single split-core radio frequency current transformer and is capable of detecting defects in non-segregated bus systems. Clinton collected EMI data from the UAT under a corrective action program work order. The data obtained met acceptance criteria and did not indicate the presence of a degraded condition warranting further evaluation. These actions provide objective evidence of Clinton using the corrective action program to apply advanced techniques for detecting possible degraded conditions within station components prior to an adverse impact to system functionality.

The operating experience relative to the Metal Enclosed Bus aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including increased resistance of connection, loss of material, reduced insulation resistance and surface cracking, crazing, scuffing, dimensional change, shrinkage, discoloration, hardening and loss of strength. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the Metal Enclosed Bus aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing Metal Enclosed Bus aging management program provides reasonable assurance that the identified aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.41 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is a new conditioning monitoring program. The program implements a technical evaluation of one-time testing results on a representative sample to ensure that either increased resistance of connection is not occurring or that the existing preventive maintenance program is effective such that a periodic inspection program is not required. This technical evaluation of a one-time testing program will provide additional confirmation to support industry operating experience that shows that electrical connections have not experienced a high degree of failures and that existing installation and maintenance practices are effective. The technical evaluation of the one-time testing program also provides additional support / refute the absence of age-related degradation due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. The representative sample of connections are chosen considering voltage level (medium and low voltage), circuit loading (high loading), connection type, and location (high temperature, high humidity, vibration, etc.). A representative sample is 20 percent of the population with a maximum sample size of 25 connections. The specific type of test performed will be a proven test for detecting increased resistance of connections (such as thermography, contact resistance measurement, or another appropriate test) without removing the connection insulation (such as heat shrink tape, sleaving, insulating boots, etc.).

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program does not implement visual inspections of cable connection insulation materials as an alternative to thermography.

This new aging management program will be implemented prior to the period of extended operation. The technical evaluation of one-time tests will also be completed prior to the period of extended operation.

NUREG-1801 Consistency

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is consistent with the ten elements of aging management program XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In May 2014, data obtained during routine, semi-annual panel thermography monitoring activities indicated a 32 degrees F step change higher delta temperature on a fuse connection in an isolation fuse panel. The delta temperature trend on the fuse connection had previously been about 15 to 20 degrees F higher. The unexpected change in temperature difference exceeded acceptance criteria necessitating a new corrective action program issue to be generated with the recommended action to increase thermography monitoring from semi-annually to monthly until a stable delta temperature trend was established. However, upon reviewing the new issue, and considering the worst case consequences of fuse failure to the plant, senior management elevated the priority of the resolution. In May 2014, troubleshooting identified elevated resistance across the fuse connection and the fuse was replaced, eliminating the degraded condition prior to an adverse impact to functionality of the associated circuit.

   This operating experience provides objective evidence of Clinton using thermography data from the preventative maintenance program to identify a degraded condition, then using the corrective action program to develop and implement actions prior to system functionality being adversely affected.

2. In May 2019, data obtained while performing routine switchyard thermography under the preventive maintenance (PM) program identified an unexpected step change in temperature inside a main power transformer power panel on a cooling fan breaker. The line side “C” phase wire was observed to have a delta temperature of 58.6 degrees F compared to the line side “A” phase wire. The line side “C” phase wire had been trending with maximum delta temperature less than 50 degrees F since September 2015. However, the unexpected step change in delta temperature to 58.6 degrees F exceeded acceptance criteria resulting in reclassification to “yellow / marginal” and necessitating a new corrective action program issue to be generated. Station review of the new issue recommended increased thermography monitoring to bi-weekly until a stable delta temperature trend was established. Actions to address the degraded condition were bundled with a PM work order scheduled for the next refueling outage. The degraded condition was eliminated when 480 VAC control cabinet breakers were replaced, including the cooling fan breaker.

This operating experience provides objective evidence of Clinton using data from the preventive maintenance program to identify a degraded condition, then using the corrective action program to develop and implement actions prior to system functionality being adversely affected.

3. In July 2018, data obtained during routine thermography monitoring activities identified a high delta temperature on the fifth harmonic current transformer (CT) on reserve auxiliary transformer (RAT) static VAR compensator. The data indicated the CT had an elevated observable temperature of 126.9 degrees F compared to an adjacent CT measured at 107.9 degrees F. The bolted connection observable temperature for the suspect CT was 151.5 degrees F compared to an adjacent CT measured at 100.1 degrees F or a delta temperature of 51.4 degrees F. The thermography data also showed an unexpected step change from data previously obtained on January 8, 2018, when the suspect CT showed a delta temperature present but within acceptance criteria. The delta temperature for the bolted connection exceeded acceptance criteria for instrument transformers and was categorized Red (Unacceptable) necessitating a new corrective action program issue to be generated. Immediate actions taken in response to the new issue included reviewing the condition with operations, engineering and maintenance personnel to align on a course of action, generating an equipment assessment report and capturing it as a system health issue and assessing the associated risk to the plant. Corrective actions included obtaining current measurements for all three CTs and obtaining external temperature data from July 9, 2018 to August 28, 2018 to establish a temperature trend and assess margin to the component maximum temperature limit. Risk to the plant was assessed to be low based on discussion with vendor, previous failure analysis on similar CTs, current measurements showing balanced current between the three phases and a stable temperature trend with more than 50 degrees F temperature margin. The degraded condition was eliminated when the suspect CT was replaced during the next refueling outage.

   This operating experience provides objective evidence of Clinton using thermography data from the preventive maintenance program to identify degraded conditions, capturing the issue in the corrective action program, methodically assessing risk to the plant then making a risk-based decision to develop and implement actions prior to system functionality being adversely affected.

The operating experience relative to the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting identified aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental

Qualification Requirements aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program will provide reasonable assurance that the aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.1.42 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

Program Description

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program is a new program that performs periodic visual inspections of internal coatings/linings exposed to closed-cycle cooling water, raw water, waste water, condensation, and fuel oil. There are no piping or components with internal coatings/linings in the program scope that are exposed to treated water, treated borated water or lubricating oil. This program is not used to manage the integrity of coatings applied to external surfaces of components. There are no cement lined piping components in the scope of the program.

