Safety Evaluation Report

With Confirmatory Items Related to the License Renewal of Vermont Yankee Nuclear Power Station

Docket No. 50-271

Entergy Nuclear Operations, Inc.

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

March 2007

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ABSTRACT

This safety evaluation report (SER) with confirmatory items documents the technical review of the Vermont Yankee Nuclear Power Station (VYNPS) license renewal application (LRA) by the United States (US) Nuclear Regulatory Commission (NRC) staff (the staff). By letter dated January 27, 2006, Entergy Nuclear Operations, Inc. (ENO or the applicant) submitted the LRA in accordance with Title 10, Part 54, of the *Code of Federal Regulations*, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." ENO requests renewal of the VYNPS operating license (Facility Operating License Number DPR-28) for a period of 20 years beyond the current expiration at midnight March 21, 2012.

VYNPS is located approximately five miles south of Brattleboro, Vermont. The NRC issued the VYNPS construction permit on December 11, 1967, and the operating license on February 28, 1973. VYNPS is of a Mark 1 BWR design. General Electric supplied the nuclear steam supply system and Ebasco originally designed and constructed the plant. The VYNPS licensed power output is 1912 megawatt thermal with a gross electrical output of approximately 612 megawatt electric.

This SER presents the status of the staff's review of information submitted through March 23, 2007, the cutoff date for consideration in the SER. The staff identified six confirmatory items which must be resolved before the staff can make a final determination on the LRA. SER Sections 1.5 and 1.6 summarize these items. The staff will present its final conclusion on the LRA review in an update to this SER.

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ABBREVIATIONS

AAC	alternate AC
AC	alternating current
ACAR	aluminum conductor alloy reinforced
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ACS	alternate cooling system
ACSR	aluminum core steel reinforced
ADAMS	Agencywide Document Access and Management System
ADS	automatic depressurization system
AEC	Atomic Energy Commission
AERM	aging effect requiring management
AFW	auxiliary feedwater
AISC	American Institute of Steel Construction
AM	accident management
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
AOG	augmented off-gas
APCSB	Auxiliary and Power Conversion Systems Branch
ART	adjusted reference temperature
AS	auxiliary system
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
AWWA	Americal Water Works Association
BAF	Bottom of the Active Fuel
BOP	balance of plant
B&PV	Boiler and Pressure Vessel
BTP	Branch Technical Position
BWR	boiling water reactor
BWRVIP	Boiling Water Reactor Vessel and Internals Project
CAC	containment atmospheric control
CAD	containment atmosphere dilution
CAP	corrective action program
CASS	cast austenitic stainless steel
CBI	Chicago Bridge & Iron
CCW	closed cooling water
CCWS	closed cooling water system
CD	condensate demineralizer
CDF	core damage frequency
CEA	control element assembly
CF	chemistry factor
CFR	*Code of Federal Regulations*
CI	confirmatory item

CLB	current licensing basis
CMAA	Crane Manufactures Association of America
CO_2	carbon dioxide
CPPU	constant pressure power uprate
CRL	component record list
CRD	control rod drive
CRGT	control rod guide tube
CS	core spray
CSS	core spray system
CSCS	core standby cooling system
CST	condensate storage and transfer
CUF	cumulative usage factor
CUFD	reactor water cleanup unit filter demineralizer
C_vUSE	Charpy upper-shelf energy
CW	circulating water
DBA	design basis accident
DBE	design basis event
DC	direct current
DG	diesel generator
DLO	diesel lube oil
DW	demineralized water
ECCS	emergency core cooling system
EDG	emergency diesel generator
EFPD	effective full power days
EFPY	effective full-power year
EIC	electrical and instrumental and control
EMPAC	Enterprise Maintenance, Planning, and Control
ENO	Entergy Nuclear Operations, Inc.
Entergy VY	Entergy Nuclear Vermont Yankee, LLC
EOL	end of life
EPRI	Electric Power Research Institute
EPRI-MRP	Electric Power Research Institute Materials Reliability Program
EPU	Extended Power Uprate
EQ	Environmental qualification
ER	Applicant's Environmental Report - Operating License Renewal Stage
ESF	engineered safety feature
FAC	flow-accelerated corrosion
FAP	fatigue action plan
FCV	flow control valve
FW	feedwater
F_{en}	environmental fatigue life correction factor
FERC	Federal Energy Regulatory Commission
FF	flency factor
FIV	flow-induced vibration
FO	fuel oil

FP	fire protection
FPC	fuel pool cooling
FPFD	fuel pool filter-demineralizer
FR	*Federal Register*
FSAR	final safety analysis report
ft-lb	foot-pound
FW	feedwater
GALL	Generic Aging Lessons Learned Report
GDC	general design criteria or general design criterion
GE	General Electric
GEIS	Generic Environmental Impact Statement
GL	generic letter
GSC	gland seal condenser
GSI	generic safety issue
HB	heating boiler
HCU	hydraulic control unit
HELB	high-energy line break
HPCI	high pressure coolant injection
HPCIS	high pressure coolant injection system
HPSI	high pressure safety injection
HVAC	heating, ventilation, and air conditioning
HWC	hydrogen water chemistry
HX	heat exchanger
I&C	instrumentation and controls
IA	instrument air
IASCC	irradiation assisted stress corrosion cracking
ID	inside diameter
IEEE	Institute of Electrical and Electronics Engineers
IGA	intergranular attack
IGSCC	intergranular stress corrosion cracking
IN	information notice
INEL	Idaho National Engineering Laboratory
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
IPE	individual plant examination
IR	insulation resistance
ISA	Instrument Society of America
ISG	interim staff guidance
ISI	inservice inspection
ISP	integrated surveillance program
IST	
IWE	
JDD	John Deere diesel

ksi	1000 pounds per square inch
KV or kV	kilo-volt
KW	kilo-watt
LOCA	loss of coolant accident
LPCI	low pressure coolant injection
LR	license renewal
LRA	license renewal application
LRBD	license renewal boundary drawings
LRIS	License Renewal Information System
LRPG	license renewal project guideline
MEB	metal-enclosed bus
MeV	mega-electron volt
MG	motor gear
MGLO	motor generator lube oil
MIC	microbiologically induced corrosion
MS	main stream
MSIV	main stream isolation valvue
MWe	megawatts-electric
MWt	megawatts-thermal
N_2	nitrogen
NaOH	sodium hydroxide
NB	nuclear boiler
NBVIS	nuclear boiler vessel instrumentation system
n/cm^2	neutrons per square centimeter
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NPS	nominal pipe size
NRC	US Nuclear Regulatory Commission
NSAC	Nuclear Science Advisory Committee
NSR	nonsafety-related
NSSS	nuclear steam supply system
NUMARC	Nuclear Management and Resources Council (now NEI)
NUREG	US Nuclear Regulatory Commission Regulatory Guide
NUREG/CR	US Nuclear Regulatory Commission Regulatory Guide contractor report
NWC	normal water chemistry
ODSCC	outside-diameter stress corrosion cracking
OE	operating experience
OI	open item
PASS	post-accident sampling system
PCAC	primary containment atmospheric control

pH	potential hydrogen
P&ID	piping and instrumentation diagram
ppm	parts per million
P-T	pressure-temperature
PTS	pressurized thermal shock
PUSAR	power uprate safety analysis report
PVC	polyvinyl chloride
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
Q&A	question and answer
RAI	request for additional information
RBCCW	reactor building closed cooling water
RCIC	reactor core isolation cooling
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RDW	radwaste liquid and solid
RFO	refueling outage
RG	regulatory guide
RHRS	residual heat removal system
RHRSW	residual heat removal service water
RIP	retired in place
RPV	reactor pressure vessel
RRP	reactor recirculation pump
RRS	reactor recirculation system
RT	radiographic testing
RTD	resistance temperature detector
RT_{NDT}	reference temperature nil ductility transition
RV	reactor vessel
RVI	reactor vessel internals
RVID	reactor vessel integrity database
RWCU	reactor water cleanup unit
SA	service air
SBFPC	standby fuel pool cooling
SBGT	standby gas treatment
SBO	station blackout
SC	structure and component
SCC	stress-corrosion cracking
SE	
SER	safety evaluation report
SFP	spent fuel pool
SIF	stress intensification factor
SLC	standby liquid control
SOC	statement of consideration
SR	safety-related

SRP	Standard Review Plan
SRP-LR	Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants
SRV	safety relief valve
SS	stainless steel
SSC	system, structure, and component
SSE	safe-shutdown earthquake
SW	service water
SWS	service water systems
TG	turbine generator
TLAA	time-limited aging analysis
TS	technical specifications
UFSAR	updated final safety analysis report
USAR	updated safety analysis report
USAS	United States of America Standard
USE	upper-shelf energy
UT	ultrasonic testing
UV	ultra violet
VHS	Vernon Hydroelectric Station
VT	visual testing
VYNPS	Vermont Yankee Nuclear Power Station
1/4 T	one-fourth of the way through the vessel wall

SECTION 1

INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This document is a safety evaluation report (SER) with confirmatory items on the license renewal application (LRA) for Vermont Yankee Nuclear Power Station (VYNPS), as filed by Entergy Nuclear Operations, Inc. (ENO or the applicant). By letter dated January 27, 2006, ENO submitted its application to the United States (US) Nuclear Regulatory Commission (NRC) for renewal of the VYNPS operating license for an additional 20 years. The NRC staff (the staff) prepared this report to summarize the results of its safety review of the LRA for compliance with Title 10, Part 54, of the *Code of Federal Regulations*, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants” (10 CFR Part 54). The NRC project manager for the license renewal review is Jonathan Rowley. Mr. Rowley may be contacted by telephone at 301-415-4053 or by electronic mail at JGR@nrc.gov. Alternatively, written correspondence may be sent to the following address:

Division of License Renewal
US Nuclear Regulatory Commission
Washington, DC 20555-0001
Attention: Jonathan Rowley, Mail Stop 011-F1

In its January 27, 2006 submission letter, the applicant requested renewal of the operating license issued in accordance with Section 104b (Operating License No. DPR-28) of the Atomic Energy Act of 1954, as amended, for VYNPS for a period of 20 years beyond the current expiration at midnight March 21, 2012. VYNPS is located approximately five miles south of Brattleboro, Vermont. The NRC issued the VYNPS construction permit on December 11, 1967, and the operating license on February 28, 1973. VYNPS is of a Mark 1 BWR design. General Electric supplied the nuclear steam supply system (NSSS) and Ebasco originally designed and constructed the plant. The VYNPS licensed power output is 1912 megawatt thermal with a gross electrical output of approximately 612 megawatt electric. The updated final safety analysis report (UFSAR) contains details of the plant and the site.

The license renewal process consists of two concurrent reviews, a technical review of safety issues and an environmental review. The NRC regulations in 10 CFR Part 54 and 10 CFR Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions,” respectively, set forth requirements for these reviews. The safety review for the VYNPS license renewal is based on the applicant’s LRA and responses to staff requests for additional information. The applicant supplemented the LRA and provided clarifications through its responses to the staff’s requests for additional information in audits, meetings, and docketed correspondence. Unless otherwise noted, the staff reviewed and considered information submitted through March 19, 2007. The staff reviewed information received after that date case by case depending on the stage of the safety review and the volume and complexity of the information. The public may view the LRA and all pertinent information and materials, including the UFSAR, at the NRC Public Document Room, on the first floor of One

White Flint North, 11555 Rockville Pike, Rockville, MD 20852-2738 (301-415-4737 / 800-397-4209), and at Dickinson Memorial Library, 115 Main St., Northfield, MA 01360. In addition, the public may find the LRA, as well as materials related to the license renewal review, on the NRC web site at http://www.nrc.gov.

This SER summarizes the results of the staff's safety review of the LRA and describes the technical details considered in evaluating the safety aspects of the unit's proposed operation for an additional 20 years beyond the term of the current operating license. The staff reviewed the LRA in accordance with the NRC regulations and the guidance in the US NRC NUREG-1800, Revision 1, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated September 2005.

Sections 2 through 4 of the SER address the staff's evaluation of license renewal issues considered during the review of the LRA. SER Section 5 is reserved for the report of the Advisory Committee on Reactor Safeguards (ACRS). SER Section 6 presents the conclusions of this report.

Appendix A of the SER is a table of the applicant's commitments for renewal of the operating license. SER Appendix B is a chronology of the principal correspondence between the staff and the applicant on the LRA review. SER Appendix C is a list of principal contributors to this SER. Appendix D is a bibliography of the references in support of the staff's review.

In accordance with 10 CFR Part 51, the staff prepared a draft, plant-specific supplement to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)." This supplement discusses the environmental considerations related to the VYNPS license renewal. The staff issued draft, plant-specific supplement to the GEIS, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants Supplement 30 Regarding Vermont Yankee Nuclear Power Station," on December 13, 2006.

1.2 License Renewal Background

Pursuant to the Atomic Energy Act of 1954, as amended, and NRC regulations, operating licenses for commercial power reactors are issued for 40 years. These licenses can be renewed for up to 20 additional years. The original 40-year license term was selected on the basis of economic and antitrust considerations, rather than on technical limitations; however, some individual plant and equipment designs may have been engineered based on an expected 40-year service life.

In 1982, the staff anticipated interest in license renewal and held a workshop on nuclear power plant aging. This workshop led the NRC to establish a comprehensive program plan for nuclear plant aging research. From the results of that research, a technical review group concluded that many aging phenomena are readily manageable and pose no technical issues for life extension of nuclear power plants. In 1986, the staff published a request for comment on a policy statement that would address major policy, technical, and procedural issues related to license renewal for nuclear power plants.