This program manages aging effects for internal coatings by conducting periodic visual inspections of all coatings/linings applied to the internal surfaces of in-scope components where loss of coating or lining integrity could impact the component's or downstream component's current licensing basis intended function(s). Inspections are performed for signs of coating failures and precursors to coating failures including peeling, delamination, blistering, cracking, flaking, chipping, rusting, and mechanical damage. For coated surfaces determined to not meet acceptance criteria, physical testing is performed where physically possible (i.e., sufficient room to conduct testing) in conjunction with repair or replacement of the coating. A coatings specialist qualified to ASTM D7108-05, "Standard Guide for Establishing Qualifications for a Nuclear Coatings Specialist," will evaluate the results of coating inspections. Inspection results that do not satisfy established acceptance criteria are entered into the Clinton 10 CFR 50, Appendix B corrective action program. The corrective action program ensures that conditions adverse to quality are promptly corrected. Corrective actions may include coating repair or replacement prior to the component being returned to service.

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program activities are implemented through station procedures and activities. The performance of periodic visual inspections assures the integrity of internal coatings and considers the guidance on acceptance criteria included in Element 6 of NUREG-1801 AMP XI.M42, as described in LR-ISG-2013-01. Visual inspections, repairs, replacement, or evaluations of internal coatings will provide reasonable assurance that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program will manage loss of coating integrity during the period of extended operation.

This new aging management program will be implemented prior to the period of extended operation. Baseline inspections will occur in the 10-year period prior to the period of extended operation.

NUREG-1801 Consistency

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program will be consistent with the ten elements of aging management program XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," specified in NUREG-1801, as described in LR-ISG-2013-01.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. During inspection activities in 2014 under a work order, it was discovered that the inlet side of the inlet/outlet water box "A" of the plant chilled water system chiller contained an area where there was no protective coating present. The area is the inlet quadrant closest to the plant service water system (WS) inlet nozzle. The area of the shell is approximately 7 square feet. The south edge of the missing coating is a straight line on the outside of the two internal supports.

   The area in question appears to have not been previously coated. It is suspected that at the time the waterbox was initially coated, that the WS isolation valves leaked by and prohibited this area from being coated. The coating deficiency was entered into the corrective action program and the area in question was coated.

   This operating experience example provides objective evidence that internal coatings are inspected for degradation, and that adverse conditions are identified and addressed in the corrective action program.

2. In 2014, during an as-found boroscopic inspection, the majority of Belzona coating inside the piping flange and reducer downstream of a control room cooling coil flow control valve was discovered to be missing. The purpose of the coating was to provide additional protection for the piping segment due to degradation caused by erosion/cavitation. With the coating missing, the piping segment was no longer "protected." The chiller was still able to perform its function with the coating missing from the pipe. No downstream impacts due to the displaced coating were identified.

Immediate actions were taken that included issuing an issue report and entering the degraded condition into the corrective action program to inspect the section of piping annually. Additionally, the station Plant Health Committee approved replacement of the piping segment with stainless steel should future inspections determine that action is required based on inspection findings.

This operating experience example provides objective evidence that internal coatings are inspected for degradation, and that adverse conditions are identified and addressed in the corrective action program.

3. During the Division 2 diesel generator fuel oil storage tank cleaning in 2015, engineering personnel identified fourteen separate indications related to the integrity of the tank internal coatings system. Twelve of these were small (3/16-inch diameter or smaller) areas where the coatings had been chipped off. One indication was a 'Holiday' where a bubble of the topcoat paint had been carried away, revealing the primer underneath. One indication was a three by one inch area where the coatings had peeled off, revealing the base metal underneath. Five of the 12 small indications have at least a small amount of corrosion.

   The station coatings specialist performed an inspection of the tank coating. All criteria, including blistering, delamination, holidays, and cracking were satisfactory with the exception of the areas identified above. An evaluation was performed and documented in the corrective action program. This evaluation determined that because the affected areas were very small, the remaining coated surface was in good condition, and no loose coating was identified that could affect downstream components, the tank could be returned to service until the next scheduled inspection. The next tank cleaning will be performed in 2025 with any coating repairs taking place during this time.

   This operating experience example provides objective evidence that internal coatings are inspected for degradation, and that adverse conditions are identified and addressed in the corrective action program.

The operating experience relative to the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects including loss of coating or lining integrity and loss of material. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The new Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks aging management program will provide reasonable assurance that the loss of coating or lining integrity and loss of material aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.2.2 Plant Specific Aging Management Programs

This section provides summaries of the plant specific programs credited for managing the effects of aging.

B.3 NUREG-1801 Chapter X Aging Management Programs

This section provides summaries of the NUREG-1801 Chapter X programs credited for managing the effects of aging.

B.3.1.1 Fatigue Monitoring

Program Description

The Fatigue Monitoring aging management program is an existing program that manages fatigue damage of reactor pressure vessel components, reactor coolant pressure boundary piping components, and other components subject to the reactor coolant, treated water, steam, condensation, diesel exhaust, air-outdoor, and air-indoor uncontrolled environments. Components that are managed by the program are fabricated from carbon steel, low alloy steel, stainless steel, nickel alloy, and inconel alloy.

The Fatigue Monitoring aging management program is a preventive program that monitors and tracks the number of critical thermal, pressure, and seismic transients to ensure that the number of transient occurrences and cumulative usage factor (CUF) for each analyzed component does not exceed the applicable design limit through the period of extended operation. The program monitors the transients specified in USAR Table 3.9-1, “Plant Events,” which is referenced in Technical Specification 5.5.5, “Component Cyclic or Transient Limit.” The program also monitors applicable design transient parameters (e.g., temperatures, pressures, displacements, strains, flow rates, etc.) for components with stress-based fatigue calculations.

The program utilizes the SI:FatiguePro™ software which is a computerized data acquisition, recording, and tracking program. SI:FatiguePro™ is used to determine the overall cumulative number of transient occurrences that have occurred at a given time and determines the CUF and environmentally-assisted fatigue (CUFen) values resulting from the combination of transient occurrences. SI:FatiguePro™ performs “stress-based” and “cycle-based” fatigue monitoring. The CUF and CUF_{en} values for the components monitored by SI:FatiguePro™ are compared to the appropriate allowable limits (e.g., 1.0 for ASME Section III locations, 0.1 for high energy line break (HELB) exclusion locations, or 1.0 for CUF_{en} for environmental fatigue locations). The Fatigue Monitoring aging management program will be enhanced to monitor the jet pump riser brace, the core spray piping, and the containment electrical penetrations through cycle-based tracking. When an actual CUF value or the number of transient occurrences exceed 80 percent of applicable allowable limit, corrective action is taken. Corrective actions may include revision of the affected fatigue analyses to address high CUF or CUF_{en} values, establishing an inspection program using an approach acceptable to the NRC (such as inspections performed in accordance with Appendix L of ASME Code Section

XI based on flaw tolerance analysis), or repair or replacement of affected components prior to the CUF or CUF_{en} values exceeding their allowed values.

This program verifies the continued acceptability of existing fatigue analyses through transient occurrence counting and calculation of CUF and CUF_{en} values to demonstrate that they continue to meet the appropriate limits. Fatigue Monitoring procedures require periodic validation of chemistry parameters that are used as input to the CUF_{en} calculations. The program requires comparison of actual event parameters to the applicable design transient definitions to ensure the actual transient is bounded by the applicable design transient. CUF and CUF_{en} values are computed parameters used to assess the likelihood of fatigue damage. Fatigue crack initiation is assumed to begin in a mechanical or structural component when the CUF or CUF_{en} values reach the value of 1.0. Class 1 piping locations with a CUF value less than or equal to 0.1 do not require HELB exclusion locations to be postulated.

NUREG-1801 Consistency

The Fatigue Monitoring aging management program is an existing program that is consistent with the ten elements of aging management program X.M1, Fatigue Monitoring, specified in NUREG-1800, with the following enhancements:

Exceptions to NUREG-1801

None.

Enhancements

The Fatigue Monitoring aging management program will be enhanced to:

1. Address the cumulative fatigue damage effects of the reactor coolant environment on component life by evaluating the impact of the reactor coolant environment on critical components identified in NUREG/CR-6260. Additional plant-specific component locations in the reactor coolant pressure boundary will be evaluated if they are more limiting than those considered in NUREG/CR-6260. SI:FatiguePro™ software will be updated to include the calculation and tracking of Environmentally Assisted Fatigue, in accordance with NUREG/CR-6909, Revision 1. Program Elements Affected: Scope of Program (Element 1), Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), Monitoring and Trending (Element 5), and Acceptance Criteria (Element 6)

2. The jet pump riser brace, the core spray piping of the reactor vessel internals, and the containment electrical penetrations will be added to the Fatigue Monitoring program procedure. The components will be monitored through cycle-based tracking and compared to the applicable design transient occurrence limits. Program Elements Affected: Scope of Program (Element 1)

Operating Experience

The following examples of operating experience provide objective evidence that the Fatigue Monitoring aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. Version 1 of the fatigue monitoring software SI:FatiguePro™ was installed for use at Clinton in 2002. Since 2002, SI:FatiguePro™ has been updated to version 4. SI:FatiguePro™ monitors plant operating parameters, counts fatigue transient stress occurrences, and then calculates, trends, and projects cumulative usage factors for bounding component locations. Some transient occurrences are manually entered into SI:FatiguePro™. The software allows the Fatigue Monitoring program manager to accurately monitor fatigue usage of critical locations to ensure that accumulative CUF values will remain less than the associated allowable design criteria through the period of extended operation. CUF values are evaluated against the procedural acceptance criterion of 80 percent of the applicable limit, and if exceeded, the condition is entered into the corrective action program. The following are some of the components that are monitored by SI:FatiguePro™: reactor pressure vessel (RPV) shell and various RPV nozzles, reactor recirculation piping, residual heat removal piping, RPV closure region, RPV shroud support, feedwater piping, feedwater nozzles, and control rod drive (CRD) penetrations.

   In 2012, the manual for SI:FatiguePro™ was reviewed. The previous three years of fatigue usage and transient reports were revaluated, and transient occurrences were verified. If transients were not counted properly, the procedure was revised, and the model was updated. During this review, it was found that the occurrence of shutdown cooling transients were improperly entered in previous model updates. The durations of the shutdown cooling transients were found to be too long and too frequent, and were corrected per the review.

   This example provides objective evidence that the Fatigue Monitoring aging management program effectively updates and improves program procedures and software to monitor cumulative fatigue usage more effectively.

2. When accumulated fatigue usage values exceed the 80 percent procedural acceptance criterion, the condition is entered in a corrective action program issue report. For example, as of December 31, 2018, the monitored location MS-460 at the socket welded joint interface between the main steam system containment isolation drain valves and downstream piping had a cumulative usage factor of 85.9 percent of the allowable limit of 0.1. In addition to planning a modification to restore margin at the location, the configuration of location MS-460 was reanalyzed and determined that the location will remain within acceptance criteria limits for 60 years.

In 2008, it was documented that the turbine-roll transient exceeded the 80 percent design allowable limit, and the condition was entered in a corrective action program issue report. The design basis of the transient was reanalyzed, and it was found that the transient was overcounted during the early years of plant operation, and the transient occurrence counts were reduced.

This example provides objective evidence that the Fatigue Monitoring aging management program effectively monitors plant transients and cumulative usage factors, utilizes the corrective action program, and results in actions or evaluations to demonstrate that cumulative usage will continue to meet acceptance criteria for the life of the plant.

3. SI:FatiguePro™ performs stress-based fatigue monitoring on four feedwater nozzle locations to ascertain cumulative fatigue. SI:FatiguePro™ previously performed stress-based fatigue calculations using single, principal stress component greens function to calculate stress ranges and fatigue usage factors. These transfer functions have since been upgraded for input into SI:FatiguePro™ Version 4 stress-based fatigue module, thus avoiding the concerns raised in NRC Regulatory Issue Summary (RIS) 2008-30, “Fatigue Analysis of Nuclear Power Plant Components.”

   Since the feedwater nozzle locations are exposed to the reactor water environment, SI:FatiguePro™ software will be upgraded for the period of extended operation to monitor for environmentally assisted fatigue using the guidance from NUREG/CR-6909, Revision 1.

   This example provides objective evidence that the Fatigue Monitoring aging management program utilizes industry operating experience and continuous improvement to ensure that cumulative usage of the feedwater nozzles will continue to meet acceptance criteria for the life of the plant.