In 1991, the staff published the license renewal rule in 10 CFR Part 54 (Volume 56, page 64943, of the *Federal Register* (56 FR 64943), dated December 13, 1991). The staff participated in an industry-sponsored demonstration program to apply 10 CFR Part 54 to a pilot plant and to gain experience necessary to develop implementation guidance. To establish a scope of review for license renewal, 10 CFR Part 54 defined age-related degradation unique to license renewal. However, during the demonstration program, the staff found that many aging effects on plant systems and components are managed during the period of initial license. In addition, the staff found that the scope of the review did not allow sufficient credit for existing programs, particularly the implementation of 10 CFR 50.65, which also manages plant-aging phenomena. As a result, the staff amended 10 CFR Part 54 in 1995. As published in 60 FR 22461, dated May 8, 1995, the amended 10 CFR Part 54 establishes a regulatory process that is simpler, more stable, and more predictable than the previous 10 CFR Part 54 process. In particular, as amended, 10 CFR Part 54 focuses on the management of adverse aging effects rather than on identifying age-related degradation unique to license renewal. The staff initiated these rule changes to ensure that important systems, structures, and components (SSCs) will continue to perform their intended functions during periods of extended operation. In addition, the revised 10 CFR Part 54 rule clarifies and simplifies the integrated plant assessment for consistency with the revised focus on passive, long-lived structures and components (SCs).

In parallel with these initiatives, the NRC pursued a separate rulemaking effort (61 FR 28467, dated June 5, 1996) and developed an amendment to 10 CFR Part 51 to focus the scope of the review of license renewal environmental impacts and to fulfill the NRC’s responsibilities in accordance with the National Environmental Policy Act of 1969.

1.2.1 Safety Review

License renewal requirements for power reactors are based on two key principles:

(1) The regulatory process is adequate to ensure that the licensing bases of all currently operating plants maintain an acceptable level of safety, with the possible exception of the detrimental aging effects on the functions of certain SSCs, as well as a few other safety-related issues, during the period of extended operation.

(2) The plant-specific licensing basis must be maintained during the renewal term in the same manner and to the same extent as during the original licensing term.

In implementing these two principles, 10 CFR 54.4, “Scope,” defines the scope of license renewal as including those SSCs that (1) are safety-related, (2) the failure of which could affect safety-related functions, or (3) are relied on for compliance with the NRC fire protection, environmental qualification (EQ), pressurized thermal shock (PTS), anticipated transient without scram (ATWS), and station blackout (SBO) regulations.

Pursuant to 10 CFR 54.21(a), a license renewal applicant must review all SSCs within the scope of 10 CFR Part 54 to identify SCs subject to an aging management review (AMR). SCs subject to an AMR perform an intended function without moving parts or without a change in configuration or properties and are not subject to replacement after a qualified life or specified time period. As required by 10 CFR 54.21(a), license renewal applicants must demonstrate that the aging effects will be managed so that the intended function(s) of those SCs will be maintained consistent with the current licensing basis (CLB) for the period of extended operation. However, active equipment is considered to be adequately monitored and maintained by existing programs. In other words, detrimental aging effects that may affect active equipment are readily detectable and can be identified and corrected through routine surveillance, performance monitoring, and maintenance. Surveillance and maintenance programs for active equipment, as well as other maintenance aspects of plant design and licensing basis, are required throughout the period of extended operation.

Pursuant to 10 CFR 54.21(d), the LRA is required to include a UFSAR supplement that must have a summary description of the applicant's programs and activities for managing aging effects and an evaluation of time-limited aging analyses (TLAAs) for the period of extended operation.

License renewal also requires TLAA identification and updating. During the plant design phase, certain assumptions were made about the length of time the plant can operate. These assumptions were incorporated into design calculations for several plant SSCs. In accordance with 10 CFR 54.21(c)(1), the applicant must either show that these calculations will remain valid for the period of extended operation, project the analyses to the end of the period of extended operation, or demonstrate that the aging effects on these SSCs will be adequately managed for the period of extended operation.

In 2001, the NRC developed and issued Regulatory Guide (RG) 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses." This RG endorses Nuclear Energy Institute (NEI) 95-10, Revision 3, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule," issued in March 2001. NEI 95-10 details an acceptable method of implementing 10 CFR Part 54. The staff also used the SRP-LR in reviewing the LRA.

In the LRA, the applicant fully utilized the process defined in NUREG-1801, Revision 1, "Generic Aging Lessons Learned (GALL) Report," dated September 2005. The GALL Report summarizes staff-approved aging management programs (AMPs) for the aging of many SCs subject to an AMR. If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources to review the LRA can be greatly reduced, improving the efficiency and effectiveness of the license renewal review process. The GALL Report summarizes the aging management evaluations, programs, and activities credited for managing aging for most SCs throughout the industry. The report is also a quick reference for both the applicant and staff reviewers to AMPs and activities that can provide adequate aging management during the period of extended operation.

1.2.2 Environmental Review

Part 51 of 10 CFR governs environmental protection regulations. In December 1996, the staff revised the environmental protection regulations to facilitate the environmental review for license renewal. The staff prepared the Genetic Environmental Impact Statement (GEIS) to document its evaluation of the possible environmental impacts of nuclear power plant license renewals. For certain environmental impacts, the GEIS establishes findings applicable to all nuclear power plants. These generic findings are codified in Appendix B, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant," to Subpart A, "National Environmental Policy Act - Regulations Implementing Section 102(2)," of 10 CFR Part 51. Pursuant to 10 CFR 51.53(c)(3)(i), license renewal applicants may incorporate these generic findings in their environmental reports. In accordance with 10 CFR 51.53(c)(3)(ii), an environmental report must also include analyses of environmental impacts that must be evaluated on a plant-specific basis (i.e., Category 2 issues).

In accordance with the National Environmental Policy Act of 1969 and 10 CFR Part 51, the staff reviewed the plant-specific environmental impacts of license renewal, including whether the GEIS had not considered new and significant information. As part of its scoping process, the staff held a public meeting on June 7, 2006, in Brattleboro, Vermont, to identify plant-specific environmental issues. Draft, plant-specific GEIS Supplement 30 documents the results of the environmental review and makes a preliminary recommendation as to the license renewal action. The staff held another public meeting on January 31, 2007, in Brattleboro, Vermont, to discuss draft, plant-specific GEIS Supplement 30.

1.3 Principal Review Matters

Part 54 of 10 CFR describes the requirements for renewing operating licenses for nuclear power plants. The staff's technical review of the LRA was in accordance with NRC guidance and the requirements of 10 CFR Part 54. Section 54.29, "Standards for Issuance of a Renewed License," of 10 CFR sets forth the standards for license renewal. This SER describes the results of the staff's safety review.

In accordance with 10 CFR 54.19(a), the NRC requires license renewal applicants to submit general information. The applicant provided this general information in LRA Section 1. The staff reviewed LRA Section 1 and finds that the applicant has submitted the information required by 10 CFR 54.19(a).

In accordance with 10 CFR 54.19(b), the NRC requires that LRAs 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." On this issue, in the LRA, the applicant stated:

> The agreement shall terminate at the time of expiration of the license specified in Item 3 of the attachment to the agreement, which is the last to expire. Item 3 of the attachment to the indemnity agreement, as revised by Amendment No. 6, lists VYNPS operating license number DPR-28. ENO requests that conforming changes be made to Article VII of the indemnity agreement, and Item 3 of the attachment to that agreement, specifying the extension of agreement until the expiration date of the renewed VYNPS facility operating license sought in this application. In addition, should the license number be changed upon issuance of the renewal license, ENO requests that conforming changes be made to Item 3 of the attachment and other sections of the indemnity agreement as appropriate.

The staff intends to maintain the original license number upon issuance of the renewed license, if approved. Therefore, conforming changes to the indemnity agreement need not be made and the requirements of 10 CFR 54.19(b) have been met.

In accordance with 10 CFR 54.21,"Contents of Application - Technical Information," the NRC requires that LRAs contain (a) an integrated plant assessment, (b) a description of any current licensing basis (CLB) changes occurring during the staff's review of the LRA, (c) an evaluation of TLAAs, and (d) a UFSAR supplement. LRA Sections 3 and 4 and Appendix B address the license renewal requirements of 10 CFR 54.21(a), 10 CFR 54.21(b), and 10 CFR 54.21(c). LRA Appendix A satisfies the license renewal requirements of 10 CFR 54.21(d).

In accordance with 10 CFR 54.21(b), the NRC requires that each year following submission of the LRA and at least three months before the scheduled completion of the staff's review, the applicant submit an LRA amendment identifying any CLB changes of the facility that materially affect the contents of the LRA, including the UFSAR supplement.

In accordance with 10 CFR 54.22, "Contents of Application - Technical Specifications," the NRC requires that the LRA include changes or additions to the technical specifications necessary to manage the aging effects during the period of extended operation. In LRA Appendix D, the applicant stated that it had not identified any technical specification changes necessary to support issuance of the renewed VYNPS operating license. This statement adequately addresses the 10 CFR 54.22 requirement.

The staff evaluated the technical information required by 10 CFR 54.21 and 10 CFR 54.22 in accordance with NRC regulations and SRP-LR guidance. SER Sections 2, 3, and 4 document the staff's evaluation of the technical information in the LRA.

As required by 10 CFR 54.25, "Report of the Advisory Committee on Reactor Safeguards," the ACRS will issue a report documenting its evaluation of the staff's LRA review and SER. SER Section 5 will incorporate the ACRS report when issued. SER Section 6 will document the findings required by 10 CFR 54.29.

The final, plant-specific GEIS Supplement 30 will document the staff's evaluation of the environmental information required by 10 CFR 54.23, "Contents of Application - Environmental Information," and will specify the considerations related to the VYNPS operating license renewal. The staff will prepare this supplement separately from the SER.

1.4 Interim Staff Guidance

License renewal is a living program. The staff, industry, and other interested stakeholders gain experience and develop lessons learned with each renewed license. The lessons learned address the staff's performance goals of maintaining safety, improving effectiveness and efficiency, reducing regulatory burden, and increasing public confidence. Interim staff guidance (ISG) is documented for use by the staff, industry, and other interested stakeholders until incorporated into such license renewal guidance documents as the SRP-LR and the GALL Report.

Table 1.4-1 shows the current set of interim staff guidance (ISGs), as well as the SER sections in which the staff addresses them.

Table 1.4-1 Current Interim Staff Guidance

ISG Issue (Approved ISG Number)	Purpose	SER Section
Nickel-alloy components in the reactor coolant pressure boundary **(LR-ISG-19B)**	Cracking of nickel-alloy components in the reactor pressure boundary. ISG under development. NEI and EPRI-MRP will develop an augmented inspection program for GALL AMP XI.M11-B. This AMP will not be completed until the NRC approves an augmented inspection program for nickel-alloy base metal components and welds as proposed by EPRI-MRP.	Not applicable (PWRs only)
Corrosion of drywell shell in Mark I containments **(LR-ISG-2006-01)**	To address concerns related to corrosion of drywell shell in Mark I containments.	3.5.2.2.1

1.5 Summary of Open Items

As a result of its review of the LRA, including additional information submitted to the staff through March 23, 2007, the staff determined that no open items exist which would require a formal response from the applicant.

1.6 Summary of Confirmatory Items

As a result of its review of the LRA, including additional information submitted to the staff through March 23, 2007, the staff identified the following confirmatory items (CIs). An item is considered confirmatory if the staff and the applicant had reached a satisfactory resolution, but the resolution has not been submitted to the staff. Each CI has been assigned a unique identifying number. The items identified in this section have been properly closed by the technical personnel.

CI 2.3.3.2a-1

License renewal drawing LRA-G-191159-SH-01-0, at location H-11, depicts pipe section 2”-SW-566C as within the scope of license renewal. The license renewal boundary flag for 2”-SW-566C is located on an unisolable section of pipe. The actual location of the license renewal scope boundary for this pipe section is not clear. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components meet the requirements of 10 CFR 54.4(a)(2).

CI 2.3.3.2a-2

LRA Section 2.1.2.1.2 states in part that nonsafety-related piping systems connected to safety-related systems were included up to the structural boundary or to a point that includes an adequate portion of the nonsafety-related piping run to conservatively include the first seismic or equivalent anchor. In addition, if isometric drawings were not readily available to identify the structural boundary, connected lines were included to a point beyond the safety/nonsafety interface, like a base-mounted component, flexible connection, or the end of a piping run (*i.e*, a drain line).

It is not clear whether the nonsafety-related piping systems were included up to the structural boundary or to a point that includes an adequate portion of the nonsafety-related piping run to include the first seismic or equivalent anchor. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(2).

CI 2.3.3.12-1

LRA Section 2.3.3.12 indicts that the John Deere Diesel (JDD) is installed in compliance with 10 CFR 50, Appendix R, requirements. However, due to a lack of available drawings and/or detailed description of the diesel equipment listed in LRA Table 2.3.3-12, it is difficult to determine if any AMR category components may have been omitted from the table. It is recommended that the JDD be inspected to assure all AMR category components are included in the list of LRA Table 2.3.3-12. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(3).

CI 2.3.3.13a-1

The LRA states that the augmented off-gas system is within the scope of license renewal based on requirements of 10 CFR 54.4(a)(2) because of the potential for physical interaction with safety-related components described in LRA Table 2.3.3.13-A. The determination of whether a component meets the requirements of 10 CFR 54.4(a)(2) for physical interactions is based on where it is located in a building and its proximity to safety-related equipment or where a structural/seismic boundary exists. This information is not provided on license renewal drawings nor was a detailed description provided in the LRA. Consequently, any omission of augmented off-gas components subject to an AMR cannot be determined. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components meet the requirements of 10 CFR 54.4(a)(2) and all the components subject to an AMR are included in LRA Table 2.3.3-13-1.

CI 2.3.3.13e-1

The LRA states that the circulating water system is within the scope of license renewal based on the potential for physical interaction with safety-related components as required by 10 CFR 54.4(a)(2) and described in LRA Table 2.3.3.13-A. The applicant did not provide drawings highlighting in-scope components required by 10 CFR 54.4(a)(2), stating that the drawings would not provide significant additional information because they do not indicate proximity of components to safety-related equipment and do not identify structural/seismic boundaries. Without license renewal drawings and/or detailed description of the circulating water system, the omission of components subject to an AMR cannot be determined (see LRA Table 2.3.3-13-9). The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(2) and all the components subject to an AMR are included in LRA Table 2.3.3-13-9.