The operating experience relative to the Fatigue Monitoring aging management program did not identify an adverse trend in performance. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that implementation of the enhanced Fatigue Monitoring aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The enhanced Fatigue Monitoring aging management program will provide reasonable assurance that the aging effects will be adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.3.1.2 Environmental Qualification (EQ) of Electric Components

Program Description

The Environmental Qualification (EQ) of Electric Components is an existing preventive program that manages the aging of electrical equipment within the scope of 10 CFR 50.49, “Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants.” The program establishes, demonstrates, and documents the level of qualification, qualified configurations, maintenance, surveillance and replacements necessary to meet 10 CFR 50.49. A qualified life is determined for equipment within the scope of the program and appropriate actions such as replacement or refurbishment are taken prior to or at the end of the qualified life of the equipment so that the aging limit is not exceeded. The various aging effects addressed by this program are adequately managed so that the intended functions of components within the scope of 10 CFR 50.49 are maintained consistent with the current licensing basis during the period of extended operation. In addition to electrical components, Clinton EQ program includes active safety-related mechanical components in harsh areas.

NUREG-1801 Consistency

The Environmental Qualification (EQ) of Electric Components aging management program is consistent with the ten elements of aging management program X.E1, "Environmental Qualification (EQ) of Electric Components," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following examples of operating experience provide objective evidence that the Environmental Qualification (EQ) of Electric Components aging management program will be effective in assuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In May 2023, during preparation of an engineering design change, reactor water cleanup (RWCU) differential flow modification, two discrepancies in EQ program documentation were identified. An error was found in an EQ binder, where the RWCU to condenser inboard isolation valve, limitorque actuator location was listed as EQ zone H-27 (drywell) instead of EQ zone H-29 (containment main steam tunnel). A second error was identified when snubber 1RT02067S was found listed in the mechanical EQ specification. The snubber 1RT02067S was previously replaced with a strut. The snubber was verified to not be listed in EQ Binder, “Mechanical

Snubbers Pacific Scientific," or the station Snubber Program Document, and is shown as "REMOVED" in the PassPort equipment database. In both cases the identified EQ documentation discrepancies were captured in the station corrective action program, reviewed by station personnel and assessed to have no impact on the component qualification or qualified life. Corrective actions to eliminate the discrepancies are identified, captured in the corrective action program and prioritized for resolution.

This operating experience example provides objective evidence of Clinton using the corrective action program to ensure EQ auditable documentation files are maintained for all components within the scope of 10 CFR 50.49.

2. In June 2021, during an Engineering Design Control Audit by a Constellation internal oversight team, a review of Clinton EQ Binders identified a backlog of updates required to reflect previously implemented design changes. A total of 77 outstanding changes were identified to be posted against 59 different EQ Binders. The 77 posted changes were associated with 16 design changes previously implemented in the plant. The observed condition does not meet the requirements of the Constellation design change control process and was captured in the corrective action program to drive resolution by the station. Corrective actions to eliminate the discrepancies are identified, captured in the corrective action program and prioritized for resolution. Clinton leveraged the License Renewal project to update the impacted EQ Binders and eliminate the backlog of EQ Binder updates.

   This operating experience example provides objective evidence of Clinton using internal operating experience generated by self-assessments to identify programmatic issues and using the corrective action program to drive actions to eliminate the concern.

3. In August 2015, Clinton identified a potential 10 CFR Part 21 issue using the NRC webpage. The Part 21 was issued by the equipment manufacturer based on field reports of anomalous behavior of components at two other nuclear power plants. The manufacturer indicated limit switches containing the suspect subcomponents were sold to Clinton. Clinton generated an issue report in the corrective action program to investigate possible applicability to Clinton as required by Constellation process procedures. The condition report drove a documented review of order, inventory and issuance history, confirmed the Part 21 issue applied to Clinton and identified four environmentally qualified valves installed in the plant containing suspected components. Additionally, the issue report drove an engineering review to assess the potential impact to functionality of systems affected by the suspected components. Engineering personnel generated a second issue report in the corrective action program to document the results of the engineering evaluation and concluded one of the four suspect valves to be inoperable as a result of the 10 CFR Part 21 condition. The 10 CFR Part 21 condition was eliminated by replacing the suspect component. Although no performance anomalies were identified, and physical inspection of the suspected limit switch showed no evidence

of degradation, replacing the switch proactively eliminated a possible challenge to functionality of a safety-related valve.

This operating experience example provides objective evidence of Clinton using external operating experience to identify potentially degraded conditions, capturing the issue in the corrective action program, developing and implementing actions prior to system functionality being adversely affected.

The operating experience relative to the Environmental Qualification (EQ) of Electric Components aging management program did not identify an adverse trend in performance. The inspection methods being implemented by the program have been proven effective in detecting aging effects. Appropriate guidance for evaluation, repair, or replacement is provided for locations where degradation is found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience. Therefore, there is confidence that continued implementation of the Environmental Qualification (EQ) of Electric Components aging management program will effectively manage the effects of aging and initiate corrective actions prior to loss of intended function during the period of extended operation.

Conclusion

The existing Environmental Qualification (EQ) of Electric Components aging management program provides reasonable assurance that the various aging effects are adequately managed so that the intended functions of components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

APPENDIX C
RESPONSE TO BWRVIP LICENSE RENEWAL APPLICANT ACTION ITEMS

Of the BWRVIP reports credited within Clinton Power Station (CPS) license renewal aging management programs, the following include NRC safety evaluation reports (SERs) that include applicant action items (AAIs) applicable to license renewal applicants:

- BWRVIP-18-R2-A; BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines
- BWRVIP-25-R1-A; BWR Core Plate Inspection and Flaw Evaluation Guidelines
- BWRVIP-26-A; BWR Top Guide Inspection and Flaw Evaluation Guidelines
- BWRVIP-27-A; BWR Standby Liquid Control System/Core Plate dP Inspection and Flaw Evaluation Guidelines
- BWRVIP-38; BWR Shroud Support Inspection and Flaw Evaluation Guidelines
- BWRVIP-41; BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines (Revision 4)
- BWRVIP-42-R1-A; BWR LPCI Coupling Inspection and Flaw Evaluation Guidelines
- BWRVIP-47-A; BWR Lower Plenum Inspection and Flaw Evaluation Guidelines
- BWRVIP-48-A; BWR Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines (Credited in BWR Vessel ID Attachment Weld program)
- BWRVIP-49-A; BWR Instrument Penetration Inspection and Flaw Evaluation Guidelines (Credited in BWR Penetrations program)
- BWRVIP-74-A; BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guideline for License Renewal
- BWRVIP-76-A; BWR Core Shroud Inspection and Flaw Evaluation Guidelines
- BWRVIP-139-R1-A, Steam Dryer Inspection and Flaw Evaluation Guidelines

License renewal applicant action items identified in the corresponding SERs for each of the above BWRVIP reports are addressed in the following tables. BWRVIP reports without SERs for license renewal do not have action items and are therefore not included in the tables.