CI 2.3.3.13m-1

The LRA states that the reactor water clean up system is within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) because of the potential for physical interaction with safety-related components as described in LRA Table 2.3.3.13-A. The determination of whether a component meets the requirements of 10 CFR 54.4(a)(2) for physical interactions is based on where it is located in a building and its proximity to safety-related equipment or where a structural/seismic boundary exists. This information is not provided on license renewal drawings nor was a detailed description provided in the LRA. Consequently, any omission of the reactor water clean up components subject to an AMR cannot be determined. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(2) and all the components subject to an AMR are included in LRA Table 2.3.3-13-36.

1.7 Summary of Proposed License Conditions

Following the staff's review of the LRA, including subsequent information and clarifications provided by the applicant, the staff identified three proposed license conditions.

The first license condition requires the applicant to include the UFSAR supplement required by 10 CFR 54.21(d) in the next UFSAR update, as required by 10 CFR 50.71(e), following the issuance of the renewed license.

The second license condition requires future activities identified in the UFSAR supplement to be completed prior to the period of extended operation.

The third license condition requires that changes to storage requirements be approved by the staff as required by 10 CFR Part 50, Appendix H.

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SECTION 2

STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW

2.1 Scoping and Screening Methodology

2.1.1 Introduction

Title 10, Section 54.21, of the *Code of Federal Regulations* (CFR), “Contents of Application Technical Information” (10 CFR 54.21), requires for each license renewal application (LRA) an integrated plant assessment (IPA) listing structures and components (SCs) subject to an aging management review (AMR) from all of the systems, structures, and components (SSCs) within the scope of license renewal.

LRA Section 2.1, “Scoping and Screening Methodology,” describes the methodology for identifying SSCs at the Vermont Yankee Nuclear Power Station (VYNPS) within the scope of license renewal and SCs subject to an AMR. The staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff) reviewed the Entergy Nuclear Operations, Inc. (ENO or the applicant) scoping and screening methodology to determine whether it meets the scoping requirements of 10 CFR 54.4(a) and the screening requirements of 10 CFR 54.21.

In developing the scoping and screening methodology for the LRA, the applicant considered the requirements of 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants” (the Rule), statements of consideration on the Rule, and the guidance of Nuclear Energy Institute (NEI) 95-10, Revision 6, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule,” dated June 2005. The applicant also considered the correspondence between the staff, other applicants, and the NEI.

2.1.2 Summary of Technical Information in the Application

LRA Sections 2 and 3 state the technical information required by 10 CFR 54.4 and 54.21(a). LRA Section 2.1 describes the process for identifying SSCs meeting the license renewal scoping criteria of 10 CFR 54.4(a) and the process for identifying SCs subject to an AMR as required by 10 CFR 54.21(a)(1). The applicant provided the results of the process for identifying such SCs in the following LRA sections:

- Section 2.2, “Plant Level Scoping Results”
- Section 2.3, “Scoping and Screening Results: Mechanical Systems”
- Section 2.4, “Scoping and Screening Results: Structures”
- Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Control Systems”

LRA Section 3, “Aging Management Review Results,” states the applicant’s aging management results in the following LRA sections:

- Section 3.1, “Reactor Vessel, Internals and Reactor Coolant System”
- Section 3.2, “Engineered Safety Features Systems”
- Section 3.3, “Auxiliary Systems”
- Section 3.4, “Steam and Power Conversion Systems”
- Section 3.5, “Structures and Component Supports”
- Section 3.6, “Electrical and Instrumentation and Controls”

LRA Section 4, “Time-Limited Aging Analyses,” states the applicant’s evaluation of time-limited aging analyses.

2.1.3 Scoping and Screening Program Review

The staff evaluated the LRA scoping and screening methodology in accordance with the guidance in Section 2.1, NUREG-1800, ”Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” Revision 1, (SRP-LR), and the Nuclear Energy Institute (NEI) 95-10, “Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule,” Revision 6, (NEI 95-10). The following regulations form the basis for the acceptance criteria for the scoping and screening methodology review:

- 10 CFR 54.4(a) as to identification of plant SSCs within the scope of the Rule
- 10 CFR 54.4(b) as to identification of the intended functions of plant systems and structures within the scope of the Rule
- 10 CFR 54.21(a)(1) and 10 CFR 54.21(a)(2) as to the methods utilized by the applicant to identify plant SCs subject to an AMR

With the guidance of the corresponding SRP-LR sections, the staff reviewed, as part of the applicant’s scoping and screening methodology, the activities described in the following LRA sections:

- Section 2.1 to ensure that the applicant described a process for identifying SSCs within the scope of license renewal in accordance with 10 CFR 54.4(a)
- Section 2.2 to ensure that the applicant described a process for identifying SCs subject to an AMR in accordance with 10 CFR 54.21(a)(1) and 10 CFR 54.21(a)(2)

The staff conducted a scoping and screening methodology audit at VYNPS in Vernon, Vermont during the week of April 24-28, 2006. The audit focused on whether the applicant had developed and implemented adequate guidance for the scoping and screening of SSCs by the methodologies in the LRA and the requirements of the Rule. The staff reviewed implementation of the project level guidelines and topical reports describing the applicant’s scoping and screening methodology. The staff discussed with the applicant details of the implementation and control of the license renewal program and reviewed administrative control documentation and selected design documentation used by the applicant during the scoping and screening process. The staff reviewed the applicant’s processes for quality assurance (QA) for development of the LRA. The staff reviewed the quality attributes of the applicant’s aging management program (AMP) activities described in LRA Appendix A, “Updated Final Safety Analysis Report Supplement,” and LRA Appendix B, “Aging Management Programs and Activities” and the LRA training and qualification development team. The staff reviewed scoping and screening results reports for the core spray (CS) system and intake structure for the applicant’s appropriate implementation of the methodology outlined in the administrative controls and for results consistent with the current licensing basis (CLB) documentation.

2.1.3.1 Implementation Procedures and Documentation Sources for Scoping and Screening

The staff reviewed the applicant's scoping and screening implementation procedures as documented in the audit report dated August 10, 2006 to verify whether the process for identifying SCs subject to an AMR was consistent with the LRA and the SRP-LR. Additionally, the staff reviewed the scope of CLB documentation sources and the applicant’s process for appropriate consideration of CLB commitments and for adequate implementation of the procedural guidance during the scoping and screening process.

2.1.3.1.1 Summary of Technical Information in the Application

In LRA Section 2.1, the applicant addressed the following information sources for the license renewal scoping and screening process:

- System and Topical Design Basis Documents (DBDs)
- VYNPS Enterprise Maintenance, Planning, and Control (EMPAC) Component Database
- Updated Final Safety Analysis Report (UFSAR)
- Appendix R Safe Shutdown Capability Assessment
- Fire Hazards Analysis Report
- Safe Shutdown Capability Assessment
- Technical Specifications
- Maintenance Rule Scoping Basis Documents
- Safety Classification Documents
- Plant Layout Drawings

The applicant stated that it used this information to identify the functions performed by plant systems and structures. It then compared these functions to the scoping criteria in 10 CFR 54.4(a)(1-3) to determine whether the associated plant system or structure performed a license renewal intended function. It also used these sources to develop the list of SCs subject to an AMR.

The license renewal boundary drawings (LRBDs) show the systems within the scope of license renewal highlighted in color.

2.1.3.1.2 Staff Evaluation

<u>Scoping and Screening Implementation Procedures</u>. The staff reviewed the following scoping and screening methodology implementation procedures:

The staff reviewed the applicant’s scoping and screening methodology implementation procedures, including license renewal project guidelines (LRPGs), license renewal project documents/reports (LRPDs), AMR reports (e.g., AMRMs - mechanical, AMREs- electrical, and AMRCs - structural), as documented in the audit report, to ensure the guidance was consistent with the requirements of the Rule, NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," Revision 1, (SRP-LR), and the Nuclear Energy Institute (NEI) 95-10, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule," Revision 6, (NEI 95-10).

The staff found the overall process for implementing 10 CFR Part 54 requirements included in the LRPGs, LRPDs, and AMRs was consistent with the Rule and industry guidance. The staff found guidance for identifying plant SSCs within the scope of the Rule, including guidelines for identifying SC component types within the scope of license renewal subject to an AMR, in the LRA, including in the implementation of NRC staff positions documented in NUREG-1800, and the information in requests for additional information (RAI) responses dated July 10, 2006. The review of these procedures focused on the consistency of the detailed procedural guidance with information in the LRA reflecting implementation of staff positions in the SRP-LR and interim staff guidance documents.

After reviewing the LRA and supporting documentation, the staff finds LRA Section 2.1 consistent with the scoping and screening methodology instructions. The applicant's methodology has sufficiently detailed guidance for the scoping and screening implementation process followed in the LRA.

Sources of Current Licensing Basis Information. For VYNPS, system safety functions are stated in safety classification documents, the Maintenance Rule SSC basis documents for each system, and in design basis documents for systems for which DBDs were written. The staff considered the safety objectives in the UFSAR system descriptions and identified objectives meeting the safety-related Criterion of 10 CFR 54.4(a)(1) as system intended functions.

The staff reviewed the scope and depth of the applicant's CLB information to verify whether the applicant's methodology had identified all SSCs within the scope of license renewal as well as component types requiring AMRs. As defined in 10 CFR 54.3(a), the CLB applies NRC requirements, written licensee commitments for compliance with, and operation within, applicable NRC requirements, and plant-specific design bases docketed and in effect. The CLB includes NRC regulations, orders, license conditions, exemptions, technical specifications, design-basis information in the most recent UFSAR, and licensee commitments in docketed correspondence like licensee responses to NRC bulletins, generic letters, and enforcement actions as well as commitments in NRC safety evaluations or licensee event reports.

During the audit, the staff reviewed the applicant's information sources and samples of such information, including the UFSAR, DBDs, controlled plant reference drawings, LRBDs, and Maintenance Rule information. In addition, the applicant's license renewal process identified additional potential sources of plant information pertinent to the scoping and screening process, including, licensing correspondence, the Fire Hazards Analysis, safety evaluations, and design documentation such as engineering calculations and design specifications. Additionally, the applicant supplemented the review by using an electronic database developed during the plant FSAR accuracy verification project conducted between 1998 and 2000. The database contained approximately 10,000 documents including all correspondence in the public document room. The searchable database was available for query during the review of the CLB information in support of LRA development. The staff confirmed that the applicant's detailed license renewal program guidelines required use of the CLB source information developing scoping evaluations.

The VYNPS component database is the applicant’s primary repository for component safety classification information. During the audit, the staff reviewed the applicant’s administrative controls for VYNPS component database safety classification data. These controls are described and implementation is governed by plant administrative procedures. Based on a review of the administrative controls, and a sample of the VYNPS component database component safety classifications, the NRC staff and concluded that the applicant had established adequate measures to control the integrity and reliability of VYNPS component database safety classification data, and therefore, the staff concluded that the VYNPS component database provided a sufficiently controlled source of component data to support scoping and screening evaluations.

During the staff’s review of the applicant’s CLB evaluation process, the applicant provided the staff with a discussion regarding the incorporation of updates to the CLB and the process used to ensure those updates are adequately incorporated into the license renewal process. The staff determined that LRA Section 2.1 provided a description of the CLB and related documents used during the scoping and screening process that is consistent with the guidance contained in NUREG-1800. In addition, the staff reviewed technical reports utilized to support identification of SSCs relied upon to demonstrate compliance with the safety-related criteria, nonsafety-related criteria, as well as the five regulated events referenced in 10 CFR 54.4(a)(1-3). The applicants license renewal program guidelines provided a comprehensive listing of documents used to support scoping and screening evaluations. The staff found these design documentation sources to be useful for ensuring that the initial scope of SSCs identified by the applicant was consistent with the plant's CLB.

2.1.3.1.3 Conclusion

Based on its review of LRA Section 2.1, the detailed scoping and screening implementation procedures, and the results from the scoping and screening audit, the staff concludes that the applicant's scoping and screening methodology considers CLB information consistently with SRP-LR and NEI 95-10 guidance and, therefore, is acceptable.

2.1.3.2 Quality Controls Applied to LRA Development

2.1.3.2.1 Staff Evaluation

The staff reviewed the quality controls used by the applicant to ensure that scoping and screening methodologies described in the LRA were adequately implemented. Although the applicant did not develop the LRA in accordance with a 10 CFR 50, Appendix B, QA program, the applicant utilized the following QA processes during the LRA development:

- Implementation of the scoping and screening methodology was governed by written procedures.
- The applicant reviewed previous LRA NRC requests for additional information to ensure that applicable issues were addressed in the LRA.

- The LRA was reviewed by the Offsite and Onsite Safety Review Committees prior to submittal to the NRC.
- The applicant performed an industry peer review of the LRA.

- The applicant’s QA organization performed an independent review of the LRA. The purpose of this review was to ensure that the technical information used to develop the LRA was updated and approved in accordance with the station’s QA program, and that industry peer and Offsite and Onsite Safety Review Committee issues were resolved and associated corrective actions implemented.

2.1.3.2.2 Conclusion

Based on its review of pertinent LRA development guidance, discussion with the applicant's license renewal personnel, and review of the quality audit reports, the staff concludes that these QA activities add assurance that LRA development activities have been performed in accordance with the scoping and screening methodologies described in the LRA.

2.1.3.3 Training

2.1.3.3.1 Staff Evaluation

The staff reviewed the applicant’s training process for consistent and appropriate guidelines and methodology for the scoping and screening activities and to ensure the guidelines and methodology were performed in a consistent and appropriate manner.

The LRPGs provided the guidance and requirements for the training of the license renewal project and site personnel. The training consisted of a combination of reading and attending training sessions. The LRPGs specified the level of training which was required for the various groups participating in the development of the LRA and began with initial training, documented on a qualification card. The training was required for both the license renewal project personnel who prepared the application and for the site personnel who reviewed the application. In addition, license renewal refresher training was provided for the license renewal project and site personnel participating in the review. Refresher training included information on the license renewal process and information specific to the site. License renewal project and site personnel were required to review applicable license renewal regulations, NEI 95-10 and associated procedures. The applicant developed periodic production meetings in which the license renewal project personnel shared their knowledge and experience of a given subject with each other.

The NRC staff reviewed completed qualification and training records of several of the applicant's license renewal project personnel and also reviewed completed check lists. The staff found these records adequately documented the required training for the license renewal project personnel. Additionally, based on discussions with the applicant's license renewal project personnel during the audit, the NRC staff confirmed that the applicant's license renewal project personnel were knowledgeable on the license renewal process requirements and the specific technical issues within their areas of responsibility.