It is recognized that the first three action items from each of the license renewal SERs applicable to the above BWRVIP reports are fundamentally identical. For that reason they are combined in the table and addressed together.

Common Action Items from BWRVIP-18 R2-A, -25 R1-A, -26-A, -27-A, -38, -41 R4, -42 R1-A, -47-A, -48-A, -49-A, -74-A, -76-A	
Action Item Description	**Clinton Response**
BWRVIP-All (AAI 1) The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP reports to manage the effects of aging of subject components during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within these BWRVIP reports described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the components or other information presented in the reports, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWRVIP reports applicable to Clinton have been reviewed and Clinton aging management programs have been verified to be bounded by the reports. Additionally, Clinton is committed to programs described as necessary in the BWRVIP reports to manage the effects of aging during the period of extended operation. These commitments are included in LRA Appendix A, Section A.5. If, upon review of a BWRVIP approved guideline, it is determined that known deviations to full compliance are warranted, the NRC will be notified of the deviation within 45 days of the receipt of NRC final approval of the guideline. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50, Appendix B.
BWRVIP-All (AAI 2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contains a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the applicable BWRVIP report shall ensure that the programs and activities specified as necessary in the applicable BWRVIP reports are summarily described in the FSAR supplement.	The USAR supplements are included in LRA Appendix A. The USAR supplements include a summary description of the programs and activities specified as necessary for managing the effects of aging per the BWRVIP reports.

Common Action Items from BWRVIP-18 R2-A, -25 R1-A, -26-A, -27-A, -38, -41 R4, -42 R1-A, -47-A, -48-A, -49-A, -74-A, -76-A	
Action Item Description	**Clinton Response**
BWRVIP-All (AAI 3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. The applicable BWRVIP reports may state that there are no generic changes or additions to technical specifications associated with the report as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the applicable BWRVIP report shall ensure that the inspection strategy described in the reports does not conflict with or result in any changes to their technical specifications. If technical specification changes or additions do result, then the applicant must ensure that those changes are included in its application for license renewal.	There are no changes to technical specifications as part of this LRA that are required to meet the requirements of the BWRVIP reports during the period of extended operation. Reference LRA Appendix D.

Additional Action Items	
BWRVIP-18 R2-A, Core Spray Internals Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-18 R2-A (AAI 4) Applicants referencing the BWRVIP-18 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components.	Cumulative fatigue damage is a potential TLAA issue identified for core spray system piping and components internal to the reactor vessel. TLAA is used to manage cumulative fatigue damage for these core spray piping and components as discussed in LRA Section 4.3.

BWRVIP-25-R1-A Core Plate Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-25-R1-A (AAI 4) Due to susceptibility of the rim hold-down bolts to stress relaxation, applicants referencing the BWRVIP-25 report for license renewal should identify and evaluate the projected stress relaxation as a potential TLAA issue.	CPS is a BWR/6 with core plate wedges, the preload on the rim hold-down bolts is not required. Therefore, there is no associated TLAA. However, LRA Section 4.2.8 does document fluence projections for the Core Plate Bolts.
BWRVIP-25-R1-A (AAI 5) Until such time as an expanded technical basis for not inspecting the rim hold-down bolts is approved by the staff, applicants referencing the BWRVIP-25 report for license renewal should continue to perform inspections of the rim hold-down bolts.	Since CPS is a BWR/6 with core plate wedges, no rim hold-down bolt inspections are recommended.

BWRVIP-26-A Top Guide Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-26-A (AAI 4) Due to IASCC susceptibility of the subject safety-related components, applicants referencing the BWRVIP-26 report for license renewal should identify and evaluate the projected accumulated neutron fluence as a potential TLAA issue.	The fluence evaluation for reactor internals performed for license renewal determined that the neutron fluence threshold for IASCC susceptibility has been exceeded. Fluence for reactor internals is evaluated as a TLAA in LRA Section 4.2. During the period of extended operation, the aging of the top guide will be managed by inspections conducted as part of the BWR Vessel Internals (B.2.1.9) program per guidance provided in BWRVIP-26-A and BWRVIP-183-A. The top guide studs are inspected in accordance with BWRVIP-26-A using VT-3 every 10-year interval. The top guide grid beam is inspected in accordance with BWRVIP-183-A. The program requires the inspection of the rim areas containing the weld and heat affected zone (HAZ) from the top surface of the top guide and two cells in the same plane/axis as the weld at least every six years at the start of the BWRVIP-183-A inspection cycle. The inspections are performed using the enhanced visual inspection technique, EVT-1. The program also allows for inspections to be performed using UT once it becomes available. Inspections will continue to be performed as described above during the period of extended operation. LRA Section 4.2 addresses fluence projections for the Top Guide.

BWRVIP-27-A Standby Liquid Control System/Core Plate dP Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-27-A (AAI 4) Due to the susceptibility of the subject components to fatigue, applicants referencing the BWRVIP 27 report for license renewal should identify and evaluate the projected fatigue cumulative usage factors as a potential TLAA issue.	At CPS, boron is injected through the core spray system. BWRVIP-27-A Section 1.1 states that the document does not apply for plants with boron injection through the core spray system.