On the basis of discussions with the applicant’s license renewal project personnel responsible for the scoping and screening process, and a review of selected design documentation in support of the process, the NRC staff concluded that the applicant's license renewal project personnel understood the requirements of and adequately implemented the scoping and screening methodology established in the applicant's renewal application. The staff did not identify any concerns regarding the training of the applicant's license renewal project or site personnel.

2.1.3.3.2 Conclusion

Based on discussions with the applicant's license renewal personnel responsible for the scoping and screening process and review of selected documentation supporting the process, the staff concludes that the applicant's technical personnel understood the requirements and adequately implemented the scoping and screening methodology documented in the LRA. The staff concludes that the license renewal personnel were adequately trained and qualified for license renewal activities.

2.1.3.4 Conclusion of Scoping and Screening Program Review

Based on its review of LRA Section 2.1, review of the applicant's detailed scoping and screening implementation procedures, discussions with the applicant's LRA personnel, and review of the scoping and screening audit results, the staff concludes that the applicant's scoping and screening program is consistent with SRP-LR guidance and, therefore, acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

LRA Section 2.1, describes the methodology for scoping SSCs as required by 10 CFR 54.4(a) and the plant scoping process for systems and structures. Specifically, the scoping process consisted of developing a list of plant systems and structures and identifying their intended functions. Intended functions are those functions that are the basis for including a system or structure within the scope of license renewal as defined in 10 CFR 54.4(b) and are identified by comparing the system or structure function with the criteria in 10 CFR 54.4(a). The systems list was developed from the VYNPS component database and the structures list from a review of plant layout drawings and structure-specific system codes in the VYNPS component database. Finally, the applicant evaluated the components in the systems and structures that were in-scope of license renewal. The in-scope system boundary of SSCs subject to an AMR is depicted on the license renewal drawings. The applicant's scoping methodology, as described in the LRA, is discussed in the sections below.

2.1.4.1 Application of the Scoping Criteria in 10 CFR 54.4(a)(1)

2.1.4.1.1 Summary of Technical Information in the Application

In LRA Section 2.1.1.1, "Application of Safety-Related Scoping Criteria," the applicant described the scoping methodology required by 10 CFR 54 as it relates to safety-related criteria in accordance with 54.4(a)(1). With respect to the safety-related criteria, the applicant stated that at VYNPS, the safety-related SSCs are initially identified based on descriptions and analyses in the UFSAR, or on DBDs such as engineering drawings, evaluations, or calculations. SSCs that are identified as safety-related in the UFSAR, in DBDs, or in the CRL were classified as satisfying criteria of 10 CFR 54.4(a)(1) and included within the scope of license renewal. The review also confirmed that all plant conditions, including conditions of normal operation, abnormal operational transients, design basis accidents, internal and external events, and natural phenomena for which the plant must be designed, were considered for license renewal scoping in accordance with 10 CFR 54.4(a)(1) criteria.

The VYNPS CLB definition of safety-related SSCs is not identical to the definition provided in the Rule. As a result, the applicant performed an evaluation of the differences between its CLB definition of safety-related and the Rule definition. The evaluation was documented in LRA Section 2.1.3.2, “Identification of Safety-related Systems and Structures.”

2.1.4.1.2 Staff Evaluation

Pursuant to 10 CFR 54.4(a)(1), the applicant must consider all safety-related SSCs relied upon to remain functional during and following a design basis event (DBE) to ensure (a) the integrity of the reactor coolant pressure boundary, (b) the ability to shut down the reactor and maintain it in a safe shutdown condition, or (c) the ability to prevent or mitigate the consequences of accidents that could cause offsite exposures comparable to those of 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11.

As to identification of DBEs, SRP-LR Section 2.1.3 states:

> The set of DBEs as defined in the Rule is not limited to Chapter 15 (or equivalent) of the UFSAR. Examples of DBEs that may not be described in this chapter include external events, such as floods, storms, earthquakes, tornadoes, or hurricanes, and internal events, such as a high-energy line break. Information regarding DBEs as defined in 10 CFR 50.49(b)(1) may be found in any chapter of the facility UFSAR, the Commission's regulations, NRC orders, exemptions, or license conditions within the CLB. These sources should also be reviewed to identify SSCs relied upon to remain functional during and following DBEs (as required by 10 CFR 50.49(b)(1)) to ensure the functions required by 10 CFR 54.4(a)(1).

The staff’s review of LRA Section 2.1 of VYNPS identified areas in which additional information was necessary to complete the review of the applicant’s scoping and screening methodology. The applicant responded to the staff’s RAIs as discussed below.

During the scoping and screening methodology audit, the staff questioned how non-accident DBEs, particularly DBEs that may not be described in the UFSAR, were considered during scoping. The staff noted that limiting the review of DBEs to those described in the UFSAR accident analysis could result in omission of safety-related functions described in the CLB and requested the applicant provide a list of all DBEs that were evaluated as part of the license renewal review. However, during the audit, the staff was unable to identify such a list. Therefore, in RAI 2.1-1, dated July 10, 2006, the staff requested that the applicant provide: a) a list of DBEs evaluated as part of the license renewal scoping process, b) describe the methodology used to ensure that all DBEs (including conditions of normal operation, anticipated operational occurrences, design-basis accidents, external events, and natural phenomena) were addressed during license renewal scoping evaluation, and c) a list of the documentation sources reviewed to ensure that all DBEs were identified.

In its response, by letter dated August 10, 2006, the applicant described the DBEs evaluated during the license renewal effort and described the methodology used to ensure that all DBEs were addressed during license renewal scoping. Specifically, the applicant identified abnormal operational transients, design-basis accidents, events for which the alternate cooling system (ACS) is credited (i.e., loss of the Vernon Pond and flooding or fire in the service water (SW) intake structure), and additional DBEs such as external and internal flooding, earthquakes, tornadoes and natural phenomena as constituting the DBEs for the Vermont Yankee plant.

In addition, the applicant described two basic means of ensuring that all of the plant DBEs were addressed during the license renewal scoping process. These include: (1) reviewing the UFSAR and DBDs (i.e., for external and internal events and safety analyses) directly for the identification of the DBEs and subsequently for the identification of the SSCs credited for each event, and (2) reviewing and evaluating the safety classification of systems and components as governed by the plant safety classification process. This process ensures that site-specific procedures, design basis information, regulatory commitments, and regulatory guidance are considered during the classification process. The VYNPS safety classification process identifies those SSCs which are credited for performance of the intended safety functions in accordance with 10 CFR 54.4(a)(1).

The NRC staff reviewed a sample of the DBDs identified as sources of this information. The staff found the DBDs to contain a detailed evaluation of events, and included appropriate CLB documentation references to support the review and a resultant matrix of systems and structures relied upon to remain functional during and following these DBEs. The staff concluded that the applicant considered DBEs consistent with the guidance contained in NUREG-1800.

The staff reviewed the additional information provided by the applicant and, on the basis of providing (1) a detailed listing of the DBEs for the plant; (2) a description of the design and configuration control processes used to identify the SSCs credited for DBE mitigation; and (3) a description of the processes and sources of DBE information used to perform the scoping evaluation consistent with the requirements of 10 CFR 54.4(a)(1), the staff found that the applicant has adequately addressed the staff's RAI. Therefore, the staff’s concern described in RAI 2.1-1 is resolved.

The applicant performed scoping of SSCs for the 54.4(a)(1) criterion in accordance with the LRPGs which provided guidance for the preparation, review, verification, and approval of the scoping evaluations to assure the adequacy of the results of the scoping process. The staff reviewed these guidance documents governing the applicant’s evaluation of safety-related SSCs, and sampled the applicant’s scoping results reports to ensure the methodology was implemented in accordance with those written instructions. In addition, the staff discussed the methodology and results with the applicant’s technical personnel who were responsible for these evaluations.

The staff reviewed a sample of the license renewal scoping results for the CSS and the Intake Structure to provide additional assurance that the applicant adequately implemented their scoping methodology with respect to 10 CFR 54.4(a)(1). The staff confirmed that the scoping results for each of the sampled systems were developed consistent with the methodology, the SSCs credited for performing intended functions were identified, and the basis for the results as well as the intended functions were adequately described. The staff confirmed that the applicant had identified and used pertinent engineering and licensing information to identify the SSCs required to be in-scope in accordance with the 10 CFR 54.4(a)(1) criteria.

To help facilitate the identification of SSCs in-scope in accordance with the 10 CFR 54.4(a) criteria, the applicant developed a license renewal information system (LRIS) which contained detailed design description information about each plant system and structure and the relevant functions of those systems and structures. A list of safety-related SCs was initially identified by using the existing components list in the VYNPS component database. The VYNPS component database safety-classification field was reviewed to ensure that any system or structure that has a component identified as safety-related was considered for inclusion into the scope of the license renewal project. For VYNPS, component safety classification fields SC1 - SC3 corresponded to the 10 CFR 54.4(a)(1) criteria. Additionally, the SC1 database safety-classification and associated plant system drawings provided a starting point for identifying specific components which were required to meet the 10 CFR 54.4(a)(1) criteria. During the audit, the applicant described the process used to evaluate components classified as safety-related that did not perform a safety-related intended function. As part of the process, the applicant stated that the safety-classification of several components were reevaluated in order to reconcile differences between scoping determinations and facility database information or CLB information. Those components that were identified as safety-related that did not perform an intended function were explicitly evaluated and described in the LRPD’s and the rationale for their exclusion from scope of the license renewal was documented. For instances where components identified as safety-related in the VYNPS component database did not perform any safety-related functions, the applicant identified these components and performed additional evaluations to confirm that the component did not perform or were not credited in the CLB for any specific safety-related functions. Examples included the reactor water cleanup (RWCU) system and the augmented off-gas (AOG) system.

The staff reviewed the safety classification criteria used to determine the safety classification to verify consistency between the VYNPS CLB definition and the Rule definition in 10 CFR 54.3(a). In addition, the staff reviewed the applicant’s evaluation of the differences between the Rule definition and the site-specific definition of safety-related to ensure all potential SSCs meeting the requirements of 10 CFR 54.4(a)(1) were adequately addressed. The applicant documented this evaluation in the LRA and LRPGs. As part of the license renewal development activities, the applicant stated that the site-specific definition for safety-related was nearly identical to the Rule definition with the following exception:

> The CLB definition regarding potential offsite exposure limits refers to 10 CFR 50.67 whereas the Rule also references comparable guidelines in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), and 10 CFR Part 100 respectively.

During the audit, the staff reviewed the applicant’s evaluation of the Rule and VY CLB definitions pertaining to 10 CFR 54.4(a)(1). Based on this review, the staff confirmed that 10 CFR 50.34(a)(1)(ii) is not applicable to VYNPS as it concerns applicants for a construction permit who apply on or after January 10, 1997. In addition, the staff has amended the VYNPS operating license to allow use of an alternative source term for accident analyses in accordance with 10 CFR 50.67. The change to 10 CFR 50.67 dose limits does not affect the VYNPS safety classification definition. The accident analyses with the alternative source term credits additional functions for the standby liquid control (SLC) and residual heat removal (RHR) systems: (1) the SLC system is credited with maintaining pH in the torus to prevent re-evolution of iodine, and (2) the drywell spray function of the RHR system is credited with particulate removal. The staff confirmed that these intended functions were included in the scoping evaluation.

During the audit, the staff also confirmed that any SSCs specifically credited for the 50.67(b) leakage pathway, were identified and included in-scope. For VYNPS, the main condenser and main steam (MS) bypass leakage pathway are credited for 50.67(b) leakage pathway and meet the 54.4(a)(1)(iii) criterion for inclusion in-scope. The staff confirmed that these pertinent SSCs were appropriately identified and placed in-scope. Since the specific SSCs were classified as nonsafety-related in the plant component database, they were placed in-scope in accordance with 10 CFR 54.4(a)(2) for nonsafety-related potentially affecting a safety-related functions.

The staff reviewed the evaluation and discussed the results of the evaluation with the applicant's license renewal team members. The staff determined that the differences between the VYNPS safety-related definition and the Rule definition were adequately identified and evaluated. These differences did not result in any additional components being considered safety-related beyond those identified in the VYNPS CLB.

2.1.4.1.3 Conclusion

Based on this sample review, discussions with the applicant, and review of the applicant's scoping process, the staff finds that the applicant's methodology for identifying systems and structures meets 10 CFR 54.4(a)(1) scoping criteria and, therefore, is acceptable.

2.1.4.2 Application of the Scoping Criteria in 10 CFR 54.4(a)(2)

2.1.4.2.1 Summary of Technical Information in the Application

In LRA Section 2.1.1.2, "Application of Criterion for Nonsafety-Related SSCs Whose Failure Could Prevent the Accomplishment of Safety Functions," and Section 2.3.3.13, "Miscellaneous Systems in-Scope for (a)(2)," the applicant described the scoping methodology as it related to the nonsafety-related criteria in accordance with 10 CFR 54.4(a)(2). The applicant evaluated the SSCs that met 10 CFR 54.4(a)(2) using three categories:

(1) <u>Nonsafety-Related SSCs Required to Perform a Function that Supports a Safety-Related SSC</u>

The SSCs required to perform a function in support of safety-related components were classified as safety-related and included in the scope of license renewal in accordance with 10 CFR 54.4(a)(1). The applicant reviewed engineering and licensing documents (UFSAR, Maintenance Rule scoping documents, and DBDs) to identify exceptions which were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

(2) <u>Nonsafety-Related SSCs Connected to Safety-Related SSCs</u>

The applicant identified certain nonsafety-related components and piping outside of the safety-class pressure boundary which must be structurally sound in order to maintain the pressure boundary integrity of safety-related piping. These components perform a structural support function.

For piping in this structural boundary, pressure integrity is not required (except when required for spatial interaction between nonsafety-related and safety-related SSCs); however, piping within the safety class pressure boundary depends on the structural boundary piping and supports in order for the system to fulfill its safety function. For VYNPS, the “structural boundary" is defined as the portion of a piping system outside the safety class pressure boundary, yet relied upon to provide structural support for the pressure boundary. The structural boundary is often shown on piping isometric drawings and was considered synonymous with the first seismic or equivalent anchor. Nonsafety-related piping systems connected to safety-related systems were included up to the structural boundary or to a point that includes an adequate portion of the nonsafety-related piping run to conservatively include the first seismic or equivalent anchor. An equivalent anchor was a combination of hardware or structures that together are equivalent to a seismic anchor. A seismic anchor was defined as hardware or structures that, as required by the analysis, physically restrain forces and moments in three orthogonal directions. The physical arrangement as analyzed insures that the stresses that are developed in the safety-related piping and supports are within the applicable piping and structural code acceptance limits. If isometric drawings were not readily available to identify the structural boundary, connected lines were included to a point beyond the safety-related/nonsafety-related interface, such as a base-mounted component, flexible connection, or the end of a piping run (such as a drain line). The LRA stated that the approach was consistent with the guidance in NEI 95-10, Appendix F.

(3) Nonsafety-related SSCs with a Potential for Spatial Interaction with Safety-Related SSCs

The applicant considered physical impact, and fluid leakage, spray or flooding when evaluating the potential for spatial interaction between nonsafety-related systems and safety-related SSCs. The applicant used a spaces approach for scoping of nonsafety-related systems with potential spatial interaction with safety-related SSCs. The spaces approach focused on the interaction between nonsafety-related and safety-related SSCs that are located in the same space. A "space" was defined as a room or cubicle that is separated from other spaces by substantial objects (such as wall, floors, and ceilings). The space was defined such that any potential interaction between nonsafety-related and safety-related SSCs is limited to the space.

Physical Impact

The applicant evaluated missiles which could be generated from internal or external events such as failure of rotating equipment, inherent nonsafety-related features that protect safety-related missiles, and overhead-handling systems whose structural failure could result in damage to any system that could prevent the accomplishment of a safety function. Nonsafety-related equipment that was determined to have a possible impact on safety-related SSCs were included within the scope of license renewal.

The applicant evaluated nonsafety-related portions of high-energy lines, including review of the UFSAR and relevant topical design basis document. The applicant’s high-energy systems were evaluated to ensure identification of components that are part of nonsafety-related high-energy lines that can effect safety-related equipment. If the applicant's high-energy line break (HELB) analysis assumed that an nonsafety-related piping system did not fail or assumed failure only at specific locations, then that piping system (piping, equipment and supports) is included within the scope of license renewal.

<u>Fluid Leakage, Spray, and Flooding</u>

The applicant evaluated moderate and low energy systems which have the potential for spatial interactions of spray and leakage. Nonsafety-related systems and nonsafety-related portions of safety-related systems with the potential for spray or leakage that could prevent safety-related SSCs from performing their required safety function were considered in the scope of license renewal. In addition, the nonsafety-related supports for nonsafety-related piping systems with a potential for spatial interaction with safety-related SSCs were included in the scope of license renewal.

The applicant determined that operating experience indicated that nonsafety-related components containing only air or gas have experienced no failures due to aging that could impact the ability of safety-related equipment to perform required safety functions. There are no effects of aging requiring management for these components when the environment is a dry gas. Systems containing only air or gas were included in the scope of license renewal.

Protective features, such as whip restraints, spray shields, supports, missile or flood barriers, (which can be applicable preventing physical impact and fluid leakage, spray, or flooding) were installed to protect safety-related SSCs against spatial interaction with nonsafety-related SSCs. Such protective features credited in the plant design were included within the scope of license renewal.

2.1.4.2.2 Staff Evaluation

Pursuant to 10 CFR 54(a)(2), the applicant must consider all nonsafety-related SSCs, the failure of which could prevent satisfactory performance of safety-related SSCs relied upon to remain functional during and following a DBE to ensure (a) the integrity of the reactor coolant pressure boundary, (b) the ability to shut down the reactor and maintain it in a safe shutdown condition, or (c) the ability to prevent or mitigate the consequences of accidents that could cause offsite exposures comparable to those of 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, as applicable.

NRC Regulatory Guide (RG) 1.188, Revision 1, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," dated September 2005, endorses the use of NEI 95-10, Revision 6, for methods the staff considers acceptable for compliance with 10 CFR Part 54 in preparing LRAs. NEI 95-10, Revision 6, addresses the staff positions on 10 CFR 54.4(a)(2) scoping criteria, nonsafety-related SSCs typically identified in the CLB, consideration of missiles, cranes, flooding, high-energy line breaks, nonsafety-related SSCs connected to safety-related SSCs, nonsafety-related SSCs in proximity of safety-related SSCs, and the mitigative and preventive options in nonsafety-related and safety-related SSCs interactions.

The staff states that applicants should not consider hypothetical failures but rather base their evaluation on the plant's CLB, engineering judgement and analyses, and relevant operating experience, describing operating experience as all documented plant-specific and industry-wide experience useful in determining the plausibility of a failure. Documentation would include NRC generic communications and event reports, plant-specific condition reports, such industry reports as safety operational event reports, and engineering evaluations.

The staff reviewed LRA Section 2.1.1.2, "Application of Criterion for Nonsafety-Related SSCs Whose Failure Could Prevent the Accomplishment of Safety Functions," and Section 2.3.3.13, "Miscellaneous Systems in-Scope for (a)(2)." The applicant described the scoping methodology as it related to the nonsafety-related criteria in accordance with 10 CFR 54.4(a)(2).

The applicant evaluated 10 CFR 54.4(a)(2) SSCs with the three categories from the NRC guidance to the industry on identification and treatment of such SSCs:

Nonsafety-Related SSCs Required to Perform Functions that Support a Safety-Related SSCs

Nonsafety-related SSCs required to perform a function in order to support a safety-related function had been previously classified as safety-related and were identified as such in the equipment data base. Therefore the nonsafety-related SSCs required to perform a function to support a safety-related function had been included in the scope of license renewal as safety-related as required by 10 CFR 54.4(a)(1). This evaluating criteria was discussed in the applicant's 10 CFR 54.4(a)(2) project report. The single exception to this approach was the main condenser and main steam isolation valve (MSIV) leakage pathway which was classified as an nonsafety-related system and was required to perform a function to support a safety-related function. This system was included in the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff found that the applicant implemented an acceptable method for scoping of nonsafety-related systems that perform a function that supports a safety-related intended function.

Nonsafety-Related SSCs Connected to Safety-Related SSCs

The applicant had previously performed an analysis to identify the nonsafety-related SSCs, outside of the safety-related pressure boundary, which were required to be structurally sound in order to maintain the integrity of the safety-related SSCs. This collection of nonsafety-related and safety-related SSCs was identified as the "structural boundary" and was typically identified on the plant isometric drawings. The applicant had included all nonsafety-related SSCs within the analyzed structural boundary in the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The LRA states that if the structural boundary was not indicated on the applicable isometric drawings, the applicant had identified the portion of the nonsafety-related SSCs beyond the safety-related SSCs to the first equivalent anchor or seismic anchor and included this portion of the nonsafety-related SSCs within the scope of license renewal. The term equivalent anchor was defined in the LRA as a combination of hardware or structures that together are equivalent to a seismic anchor (a seismic anchor was defined as hardware or structures that, as required by analysis, physically restrain forces and movements in three orthogonal directions). The LRA also indicated that if the structural boundary could not be identified for the applicable nonsafety-related/safety-related interface, the nonsafety-related SSCs were included to a point beyond the nonsafety-related/safety-related interface to a base-mounted component, flexible connection, or to the end of the piping run in accordance with the guidance of NEI 95-10. NEI 95-10, Appendix F describes the use of “bounding criteria” as a method of determining the portion of nonsafety-related SSCs to be included within the scope of license renewal.

The staff was unable to determine whether equivalent anchors (such as a combination of supports in the three orthogonal directions) had been used, in addition to the bounding criteria (base-mounted component, flexible connection, or the end of the piping run) discussed in the LRA and the 10 CFR 54.4(a)(2) project report which described the AMR of nonsafety-related systems and components affecting safety-related systems. In RAI 2.1-1, dated July 10, 2006, the staff requested that the applicant provide information related to the method used to develop the structural boundary and whether equivalent anchors had been used in addition to the bounding criteria discussed in the LRA.

In its response, by letters dated August 10, 2006, and October 17, 2006, the applicant further described the process used to determine the structural boundaries for those nonsafety-related systems which provided limited structural support to safety-related systems. As part of the applicant’s evaluation, isometric drawing of plant piping systems were reviewed where applicable to determine the location of structural boundaries. These isometric drawings were developed as part of the plant design process utilizing the results of piping stress analyses. No new analyses or isometric drawings were developed to support the license renewal process. Rather, the existing drawings and analyses were used to develop the structural boundaries, and in those instances where isometric drawings were not readily available, the applicant used the bounding criteria in NEI 95-10 to identify the portions of the nonsafety-related system necessary to support the intended function. With respect to the use of equivalent anchors, the applicant stated that other than the actual structural boundaries identified as a result of the existing piping stress analysis, isometric drawings, and use of the bounding criteria, they did not use any equivalent anchors to identify the structural boundaries for the nonsafety-related systems identified as performing a 10 CFR 54.4(a)(2) function.

The staff reviewed the additional information provided by the applicant and, on the basis of providing a detailed description of the process used to identify the structural boundaries, and confirmation that equivalent anchors were not used for the purposes of identifying structural boundaries for the nonsafety-related systems identified as performing a 10 CFR 54.4(a)(2) function, the staff found that the applicant has adequately addressed the staff's RAI. Therefore, the staff’s concern described in RAI 2.1-2 is resolved.

<u>Nonsafety-Related SSCs with a Potential for Spatial Interation with Safety-Related SSCs</u>

The applicant considered physical impact, and fluid leakage, spray or flooding when evaluating the potential for spatial interaction between nonsafety-related systems and safety-related SSCs. The applicant used a spaces approach for scoping of nonsafety-related systems with potential spatial interaction with safety-related SSCs. The spaces approach focused on the interaction between nonsafety-related and safety-related SSCs that are located in the same space. A "space" was defined as a room or cubicle that is separated from other spaces by substantial objects (such as wall, floors, and ceilings). The space was defined such that any potential interaction between nonsafety-related and safety-related SSCs is limited to the space.

The 10 CFR 54.4(a)(2) project report stated that the applicant had evaluated situations where missiles could be generated from internal or external events such as failure of rotating equipment. The nonsafety-related design features that protect safety-related SSCs from such missiles are within the scope of license renewal. In addition, the 10 CFR 54.4(a)(2) project report stated that the applicant had evaluated overhead-handling systems to identify those whose structural failure could result in damage to any system that could prevent the accomplishment of a safety function. Nonsafety-related overhead-handling equipment determined to have a possible impact on safety-related SSCs were included within the scope of license renewal.

The LRA stated that the applicant had evaluated nonsafety-related portions of high-energy lines, including review of the UFSAR and relevant topical design basis document. As discussed in the 10 CFR 54.4(a)(2) project report, the applicant used these references to evaluate the high-energy lines for postulated pipe breaks and identified eleven systems within the reactor building and five systems outside the reactor building. The applicant's high-energy systems were evaluated to ensure identification of components that are part of nonsafety-related high-energy lines that can effect safety-related equipment. If the applicant's high-energy line break (HELB) analysis assumed that a nonsafety-related piping system did not fail, or assumed failure only at specific locations, then that piping system (piping, equipment and supports) was included in the scope of license renewal. Many of the identified systems were safety-related and included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). The remaining nonsafety-related high-energy lines that were determined to have potential interaction with safety-related SSCs were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

The applicant evaluated moderate and low energy systems that have the potential for spatial interactions of spray and leakage. Nonsafety-related systems and nonsafety-related portions of safety-related systems with the potential for spray or leakage that could prevent safety-related SSCs from performing their required safety function were considered in the scope of license renewal. In addition, the applicant evaluated retired in place (RIP) systems for potential for spatial interaction. These RIP systems include both air-filled and fluid-filled portions of systems which were depressurized and isolated or capped from the remaining system. The applicant performed a review of the material/environment combinations for the RIP systems to determine if leakage of any fluid-filled portions due to corrosion could create the potential for a spatial interaction. The applicant applied the guidance from the Electric Power Research Institute (EPRI), "Non-Class 1 Mechanical Implementation guideline and Mechanical Tools," Revision 4, 2006. Consistent with the EPRI tools guidance, the applicant determined that the current configuration of these systems would not provide the necessary mechanisms to cause a failure in these systems which could result in system degradation and the potential subsequent leakage.

The 10 CFR 54.4(a)(2) project report stated that the applicant used a "spaces" approach to identify the nonsafety-related SSCs which were located within the same space as safety-related SSCs. A space was defined as a room or cubicle, separated by walls, floors, and ceilings. The applicant documented the review of each mechanical system for potential spatial interaction with safety-related SSCs in applicant's scoping results report, as documented in the audit report. Following identification of the applicable mechanical systems, the applicant reviewed the system functions to determine whether the system contained fluid, air or gas. Nonsafety-related SSCs containing air or gas were excluded from the scope of license renewal. The applicant then reviewed the mechanical systems to determine whether the system had any components located within a safety-related structure. included a walk-down of the safety-related structures. Those liquid-filled systems determined to have components located within a safety-related structure where then reviewed to determine if the system had components located within a space containing safety-related SSCs. Those nonsafety-related SSCs determined to contain fluid and to be located within a space containing safety-related SSCs were included within the scope license renewal.

In addition, protective features, such as whip restraints, spray shields, supports, missile or flood barriers (which can prevent physical impact and fluid leakage, spray, or flooding), installed to protect safety-related SSCs against spatial interaction with nonsafety-related SSCs were included within the scope of license renewal.

2.1.4.2.3 Conclusion

Based on its review, the staff determined that the applicant's methodology for identifying systems and structures meets 10 CFR 54.4(a)(2) scoping criteria and, therefore, is acceptable. This determination is based on a review of sample systems, discussions with the applicant, and review of the applicant's scoping process.