BWRVIP-42, R1-A, BWR LPCI Coupling Inspection and Flaw Evaluation Guidelines.	
Action Item Description	**Clinton Response**
BWRVIP-42 R1-A (AAI 4) Applicants referencing the BWRVIP-42 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components.	Cumulative fatigue damage is not a potential TLAA issue identified for the LPCI coupling.
BWRVIP-42 R1-A (AAI 5) The BWRVIP committed to address development of the technology to inspect inaccessible welds and to have the individual LR applicant notify the NRC of actions planned. Applicants referencing BWRVIP-42 report for license renewal should identify the action as open and to be addressed once the BWRVIP's response to this issue has been reviewed and accepted by the staff.	Inspection of the LPCI coupling is performed in accordance with guidelines described in BWRVIP-42-A. Portions of the Upper Elbow to Thermal Sleeve welds at the RPV, are inaccessible. Similar accessible welds have been identified and inspected with no flaws identified. The condition of the accessible welds provides indirect evidence of the condition of the inaccessible welds. The program for inspection of the LPCI coupling includes the guidance within BWRVIP-42-1-A to determine an assumed leakage from any inaccessible weld, if a flaw is identified in any similar accessible welds. If 75 percent of the accessible similar welds are cracked, then a method must be developed to inspect the inaccessible weld. The NRC has accepted use of 75 percent cracking of the similar accessible welds as a criterion for managing inaccessible welds. CPS will notify the NRC if 50 percent and 75 percent of accessible similar welds become cracked in the future.

BWRVIP-47-A, BWR Lower Plenum Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-47-A (AAI 4) Due to fatigue of the subject safety-related components, applicants referencing the BWRVIP-47 report for LR should identify and evaluate the projected CUF as a potential TLAA issue.	Fatigue usage is considered a TLAA for reactor vessel incore instrumentation penetrations and CRD penetrations. This is addressed in LRA Sections 4.3.

BWRVIP-74-A, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines

Action Item Description	Clinton Response
BWRVIP-74-A (AAI 4) The staff is concerned that leakage around the reactor vessel seal rings could accumulate in the VFLD lines, cause an increase in the concentration of contaminants and cause cracking in the VFLD line. The BWRVIP-74 report does not identify this component as within the scope of the report. However, since the VFLD line is attached to the RPV and provides a pressure boundary function, LR applicants should identify an AMP for the VFLD line.	The vessel flange leak detection (VFLD) nozzles and piping are included in the scope of license renewal. The VFLD nozzle is made from nickel alloy. Cracking of the nozzle (N17) is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.1.1) and Water Chemistry (B.2.1.2) programs and loss of material is managed by the One-Time Inspection (B.2.1.22) and Water Chemistry (B.2.1.2) programs. The VFLD piping is fabricated from carbon steel material and is therefore not susceptible to cracking. The VFLD piping is managed by the One-Time Inspection (B.2.1.22), Water Chemistry (B.2.1.2), and External Surfaces Monitoring (B.2.1.25) programs for loss of material.
BWRVIP-74-A (AAI 5) LR applicants shall describe how each plant-specific aging management program addresses the following elements: (1) scope of program, (2) preventative actions, (3) parameters monitored and inspected, (4) detection of aging effects, (5) monitoring and trending, (6) acceptance criteria, (7) corrective actions, (8) confirmation process, (9) administrative controls, and (10) operating experience.	There are no plant-specific aging management programs credited for managing aging of reactor pressure vessel components. Descriptions of the aging management programs credited for managing the reactor pressure vessel are described in Appendix B. These descriptions include any program element that deviates from the NUREG-1801 Revision 2 program element, and any enhancements that are required to meet NUREG-1801 Revision 2 requirements.

BWRVIP-74-A, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-74-A (AAI 6) The staff believes inspection by itself is not sufficient to manage cracking. Cracking can be managed by a program that includes inspection and water chemistry. BWRVIP-29 describes a water chemistry program that contains monitoring and control guidelines for BWR water that is acceptable to the staff. BWRVIP-29 is not discussed in the BWRVIP-74 report. Therefore, in addition to the previously discussed BWRVIP reports, LR applicants shall contain water chemistry programs based on monitoring and control guidelines for reactor water chemistry that are contained in BWRVIP-29.	The Water Chemistry (B.2.1.2) aging management program is consistent with NUREG-1801, Revision 2, Chapter, XI.M2, "Water Chemistry", and meets the requirements of the latest BWRVIP Water Chemistry guidelines to help ensure the long-term integrity of the reactor vessel and internals. Aging management programs that utilize inspections to perform condition monitoring of reactor pressure vessel and internal components to identify cracking also credit the Water Chemistry program to mitigate cracking of reactor vessel components, including the BWR Vessel Internals (B.2.1.9), BWR Vessel ID Attachment Welds (B.2.1.4), BWR Penetrations (B.2.1.8), and BWR Stress Corrosion Cracking (B.2.1.7) programs.
BWRVIP-74-A (AAI 7) LR applicants shall identify their vessel surveillance program, which is either an ISP or plant-specific in-vessel surveillance program, applicable to the LR term.	The Reactor Vessel Surveillance (B.2.1.20) program describes the Integrated Surveillance Program (ISP) that is applicable for the license renewal term.
BWRVIP-74-A (AAI 8) LR applicants should verify that the number of cycles assumed in the original fatigue design is conservative to assure that the estimated fatigue usage for 60 years of plant operation is not underestimated. The use of alternative actions for cases where the estimated fatigue usage is projected to exceed 1.0 will require case-by-case staff review and approval. Further, a LR applicant must address environmental fatigue for the components listed in the BWRVIP-74 report for the LR period.	The Metal Fatigue Analyses associated with the reactor vessel are evaluated as TLAAs in LRA Section 4.3.2. Fatigue TLAAs are managed by the Fatigue Monitoring (B.3.1.1) program to ensure that cumulative fatigue usage will not exceed 1.0. Environmental fatigue for reactor vessel components is evaluated in LRA Section 4.3.2.