2.1.4.3 Application of the Scoping Criteria in 10 CFR 54.4(a)(3)

2.1.4.3.1 Summary of Technical Information in the Application

In LRA Section 2.1.1.3, “Application of Criterion for Regulated Events,” the applicant described the methodology for identifying systems, structures, and components relied on in safety analyses or plant evaluation to perform a function. Mechanical systems and structures that perform a intended function that demonstrates compliance with the 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 (ATWS) (10 CFR 50.62), and station blackout (SBO) (10 CFR 50.63) were included in the scope of license renewal. Mechanical systems and structures that have an intended function for 10 CFR 54.4(a)(3) are identified in LRA Sections 2.3 and 2.4. For example, LRA Section 2.3.2.2 states that the core spray (CS) system has two intended functions for 10 CFR 54.4(a)(3): the Appendix R safe shutdown capability analysis and the SBO coping analysis. LRA Section 2.4.3 states that the intake structure has one intended function for 10 CFR 54.4(a)(3): the Appendix R safe shutdown capability analysis for fire protection. All plant electrical and instrumental and control (EIC) systems and electrical equipment in mechanical systems were included in-scope of license renewal.

Fire Protection. The applicant described the scoping of mechanical systems and structures required to demonstrate compliance with the fire protection requirements in LRA Section 2.1.1.3.1, “Commission’s Regulations for Fire Protection (10 CFR 50.48).” The applicant reviewed its CLB and identified the mechanical systems and structures relied upon to meet Appendix R and 10 CFR 50.48 requirements. Mechanical systems and structures credited with fire prevention, detection, mitigation in areas containing equipment important to safe operation of the plant, and equipment credited with safe shutdown in the event of a fire were included in-scope license renewal.

Environmental Qualification. The applicant described the environmental qualification requirements of 10 CFR 50.49 in LRA Section 2.1.1.3.2, “Commission’s Regulations for Environmental Qualification (10 CFR 50.49).” All plant EIC systems and electrical equipment in mechanical systems were included in-scope of license renewal.

Pressurized Thermal Shock. These requirements are not applicable because Vermont Yankee is a Boiling Water Reactor.

Anticipated Transient Without Scram. The applicant described the scoping of mechanical systems and structures required to demonstrate compliance with the anticipated transient without scram (ATWS) requirements of 10 CFR 50.62 in LRA Section 2.1.1.3.4, “Commission’s Regulations for Anticipated Transients without Scram (10 CFR 50.62).” Mechanical systems and structures that perform a 10 CFR 50.62 intended function were included in-scope of license renewal.

Station Blackout. The applicant described the scoping criteria in LRA Section 2.1.1.3.5, “Commission’s Regulations for Station Blackout (10 CFR 50.63).” The applicants licensing basis requires a SBO coping duration of two hours and mechanical systems and structures required to support the two-hour coping duration are within the scope of license renewal. Although the switchyard is not considered a plant system, the Offsite Power system and related structures required to restore offsite power were also included in-scope of license renewal.

2.1.4.3.2 Staff Evaluation

The staff reviewed the applicant’s approach to identifying mechanical systems and structures relied upon to perform a function related to the four regulated events applicable to boiling water reactors (BWRs) required by 10 CFR 54.4(a)(3). As part of this review, the staff discussed the methodology with the applicant, reviewed the documentation developed to support the review, and evaluated a sample of the resultant mechanical systems and structures identified as in-scope for 10 CFR 54.4(a)(3) criteria.

The LRPGs described the applicant’s process for identifying systems and structures that are in the scope of license renewal. The LRPGs stated that all mechanical systems and structures that perform an intended function for 10 CFR 54.4(a)(3) are to be included in-scope of license renewal, and that the results of scoping are documented in the applicants scoping results report. The report also described the procedures and data base that were used to identify mechanical systems and structures for regulated events. In addition, the applicant used a variety of The Topical Design Basis Documents, as described in the audit report, to identify the principle systems for each regulated event. The applicants component database uses a classification code of “OQA” for components that are not safety-related but are subject to the requirements imposed by NRC regulations. Systems initially identified as not meeting the criterion of 10 CFR 54.4(a)(3) based on review of design basis information were reviewed for OQA components in the component database to verify that the systems performed no intended functions for license renewal regulated events.

Fire Protection. The applicant’s LRPDs state that the Fire Hazard Analysis, Fire Protection and Appendix R Program, and Safe Shutdown Capability Analysis, are used to identify mechanical systems and structures that are in-scope of license renewal. The report identifies the mechanical systems that are included in-scope of license renewal because they perform a 10 CFR 50.48 intended function. For example, the fire protection system has one intended function, which is to extinguish fires in the vital areas of the plant. The LRPDs summarizes the scoping results for mechanical systems and identifies 23 mechanical systems which have one or more 10 CFR 50.48 intended functions. The report also identifies the structures that are included in-scope of license renewal because they perform a 10 CFR 50.48 function, and provides a summary of the scoping results for ten structures that have one or more 10 CFR 50.48 intended functions. For example, the carbon dioxide (CO_2) tank foundation has one intended function, which is to provide support for the CO_2 tank.

Environmental Qualification. For the environmental qualification regulated event, the staff reviewed the LRA, the applicant's implementation procedures, results reports, and the Master Equipment List which were used by the applicant to identify environmental qualification components within the scope of license renewal. The staff also reviewed the Environmental qualification list which was used by the applicant during the screening process to identify short-lived components.

Anticipated Transient Without Scram. The applicant's scoping results report identifies the mechanical systems that are included in-scope of license renewal because they perform a 10 CFR 50.62 intended function. For example, the control rod drive (CRD) system has one intended function which is to provide alternate rod insertion during an ATWS event. The report summarizes the scoping results for mechanical systems, identifies that the CDR and SLC systems perform 10 CFR 50.62 intended functions, and identifies one structure that is included in-scope of license renewal because it performs a 10 CFR 50.62 intended function. A criterion for including the reactor building in-scope of licensee renewal was that it housed equipment credited for ATWS.

Station Blackout. The applicant's scoping results report states that mechanical systems and structures credited with the two-hour coping duration and switchyard components required to restore offsite power are included in-scope of license renewal. The report identifies the mechanical systems that are were included in-scope of license renewal because they perform a 10 CFR 50.63 intended function. For example, the CS system has one intended function which is to provide reactor coolant makeup in the SBO coping analysis. The report summarizes the scoping results for mechanical systems, identifies eight mechanical systems that have one or more 10 CFR 50.63 intended functions, and identifies that the Offsite Power system is in-scope of license renewal because it performs a 10 CFR 50.63 intended function. The report also identifies the structures that were included in-scope of license renewal because they perform a 10 CFR 50.63 function. For example, the Vernon Hydroelectric Station (VHS) had one intended function which is to maintain integrity for SBO. The report summarizes the scoping results for structures and identifies five structures that have one or more 10 CFR 50.63 intended functions.

Section 54.4(a)(3) of 10 CFR requires that all systems and structures relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63) be included in the scope of license renewal. LRA Section 2.1.1.3.5 stated that the VHS is credited as the alternate alternating current (AC) power source for SBO. LRA Section 2.4.5 states that the VHS structures are in-scope of license renewal. LRA Section 2.3.5 and the applicant's scoping results report identify the VHS structures that are in the scope of license renewal. However, the VHS mechanical and electrical systems were not explicitly identified as being included in the scope of license renewal. It was not clear to the staff why the Vernon Station mechanical and electrical systems were not identified in the scope of license renewal in accordance with 10 CFR 54.4(a)(3). Therefore, the staff submitted RAI 2.1-3 requesting that the applicant describe the scoping and screening methodology as it applies to the mechanical and electrical systems associated with the VHS, and identify those mechanical and electrical systems and components (SCs) that are in the scope of license renewal and subject to an AMR.

In its responses, by letters dated July 14, 2006, August 10, 2006, and October 20, 2006, the applicant further described the scoping and screening process used to evaluate the VHS. The applicant identified the VHS as the alternate alternating current source credited for the VYNPS loss of all alternating current power compliance with 10 CFR 50.63 (SBO rule), and therefore, in-scope of license renewal. The applicant stated, in part, that they had credited the Federal Energy Regulatory Commission dam inspection program to manage the effects of aging on the civil and structural elements of the VHS. All additional mechanical and electrical systems associated with the turbine generator (TG) were considered an active assembly that is routinely confirmed through normal operation and therefore, consistent with the screening process, determined to not be subject to an AMR. Notwithstanding the screening of the mechanical and electrical systems as part of the active assembly, the applicant performed an IPA of the passive, long-lived electrical and mechanical components of the VHS. On the basis of this evaluation, the applicant identified specific structural, mechanical, and electrical SSCs that support one or more of the intended functions of the VHS, which is consistent with the screening methodology described in Safety Evaluation (SE) Section 2.1.5.

The staff reviewed the applicant’s responses to the RAI and concluded that the applicant has adequately described its process for scoping and screening of the VHS, and has identified the VHS as in-scope. The applicant has also evaluated the SSCs associated with the VHS, consistent with the screening methodology described in SE Section 2.1.5. The staff found that the applicant has adequately addressed the staff's RAI. Therefore, the staff’s concern described in RAI 2.1-3 is resolved.

2.1.4.3.3 Conclusion

On the basis of the sample review, discussions with the applicant, the applicants RAI response, and review of the applicant's scoping process, the NRC staff determined that the applicant's methodology for identifying systems and structures meets the scoping criteria of 10 CFR 54.4(a)(3), and is therefore acceptable.

2.1.4.4 Plant-Level Scoping of Systems and Structures

2.1.4.4.1 Summary of Technical Information in the Application

<u>System and Structure Level Scoping</u>. The applicant documented its methodology for performing the scoping of SSCs in accordance with 10 CFR 54.4(a) in its LRPGs and LRPDs. The applicant's approach to system and structure scoping provided in the site guidance was consistent with the methodology described in LRA Section 2.1. The LRPGs specify that the personnel performing license renewal scoping use CLB documents. The LRPGs also describe the system or structure, including a list of functions that the system or structure is required to

accomplish. Sources of information regarding the CLB for systems included the UFSAR, DBDs, VYNPS component database, Maintenance Rule scoping reports, control drawings, and docketed correspondence. The applicant then compared identified system or structures function lists to the scoping criteria to determine whether the functions met the scoping criteria of 10 CFR 54.4(a). The applicant documented the results of the plant-level scoping process in accordance with the LRPGs. These results were provided in the systems and structures LRPDs. The information in the LRPDs includes a description of the structure or system, a listing of functions performed by the system or structure, information pertaining to system realignment (as applicable), identification of intended functions, the 10 CFR 54.4(a) scoping criteria met by the system or structure, references, and the basis for the classification of the system or structure intended functions. During the scoping methodology audit, the staff reviewed a sampling of LRPD reports and concluded that the applicant's scoping results in the LRPDs contained an appropriate level of detail to document the scoping process.

Conclusion

On the basis of a review of the LRA, the scoping and screening implementation procedures, and a sampling review of system and structure scoping results during the methodology audit, the staff concluded that the applicant's scoping methodology for systems and structures was adequate. In particular, the staff determined that the applicant's methodology reasonably identified systems and structures within the scope of license renewal and their associated intended functions.

Component Level Scoping. After the applicant identified the systems and structures within the scope of license renewal, a review of mechanical systems and structures was performed to determine the components in each in-scope system and structure. The structural and mechanical components that supported intended functions were considered within the scope of license renewal and screened to determine if an AMR was required. All electrical components within the mechanical and electrical systems were included in-scope as commodity groups (groups of like structures and components). The applicant considered three component classifications during this stage of the scoping methodology: mechanical, structural, and electrical. The VYNPS component database and controlled plant drawings provide a comprehensive listing of plant components. Component type and unique component identification numbers were used to identify each component identified as in-scope and subject to an AMR.

Commodity Groups Scoping. Initially all electrical components within the mechanical and electrical systems were included in the scope of license renewal as commodity groups. Since many electrical component types are considered active in accordance with the guidance in NEI 95-10 and the SRP-LR, they were screened out as not meeting the passive criteria and were subsequently not subject to an AMR. In LRA Section 2.1.2.3, the applicant described the commodity groups used to evaluate all in-scope electrical components subject to an AMR.

Structural components were grouped as structural commodity types. Commodity types were based on materials of construction. LRA Section 2.1.2.2.1 identified the various structural commodity groups including:

- steel

- threaded fasteners
- concrete
- fire barriers
- elastomers
- earthen structures
- flouropolymers and lubrite sliding surfaces

Insulation. LRA Section 2.4.6, “Bulk Commodities,” stated that insulation may have the specific intended functions of (1) controlling the heat load during design basis accidents in areas with safety-related equipment, or (2) maintaining integrity such that falling insulation does not damage safety-related equipment (reflective metallic type reactor vessel insulation). As such, insulation is included in the scope of license renewal as a commodity group in those applications where it provides one or both of the above intended function.

Consumables. In LRA Section 2.1.2.4, “Consumables,” the applicant discussed consumables. The guidance in Table 2.1-3 in NUREG-1800 was used to categorize and evaluate consumables. Consumables were divided into the following four categories 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.

The consumables in both categories (a) and (b) are considered as subcomponents. Category (a) subcomponents are not relied upon to form a pressure-retaining function and, therefore, not subject to an AMR. Category (b) subcomponents are structural sealants for structures within the scope of license renewal that require an AMR. Category (c) consumables are periodically replaced in accordance with plant procedures and, therefore, not subject to an AMR. Category (d) consumables are subject to replacement based on National Fire Protection Association (NFPA) standards in accordance with plant procedures and, therefore, not subject to an AMR.

2.1.4.4.2 Staff Evaluation

The staff reviewed the applicant’s methodology for performing the scoping of plant systems and components to ensure it was consistent with 10 CFR 54.4(a). The methodology used to determine the mechanical systems and components in-scope of license renewal was documented in LRPDs and plant level scoping results were identified in LRA Table 2.2-1. The scoping process defined the entire plant in terms of systems and structures. Specifically, the LRPGs identified the systems and structures that are subject to 10 CFR 54.4 review, described the processes for capturing the results of the review, and were used to determine if the system or structure performed intended functions consistent with the criteria of 10 CFR 54.4(a). The process was completed for all systems and structures to ensure that the entire plant was addressed. The applicant’s technical personnel performed initial reviews on systems and structures identified in the CLB.

The staff noted that a system or structure was presumed to be in-scope of license renewal if it performed one or more safety-related functions or met the other scoping criteria per the Rule as determined by CLB review. Mechanical and structural component types that supported intended functions were considered in-scope of license renewal. All component types in electrical systems in-scope of license renewal were considered in-scope of license renewal. These component types were placed in commodity groups. The electrical commodity groups were further screened to determine if they required an AMR. The staff did not identify any discrepancies with the methodology used by the applicant.

The staff reviewed the methodology used by the applicant to generate commodity groups. Separate commodity groups were identified for various mechanical, structural, and electrical components and were identified in the LRPDs. The staff reviewed the commodity group level functions that were identified and evaluated by the applicant in accordance with 10 CFR 54.4(a). This process determined whether the commodity group was considered in-scope of license renewal.The staff found the methodology used acceptable.

The staff reviewed the results of the scoping process documented in the LRPDs in accordance with the LRPGs. This documentation included the description of the system or structure and the 10 CFR 54.4(a) scoping criteria met by the system or structure. The staff also reviewed a sample of the applicant's scoping documentation and concluded that it contained an appropriate level of detail to document the scoping process.

The staff reviewed the applicant's evaluation of plant insulation as documented in the LRPD and the bulk commodities AMR. The applicant identified insulation as being in-scope and subject to an AMR based on it providing intended functions of insulating characteristics to reduce heat transfer, and structural or functional support to nonsafety-related SCs whose failure could prevent safety-related functions. Both mirror and non-mirror insulation were evaluated. The staff concludes that the applicant's methods and conclusions regarding insulation are acceptable.

The staff reviewed the scoping and screening of consumables and finds that the applicant followed the process described in NUREG-1800, and appropriately identified and categorized the various consumables in accordance with the guidance. Plant consumables were initially identified and evaluated to determine if any met the criteria requiring an AMR, such as structural sealants. Additionally, the applicant identified all pertinent industry guidelines which were used as the basis for replacement of the item, such as NFPA standards.

2.1.4.4.3 Conclusion

Based on its review of the LRA, scoping and screening implementation procedures, and a sampling of system scoping results during the audit, the staff concludes that the applicant's scoping methodology for plant SSCs, commodity groups, insulation, and consumables is acceptable. In particular, the staff determines that the applicant's methodology reasonably identifies systems, structures, component types, and commodity groups within the scope of license renewal and their intended functions.

2.1.4.5 Mechanical Component Scoping

2.1.4.5.1 Summary of Technical Information in the Application

In LRA Section 2.1, the applicant described the methodology for identifying mechanical system components that are in the scope of license renewal. For mechanical systems, the mechanical components that support the system intended functions are included in the scope of license renewal. For mechanical system scoping, a system was defined as the collection of components in the component database assigned to the system code. System intended functions were determined based on the functions performed by those components. Defining a system by the components in the database is generally consistent with the VYNPS maintenance rule scoping documents and safety classification procedure. Each mechanical system was evaluated against the criteria of 10 CFR 54.4 to determine which system components performed the intended functions consistent with the scoping criteria.

2.1.4.5.2 Staff Evaluation

The staff evaluated LRA Section 2.1 and the guidance in LRPDs, LRPGs, and accident management (AM) reports to complete the review of mechanical scoping process. The program guidelines and AM reports provided instructions for identifying and evaluating individual mechanical system components with respect to the scoping criteria. The CLB documents were utilized when determining whether a system or component is within the scope of 10 CFR 54.4(a). Examples of these sources included, but were not limited to, the UFSAR, Maintenance Rule database, separate ATWS, environmental qualification, fire protection and SBO documents, technical specifications, safety evaluation reports. Additional sources of mechanical component information included the VYNPS component database and individual system flow diagrams.

Mechanical system diagrams were evaluated to create license renewal boundaries for each system showing the in-scope components. Components that support a safety-related function or a regulated event were identified and further evaluated during the screening process to determine if the component should be subject to an AMR. Nonsafety-related components that are connected to safety-related components and provide structural support at the safety/non-safety interface, or components whose failure could prevent satisfactory accomplishment of a safety-related function due to spatial interaction with safety-related SSCs are included in-scope and individually identified in the AMR associated with the 10 CFR 54.4(a)(2) evaluation, but were not specifically highlighted on the license renewal drawings. As part of the applicant’s verification process, the list of mechanical components identified as in-scope were compared to the data in LRIS and the VYNPS component database to confirm the scope of components in the system.

The staff reviewed the implementation guidance and the CLB documents associated with mechanical system scoping, and found that the guidance and CLB source information noted above were acceptable to identify mechanical components and support structures in mechanical systems that are within the scope of license renewal. The staff conducted detailed discussions with the applicant's license renewal project management personnel and reviewed documentation pertinent to the scoping process. The staff assessed whether the applicant had appropriately applied the scoping methodology outlined in the LRA and implementation procedures and whether the scoping results were consistent with CLB requirements. The staff determined that the applicant's proceduralized methodology was consistent with the description provided in the LRA Section 2.1 and the guidance contained in SRP-LR, Section 2.1, and was adequately implemented.

Scoping Methodology for the Core Spray System

In LRA Section 2.3.2.2, "Core Spray," the applicant provided the scoping and screening methodology results for SSCs within the CS system. The CS system is a safety-related system and is credited with mitigating the effects of a loss of coolant events. The CS system accomplishes the following scoping criteria associated with the Rule:

The CS system has the following intended functions for 10 CFR 54.4(a)(1):

- Provide injection of water following loss of reactor coolant
- Support primary containment isolation
- Provide reactor coolant pressure boundary

The CS system has the following intended function for 10 CFR 54.4(a)(2):

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function

The CS system has the following intended function for 10 CFR 54.4(a)(3):

- The CS system is credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48)
- The CS system is credited in the SBO coping analysis (10 CFR 50.63)

The CS license renewal scoping boundary includes those portions of nonsafety-related piping and equipment that extend beyond the safety-related/nonsafety-related interface. The scoping results indicated that the CS contains six system functions within the scope of license renewal.

As part of the audit, The staff reviewed the applicant's methodology for identifying CS mechanical component type meeting the scoping criteria as defined in the Rule. The staff also reviewed the scoping methodology implementation procedures and discussed the methodology and results with the applicant. The staff confirmed that the applicant had identified and used pertinent engineering and licensing information in order to determine the CS mechanical component type required to be in-scope of license renewal. As part of the review process, the staff evaluated each system intended function identified for the CS system, the basis for inclusion of the intended function, and the process used to identify each of the system components credited with performing the intended function. The staff confirmed that the applicant had identified and highlighted system P&IDs to develop the system boundaries in accordance with the procedural guidance. The applicant was knowledgeable about the process and conventions for establishing boundaries as defined in the license renewal implementation procedures. Additionally, the staff confirmed that the applicant had independently confirmed the results in accordance with the governing procedures. Specifically, other license renewal personnel knowledgeable about the system had independently reviewed the marked-up drawings to ensure accurate identification of system intended functions. The applicant performed additional cross-discipline verification and independent reviews of the resultant highlighted drawings before final approval of the scoping effort.

2.1.4.5.3 Conclusion

Based on its review of the LRA, scoping implementation procedures, and the system sample and discussions with the applicant, the staff concludes that the applicant's methodology for identifying mechanical systems for 10 CFR 54.4(a) scoping criteria is acceptable.

2.1.4.6 Structural Component Scoping

2.1.4.6.1 Summary of Technical Information in the Application

In LRA Section 2.1, the applicant described the methodology for identifying structures that are in the scope of license renewal. All plant structures and SBO-related non-plant structures were initially identified. Structure intended functions were identified using CLB documents such as the UFSAR, the Maintenance Rule document for buildings and structures, safety classification procedures, the fire hazards analysis, and the safe shutdown capability assessment. Structures that have an intended function for 10 CFR 54.4(a) were included in the scope of license renewal and listed in LRA Table 2.2-3. Structures that were not in-scope of license renewal are listed in LRA Table 2.2-4. LRA Section 2.4 describes the scoping results for the individual structures that are in-scope of license renewal. For example, LRA Section 2.4.1 describes the intake structure's purpose and seismic classification. The intake structure was in-scope of license renewal because it provides supports, shelter and protection for safety and nonsafety-related systems within the scope of license renewal.

2.1.4.6.2 Staff Evaluation

The staff reviewed the applicant's approach for identifying structures relied upon to perform the functions as required by 10 CFR 54.4(a). As part of this review, the staff discussed the methodology with the applicant, reviewed the documentation developed to support the review, and evaluated the scoping results for several structures that were identified in-scope of license renewal.

The LRPGs describe the applicant's process for identifying structures that are in the scope of license renewal and state that all structures that perform an intended function are to be included in-scope of license renewal and that the scoping results are to be documented in the scoping results report. The scoping results report lists all the structures that were evaluated and also describes the procedures that were used to identify structures. In additional, the plant UFSAR, Maintenance Rule Document, Fire Hazards Analysis, and Safe Shutdown Capability Analysis were used to identify structures. The applicant's component database uses a classification code of "BLD" for structures, and a search of this data base was used to identify structures.

The staff reviewed the applicants implementation procedures and scoping results reports. Structural scoping was performed in a manner to ensure that all plant buildings, yard structures, and SBO related non-plant structures were considered. The scoping results report identified the intended functions for each structure required for compliance with one or more criteria of 10 CFR 54.4(a). The structural component intended functions were identified based on the guidance provided in NEI 95-10 and NUREG-1800. For structures, the evaluation boundaries were determined by developing a complete description of each structure with respect to the intended functions performed by the structure. The results of the review were documented in the scoping results report (which contains a list of structures, evaluation results for each of the 10 CFR 54.4(a) criteria for each structure, a description of structural intended functions, and source reference information for the functions).

The staff conducted detailed discussions with the applicant’s license renewal team and reviewed documentation pertinent to the scoping process. The staff assessed if the scoping methodology outlined in the LRA and procedures were appropriately implemented and if the scoping results were consistent with CLB requirements. The staff also reviewed structural scoping evaluation results for the intake structure and VHS to verify proper implementation of the scoping process. Based on these audit activities, the staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.4.6.3 Conclusion

Based on its review of the LRA, the applicant's detailed scoping implementation procedures, and a sampling of structural scoping results, the staff concludes that the applicant's methodology for identification of structural component types within the scope of license renewal meets 10 CFR 54.4(a) requirements and, therefore, is acceptable.

2.1.4.7 Electrical Component Scoping

2.1.4.7.1 Summary of Technical Information in the Application

LRA Section 2.1.1, “Scoping Methodology” describes the scoping process associated with electrical systems and components. For the purposes of system level scoping, plant EIC systems were included in the scope of license renewal. EIC components in mechanical systems were included in the evaluation of electrical systems. LRA Section 2.1.1 refers to LRA Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Control Systems,” which further states that the default inclusion of plant electrical and instrumentation and controls (EIC) systems in the scope of license renewal reflects the method used for the scoping of electrical systems, which is different from the methods used for mechanical systems and structures. The approach used for EIC components was to include components in the review unless they were specifically screened out. When used with the plant spaces approach, this method eliminated the need for unique identification of every component and its specific location. This gave assurance that components were not excluded from an AMR.

2.1.4.7.2 Staff Evaluation

The staff evaluated LRA Sections 2.1.1 and 2.5 and the applicants implementing procedures and aging management reports, as documented in the audit report, governing the electrical scoping methodology. The scoping phase for electrical components began with placing all electrical components from plant systems within the scope of license renewal. In addition, any electrical components from non-plant systems that met the criteria for inclusion of 10 CFR 54.4(a) (such as components credited for SBO) were also included within the scope of license renewal. The staff determined that the data sources used for scoping included the EMPAC data base, the station single line drawing, and the cable design procurement specifications. The applicant gathered and sorted the collection of all electrical components from the data sources and assembled the data into word processing file, called the “scoping” file. The staff reviewed selected portions of the data sources and the resulting assemblage of the data contained in the “scoping” file. The staff selected components for validation. The applicant demonstrated the component location in the data source and how the component was included in the “scoping” file through implementation of the LRPGs.

2.1.4.7.3 Conclusion

Based on its review of the LRA, the applicant’s detailed scoping implementation procedures, and a sampling of electrical scoping results, the staff concludes that the applicant’s methodology for identification of electrical components within the scope of license renewal meets 10 CFR 54.4(a) requirements and, therefore, is acceptable.

2.1.4.8 Conclusion for Scoping Methodology

Based on its review of the LRA and the scoping implementation procedures, the staff determines that the applicant's scoping methodology is consistent with SRP-LR guidance and has identified SSCs within the scope of license renewal as required by 10 CFR 54.4(a)(1), (a)(2), and (a)(3). Therefore, the staff concludes that the applicant’s methodology meets 10 CFR 54.4(a) requirements.

2.1.5 Screening Methodology

2.1.5.1 General Screening Methodology

After identifying systems and structures within the scope of license renewal, the applicant implemented a process for identifying SCs subject to an AMR in accordance with 10 CFR 54.21.

2.1.5.1.1 Summary of Technical Information in the Application

In LRA Section 2.1.2, “Screening Methodology,” the applicant discussed the method of identifying components from in-scope systems and structures that are subject to an AMR. The screening process consisted of the following steps:

> Identification of components that are long-lived or passive for each in-scope mechanical system, structure and electrical commodity group.
>
> Identification of the license renewal intended function(s) for all mechanical and structural component types and electrical commodity groups.

Active components were screened out and therefore, did not require an AMR. The screening process also identified short lived components and consumables. The short lived components are not subject to an AMR. Consumables are a special class of items that include packing, gaskets, component seals, O-rings, oil, grease, component filters, system filters, fire extinguishers, fire hoses, and air packs. Structural sealants for structures were the only consumables in-scope of license renewal that require an AMR.

2.1.5.1.2 Staff Evaluation

Pursuant to 10 CFR 54.21, the Commission requires that each LRA must contain an IPA that identifies SCs within the scope of license renewal that are subject to an AMR. The IPA must identify components that perform an intended function without moving parts or a change in configuration or properties (passive), as well as components that are not subject to periodic replacement based on a qualified life or specified time period (long-lived). The IPA includes a description and justification of the methodology used to determine the passive and long-lived SCs, and a demonstration that the effects of aging on those SCs will be adequately managed so that the intended function(s) will be maintained in accordance with all design conditions imposed by the plant-specific CLB for the period of extended operation.