BWRVIP-74-A, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-74-A (AAI 9) Appendix A to the BWRVIP-74 report indicates that a set of P-T curves should be developed for the heat-up and cool-down operating conditions in the plant at a given EFPY in the LR period.	P-T limit curves have been developed and will be implemented per 10 CFR 50, Appendix G requirements for the period of extended operation as discussed in LRA Section 4.2.4.
BWRVIP-74-A (AAI 10) To demonstrate that the beltline materials meet the Charpy USE criteria specified in Appendix B of the report, the applicant shall demonstrate that the percent reduction in Charpy USE for their beltline materials are less than those specified for the limiting BWR/3-6 plates and the non-Linde 80 submerged arc welds and that the percent reduction in Charpy USE for their surveillance weld and plate are less than or equal to the values projected using the methodology in RG 1.99, Revision 2.	Charpy upper-shelf energy (USE) values for the period of extended operation were determined using methods consistent with RG 1.99, Revision 2. This is discussed as a TLAA in LRA Section 4.2.2.
BWRVIP-74-A (AAI 11) To obtain relief from the inservice inspection of the circumferential welds during the LR period, the BWRVIP report indicates each licensee will have to demonstrate that (1) at the end of the renewal period, the circumferential welds will satisfy the limiting conditional failure frequency for circumferential welds in the Appendix E for the staff's July 28, 1998, SER, and (2) that they have implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the staff's FSER.	At the end of the renewal period, the circumferential welds for CPS will satisfy the limiting conditional failure frequency for circumferential welds in the staff's July 28, 1998, FSER. Relief from the inservice inspection of the circumferential welds during the period of extended operation is discussed in LRA Section 4.2.5.

BWRVIP-74-A, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-74-A (AAI 12) As indicated in the staff's March 7, 2000, letter to Carl Terry, a LR applicant shall monitor axial beltline weld embrittlement. One acceptable method is to determine that the mean RT_{NDT} of the limiting axial beltline weld at the end of the period of extended operation is less than the values specified in Table 1 of this FSER.	The Axial Weld Failure Probability Assessment Analyses have been identified as TLAAs that are evaluated in LRA Section 4.2.6.
BWRVIP-74-A (AAI 13) The Charpy USE, P-T limit, circumferential weld, and axial weld RPV integrity evaluations are all dependent upon the neutron fluence. The applicant may perform neutron fluence calculations using staff approved methodology or may submit the methodology for staff review. If the applicant performs the neutron fluence calculation using a methodology previously approved by the staff, the applicant should identify the NRC letter that approved the methodology.	An NRC approved methodology was used to determine fluence during the period of extended operation, as discussed in LRA Section 4.2.1.
BWRVIP-74-A (AAI 14) Components that have indications that have been previously analytically evaluated in accordance with sub-section IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period shall be re-evaluated for the 60-year service period corresponding to the LR term.	There are no components within the ASME Code Class 1 reactor coolant pressure boundary with indications that have been previously analytically evaluated until the end of the 40-year service period.

BWRVIP-76 R1-A, BWR Core Shroud Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-76 R1-A (AAI 4) The applicant shall reference the NRC staff-approved TRs BWRVIP-14-A, BWRVIP-99 (when approved) and BWRVIP-100-A in their RVI AMP. The applicant shall make a statement in their LRA that the crack growth rate evaluations and fracture toughness values specified in these reports shall be used for cracked core shroud welds that are exposed to the neutron fluence values that are specified in these TRs. The applicant shall confirm that they will incorporate any emerging inspection guidelines developed by the BWRVIP for these welds.	The BWR Vessel Internals (B.2.1.9) program implements BWRVIP-76-A requirements including guidance within BWRVIP-76-A Section D to use current NRC-approved BWRVIP guidance to determine crack growth rates and fracture toughness values. The BWR Vessel Internals program includes reference to BWRVIP-14-A, BWRVIP-99-A, and BWRVIP-100-A for evaluation of crack growth. The current guidance references BWRVIP-14-A and BWRVIP-99-A for crack growth rates and BWRVIP-100-A for fracture toughness values. The implementing procedures for the BWR Vessel Internals program include guidance to incorporate new guidance within new or revised BWRVIP reports. This assures that any emerging inspection guidelines developed by the BWRVIP for these core shroud welds will be incorporated into the program.
BWRVIP-76 R1-A (AAI 5) LR applicants that have core shrouds with tie rod repairs shall make a statement in their AMP associated with RVI components that they have evaluated the implications of the Hatch Unit 1 tie rod repair cracking on their units and incorporated revised inspection guidelines, if any, developed by the BWRVIP.	CPS installed a shroud tie-rod repair in C1R10 (2006) to address identified cracking in horizontal weld H4. Relief Request 4211 was submitted and approved by the NRC for the tie rod repair. Subsequent tie-rod inspections meet the requirements of BWRVIP-76-A and vendor repair design requirements. CPS has inspected all four (4) tie-rods and their upper supports in C1R11 (2008), C1R12 (2010), and C1R13 (2012) where the Hatch Unit 1 tie-rod cracking occurred. There were no indications identified. EVT-1 inspections of the upper support corners were performed in C1R13 (2012) and no indications were identified. CPS will continue inspecting the tie-rod hardware and upper supports per vendor repair design requirements.

BWRVIP-76 R1-A, BWR Core Shroud Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-76 R1-A (AAI 6) The NRC staff's guidance in Table IV.B1 of the GALL Report lists two potentially applicable aging effects (i.e., in addition to cracking) for generic BWR reactor vessel internal components (including BWR core shroud and core shroud repair assembly components) that are made from either stainless steel (including CASS) or nickel alloy: (1) loss of material due to pitting and crevice corrosion (Refer to GALL AMR IV.B1 15), and (2) cumulative fatigue damage (Refer to GALL AMR item IV.B1 14). BWR LR applicants will need to assess their designs to see if the generic guidelines for managing cumulative fatigue damage in GALL AMR item IV.B1 14 and for management loss of material due to pitting and crevice corrosion in GALL AMR IV.B1 15 are applicable to the design of their core shroud components (including welds) and any core shroud repair assembly components that have been installed through a design modification of the plant. If these aging effects are applicable to the design of these components as a result of exposing them to a reactor coolant with integrated neutron flux environment, applicants for license renewal will need to: (1) identify the aging effects as aging effects requiring management (AERM) for the core shrouds and for their core shroud repair assembly components if a repair design modification has been implemented, and (2) identify the specific aging management programs or time limited aging analyses that will be used to manage these aging effects during the period of extended operation. Refer to License Renewal Applicant Action Item 7) for additional guidance on identifying the AERMs for core shroud components or core shroud repair assembly components that made from materials other than stainless steel (including CASS) or nickel alloy.	The core shroud and tie-rod repair hardware (including welds) are fabricated from stainless steel and nickel alloy material. Cumulative fatigue damage for the core shroud has been identified as a TLAA as discussed in LRA Section 4.3.1 and 4.3.7. In addition, loss of preload of the Stabilizer Assembly Bracket Tie Rods has been identified as a TLAA as discussed in LRA Section 4.2.9. In addition to cracking, loss of material due to pitting and crevice corrosion and cumulative fatigue damage and loss of preload are identified as aging effects requiring aging management. The BWR Vessel Internals (B.2.1.9) and Water Chemistry (B.2.1.2) programs will be used to manage cracking and loss of material due to pitting and crevice corrosion during the period of extended operation.

BWRVIP-76 R1-A, BWR Core Shroud Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-76 R1-A (AAI 7) For BWR LRAs identification of AERMs for core shroud components or core shroud repair assembly components that are made from materials other than stainless steel (including CASS) or nickel alloy will need to be addressed on a plant-specific basis that is consistent with the Note format criteria for plant-specific AMR items in the latest NRC-approved version TR NEI-95-10.	The core shroud and tie-rod repair hardware (including welds) are fabricated from stainless steel and nickel alloy material. No other materials are included. Therefore, core shroud components that are made from materials other than stainless steel or nickel alloy are not addressed.
BWRVIP-76 R1-A (AAI 8) LR applicant shall reference the NRC staff-approved topical reports BWRVIP-99 and BWRVIP-100-A in their RVI components AMP.	The BWR Vessel Internals (B.2.1.9) program implements BWRVIP-76-A requirements including guidance within BWRVIP-76-A Section D to use current NRC-approved BWRVIP guidance to determine crack growth rates and fracture toughness values. The current guidance includes letter 2012-074 from Randy Stark, EPRI, BWRVIP Program Manager, to All BWRVIP Committee Members, Superseded "Needed" Guidance Regarding Crack Growth Assumptions, March 22, 2012, for evaluation of crack growth rates in austenitic stainless steel and nickel-based alloy components. This guidance is consistent with BWRVIP-14-A, BWRVIP-99-A, and BWRVIP-100 Rev 1-A, as applicable. The implementing procedures for the BWR Vessel Internals program include references to applicable BWRVIP reports for evaluation of crack growth.

BWRVIP-139-R1-A, Steam Dryer Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-139-R1-A (AAI 1) Aging Effects and Mechanisms Not Assessed or Managed in TR No. BWRVIP-139, Appendix B–Plant-Specific Design Differences or Operating Experience Considerations The regulation in 10 CFR 54.21(a)(3) requires a license renewal applicant to manage all aging effects that are applicable to those plant components that have been scoped in for license renewal in accordance with 10 CFR 54.4 and have been screened in for an AMR in accordance with 10 CFR 54.21(a)(1). Guidelines for identifying applicable aging effects are given in Section A.1.2.1 of NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (SRP-LR, with the current version being Revision 2 of the report), and in TR No. NEI 95-10 (current NRC-endorsed version of the report is Revision 6 of the NEI report). a. BWR applicants for license renewal are requested to perform a review of the CLB and design basis of their facilities to determine whether there are any design differences in their steam dryer designs or steam dryer-related OE that is applicable for their BWR design. Specifically, BWR applicants for license renewal are requested to perform a review of the CLB and design basis of their facilities to determine whether there are any additional aging effects/mechanisms that might be applicable to the designs of their BWR steam dryer assemblies, in addition to those that are mentioned as being applicable aging effects/mechanisms requiring management (AERMs) in BWRVIP-139, Appendix B.	a) The CPS Steam Dryer is a curved hood design and inspections are performed in accordance with BWRVIP-139-R1-A. Review of the CLB and design basis determined there are no additional aging effects/mechanisms in addition to those that are mentioned in BWRVIP-139, Appendix B as being applicable aging effects/mechanisms requiring management, crack initiation and growth and loss of material due to wear or flow induced vibrations. There are no TLAAs associated with the CPS steam dryer.

BWRVIP-139-R1-A, Steam Dryer Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
b. For those BWR license renewal applicants that identify additional AERMs beyond those listed in BWRVIP-139, Appendix B, the applicants should include applicable GALL-based or plant-specific AMR items in the LRAs that identify the additional aging effects that are applicable to their steam dryer designs, and should identify and justify the AMP or TLAA that will be used to manage those aging effects during the period of extended operation, as required by 10 CFR 54.21(a)(3)	b) There are no additional AERMs beyond those listed in BWRVIP-139, Appendix B identified. There are no TLAAs associated with the CPS steam dryer.
BWRVIP-139-R1-A (AAI 2) Referencing of the BWRVIP-139-A Report and Appendix B of the Report in the FSAR, UFSAR, or USAR Supplement For demonstration of the requirement in 10 CFR 54.21(d), BWR license renewal applicants applying the BWRVIP-139 report and Appendix B of the report to manage age-related degradation in their BWR steam dryer assemblies shall describe or reference in the applicable FSAR, UFSAR, or USAR supplement summary description for the AMP how the BWRVIP-139 report and Appendix B of the report will be used to manage aging in the plant's steam dryer assembly components during the period of extended operation.	USAR supplement, App A to AMP (B.2.1.9), BWR Vessel Internals describes the use of BWRVIP-139-1-A including Appendix B for aging management.

BWRVIP-139-R1-A, Steam Dryer Inspection and Flaw Evaluation Guidelines	
Action Item Description	**Clinton Response**
BWRVIP-139-R1-A (AAI 3) Identification of Time Limited Aging Analyses License renewal applicants are required by 10 CFR 54.21(c)(1) to identify all analyses in the CLB that conform to the six criteria in 10 CFR 54.3(a) for defining an analysis as a TLAA. For those BWR license renewal applicants that confirm that the CLB includes a steam dryer analysis, and the analysis conforms to the definition of TLAA, the applicants shall: a. include the TLAA in the LRA in accordance with the requirements in 10 CFR 54.21(c)(1) b. demonstrate that the TLAA will be acceptable for the period of extended operation in accordance with one of three criteria for accepting TLAAs in 10 CFR 54.21(c)(1)(i), (ii), or (iii), and c. include a FSAR, UFSAR or USAR supplement summary description for the TLAA in the LRA, in accordance with 10 CFR 54.21(d). These bases are consistent with the guidelines for formatting LRAs in NEI 95-10, Revision 6.	There are no TLLAs associated with the CPS steam dryer.

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 Technical Specification changes or additions were identified as necessary to manage the effects of aging during the period of extended operation and as such no Technical Specification changes or additions are included with this License Renewal Application.