The staff reviewed the methodology used by the applicant to determine if mechanical and structural component types, and electrical commodity groups in-scope of license renewal should be subject to an AMR. The applicant implemented a process for determining which SCs were subject to an AMR as required by 10 CFR 54.21(a)(1). In LRA Section 2.1.2, the applicant discussed these screening activities as they related to the component types and commodity groups within the scope of license renewal.

The screening process evaluated these in-scope component types and commodity groups to determine which ones were long-lived and passive and therefore, subject to an AMR. The staff reviewed LRA Sections 2.3, 2.4, and 2.5 that provided the results of the process used to identify component types and commodity groups subject to an AMR. The staff also reviewed the screening results reports for the CS system and intake structure.

The applicant provided the staff with a detailed discussion of the processes used for each discipline and provided administrative documentation that described the screening methodology. Specific methodology for mechanical, electrical, and structural is discussed below.

2.1.5.1.3 Conclusion

Based on its review of the LRA, the screening implementation procedures, and a sampling of screening results, the staff determines that the applicant's screening methodology is consistent with SRP-LR guidance and capable of identifying passive, long-lived components within the scope of license renewal and subject to an AMR. The staff determines that the applicant's process for identifying component types and commodity groups subject to an AMR meets 10 CFR 54.21 requirements and, therefore, is acceptable.

2.1.5.2 Mechanical Component Screening

2.1.5.2.1 Summary of Technical Information in the Application

In LRA Section 2.1.2.1, "Screening of Mechanical Systems," the applicant discussed the screening methodology for identifying passive and long-lived mechanical components and their support structures that are subject to an AMR. License renewal drawings were prepared to indicate portions of systems that support system intended functions within the scope of License renewal (with the exception of those systems in-scope for 10 CFR 54.4(a)(2) for physical interactions, as discussed below). In addition, the drawings identify components that are subject to an AMR. Boundary flags are used in conjunction with safety-to-nonsafety class breaks to identify the system intended function boundaries. Boundary flags are noted on the drawings as system intended function boundaries. All components within these boundary flags and class breaks support system intended functions within the scope of license renewal. Components subject to an AMR (i.e., passive, long-lived components that support system intended functions) were highlighted to indicate that the component was subject to an AMR.

2.1.5.2.2 Staff Evaluation

The staff evaluated the mechanical screening methodology in LRA 2.1.2.1, “Screening of Mechanical Systems,” the LRPDs, LRPGs, and the AM reports, as documented in the audit report. The mechanical system screening process began with the results from the scoping process. The applicant reviewed each mechanical system flow diagram to identify passive and long-lived components. To identify system components required to perform a system intended function, the applicant generated a listing of mechanical system components based on information derived from controlled system diagrams and the VYNPS component database. The LRPGs and LRPDs discuss in detail how to (1) determine system boundaries, (2) indicate components within a specific flow path which are required for performance of intended functions, and (3) determine and identify system and interdisciplinary interfaces (e.g., mechanical/structural, mechanical/electrical, structural/electrical). These components were entered into the LRIS database. The applicant also reviewed components in the VYNPS component database to confirm that all system components were considered. In cases where the mechanical system flow diagrams did not provide sufficient detail, such as large vendor supplied components (e.g., compressors, emergency diesel generators (EDGs)), the applicant reviewed associated component drawings or vendor manuals as necessary to identify individual components.

The staff reviewed the results of the boundary evaluation and discussed the process further with the applicant. The staff confirmed that mechanical system evaluation boundaries were established for each system within the scope of license renewal. These boundaries were determined by mapping the pressure boundary associated with system-level license renewal intended functions onto the controlled system drawings. Mechanical component types were loaded into a scoping and screening database and further review was performed to ensure all component types were identified. If a component type was not already in the LRIS, the component type was created for use in the license database. A preparer and an independent reviewer performed a comprehensive evaluation of the boundary drawings to ensure the completeness and accuracy of the review results. As part of the evaluation, the applicant also benchmarked passive and long-lived components for a system against previous LRAs containing similar systems.

As part of the audit, the staff reviewed the methodology used by the applicant to identify SSCs which met the screening criteria of the Rule. The staff confirmed that the applicant had implemented and followed the screening guidance in the SRP-LR and NEI 95-10. The staff confirmed the applicant had developed sufficiently detailed procedures for the screening of mechanical systems, had implemented those procedures, and had adequately documented the results in the associated AMR reports.

Additionally, the staff reviewed the screening activities associated with the CS system. The staff reviewed the system intended functions and associated source documents identified for the system, the CS flow diagrams, and the associated results documented in the AM report. The staff did not identify any discrepancies with the valuation, and determined that the applicant has adequately followed the process documented in the LRPDs and adequately documented the results in the AM reports.

2.1.5.2.3 Conclusion

Based on its review of the LRA, the screening implementation procedures, and a sample review of CS screening results, the staff determines that the applicant's mechanical component screening methodology is consistent with SRP-LR guidance. The staff concludes that the applicant's methodology for identification of passive, long-lived mechanical components within the scope of License renewal and subject to an AMR meets 10 CFR 54.21(a)(1) requirements.

2.1.5.3 Structural Component Screening

2.1.5.3.1 Summary of Technical Information in the Application

The applicant described the methodology used for structural screening in LRA Sections 2.1.2.2, "Screening of Structures," and 2.4, "Scoping and Screening Results: Structures." LRA Section 2.1.2.2 states that structural components were evaluated to determine those subject to an AMR for each structure within the scope of license renewal. Specific structural components were identified from reviewing the CLB (drawings, etc.). Passive and long-lived structural components that performed an intended function were identified and subject to an AMR. NUREG-1800 and NEI 95-10, Appendix B, were used as the basis for the identification of passive structural components. Structural components (door, gate, pipe support, strut, or siding for example) were categorized as steel, threaded fasteners, concrete, fire barriers, elastomers, earthen structures, or flouropolymers and lubrite sliding surfaces. LRA Section 2.4 summarizes the screening results for structures. For example, LRA Section 2.4.3 and Table 2.4-3 summarize the screening results for the intake structure. LRA Section 2.4.5 and Table 2.4-5 summarize the screening results for the VHS. The structural components common to all structures such as piping supports were categorized as bulk commodities. LRA Section 2.4.6 and Table 2.4-6 summarize the screening results for structural bulk commodities.

2.1.5.3.2 Staff Evaluation

The staff reviewed the applicant's methodology for identifying structural components that are subject to an AMR as required in 10 CFR 54.21(a)(1). As part of this review, the staff discussed the methodology with the applicant, reviewed the documentation developed to support the activity, and evaluated the screening results for several structures that were identified in-scope of license renewal.

The applicant's AM reports, as described in the audit report, provided detailed implementation guidance on the applicant's process for identifying and screening structural components that are subject to an AMR. The report stated that all structural components that perform an intended function and are passive and long-lived are subject to an AMR. In addition, the screening results for each system were described in separate AM reports for each system.

The staff reviewed the applicant's methodology used for structural screening described in LRA sections noted above, and in applicants implementing guidance and AM reports The applicant performed the screening review in accordance with the implementation guidance and captured pertinent structure design information, component, materials, environments, and effects of aging. The staff confirmed that the applicant used the lists of passive SCs embodied in the regulatory guidance as an initial starting point and supplemented that list with additional items unique to the site or for which a direct match to the generic lists did not exist (i.e., material/environment combinations). As one of the general rules for structural screening, the applicant determined that components which support or interface with electrical components such as, cable trays, conduits, instrument racks, panels and enclosures, were assessed as structural components.

The boundary for a structure was the entire building including base slabs, foundations, walls, beams, slabs, and steel superstructure. The AM reports identified each individual SC and indicated if the component is subject to an AMR. Each component was identified as a component as a component type (door, gate, anchor support, strut, or siding for example) or as a material. The applicant provided the staff with a detailed discussion that described the screening methodology, as well as the screening reports for a selected group of structures.

The staff also examined the applicant’s results from the implementation of this methodology by reviewing several of the plant structures (intake structure and VHS) identified as being in-scope. As part of this review, the staff reviewed the AM reports to verify that the applicant had performed a comprehensive evaluation and had identified the relevant structural components as part of their evaluation. The review included the evaluation of in-scope components, the corresponding component-level intended functions, and the resulting list of components subject to an AMR. The staff also discussed the process and results with the applicant. The staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.5.3.3 Conclusion

Based on its review of the LRA, the applicant's detailed screening implementation procedures, and a sampling of structural screening results, the staff concludes that the applicant's methodology for identification of passive, long-lived structural component types within the scope of License renewal and subject to an AMR meets 10 CFR 54.21(a)(1) requirements.

2.1.5.4 Electrical Component Screening

2.1.5.4.1 Summary of Technical Information in the Application

In the LRA Section 2.1.2.3, “Screening of Electrical and Instrumentation and Control Systems,” the applicant discussed the use of NEI 95-10, Appendix B, “Typical Structure, Component and Commodity Groupings and Active/ Passive Determinations for the Integrated Plant Assessment,” which identifies electrical commodities considered to be passive. The electrical commodity groups were identified and cross-referenced to the appropriate NEI 95-10 commodity.

The applicant determined that the majority of EIC commodity groups are active and do not require an AMR. Two passive EIC commodity groups were identified that meet the 10 CFR 54.21(a)(1)(i) criterion (components that perform an intended function without moving parts or without a change in configuration or properties):

- high-voltage insulators, and
- cables and connections, bus, electrical portions of EIC penetration assemblies

Additionally, the pressure boundary function that may be associated with some EIC components identified in NEI 95-10, Appendix B (flow elements, vibration probes) was considered in the mechanical AMRs, as applicable. Electrical components supported by structural commodities (cable trays, conduit and cable trenches) were included in the structural AMRs.

The applicant reviewed the passive electrical components to determine those components that were replaced based on a qualified life and therefore not subject to an AMR. The applicant determined that the components included in the Environmental Qualification of Electric Components Program per 10 CFR 50.49 are replaced based on qualified life and, therefore are not subject to an AMR. The applicant determined that the AMRs would be performed for the identified passive, non-Environmental Qualification EIC components.

2.1.5.4.2 Staff Evaluation

The staff reviewed the applicant’s methodology used for electrical screening in LRA Sections 2.1.2.3 and the applicants implementation procedures and AM reports. The applicant used the screening process described in these documents to identify the electrical commodity groups subject to an AMR. The applicant used the VYNPS component database, the stations single line drawings, and cable procurement specifications as data sources to identify the EIC components including fuses-holders. The applicant determined there were no fuse-holders located outside of active devices and subject to an AMR.

The staff determined that the applicant had performed screening by initially identifying passive SCs and subsequently identifying the long-lived SCs contained within the passive SC population. The applicant identified seven commodities that were determined to meet the passive criteria. The seven commodities were further grouped in accordance with NEI 95-10 as (1) cables and connections, electrical portions of penetration assemblies, switchyard bus, transmission bus, transmission conductors and uninsulated ground conductors, and (2) high-voltage insulators. All were included in the “passive component table.” The applicant then evaluated the passive commodities contained in the “passive component table” to identify whether they were subject to period replacement based on a qualified life or specified time period (short-lived), or not subject to period replacement based on a qualified life or specified time period (long-lived). The information used to identify short-lived components, which would not be subject to an AMR, included the environmental qualification master list. The environmental qualification master list identified the short-lived components included in the Environmental Qualification program. The remaining passive, long-lived components were included in the “passive, long-lived component table” and were determined to be subject to an AMR.

The staff reviewed the information contained in the scoping file, including the “passive component table,” and the “passive, long-lived component table,” to verify that the applicant had appropriately identified the identified those passive components which were long-lived and not subject to periodic replacement and therefore subject to an AMR. The staff reviewed the screening of selected components to verify the correct implementation of the LRPGs and AM reports.

2.1.5.4.3 Conclusion

The staff reviewed the LRA, procedures, electrical drawings, and a sample of the results of the screening methodology. The staff determined that the applicant’s methodology was consistent with the description provided in LRA and the applicant’s implementing procedures. On the basis of a review of information contained in the LRA, the applicant’s screening implementation procedures, and a sampling review of electrical screening results, the staff concluded that the applicant’s methodology for identification of electrical commodity groups subject to an AMR is consistent with the requirements of 10 CFR 54.21(a)(1), and is therefore acceptable.

2.1.5.5 Conclusion for Screening Methodology

Based on its review of the LRA, the screening implementation procedures, discussions with the applicant’s staff, and a sample review of screening results, the staff determines that the applicant's screening methodology is consistent with the guidance of the SRP-LR and has identified passive, long-lived components within the scope of license renewal and subject to an AMR. The staff concludes that the applicant’s methodology is consistent with the requirements of 10 CFR 54.21(a)(1) and, therefore, acceptable.

2.1.6 Summary of Evaluation Findings

The information in LRA Section 2.1, the supporting information in the scoping and screening implementation procedures and reports, and the information presented during the scoping and screening methodology audit and the applicant’s responses to the staff’s RAIs dated August 10, 2006, formed the basis of the staff’s determination that the applicant’s scoping and screening methodology was consistent with the requirements of the Rule. Based on this determination, the staff concludes that the applicant’s methodology for identifying SSCs within the scope of license renewal and SCs requiring an AMR is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1), and, therefore, acceptable.

2.2 Plant-Level Scoping Results

2.2.1 Introduction

In LRA Section 2.1, the applicant described the methodology for identifying SSCs within the scope of License renewal. In LRA Section 2.2, the applicant used the scoping methodology to determine which SSCs must be included within the scope of License renewal. The staff reviewed the plant-level scoping results to determine whether the applicant has properly identified all systems and structures relied upon to mitigate DBEs, as required by

10 CFR 54.4(a)(1), systems and structures the failure of which could prevent satisfactory accomplishment of any safety-related functions, as required by 10 CFR 54.4(a)(2), and systems and structures relied on in safety analyses or plant evaluations to perform functions required by regulations referenced in 10 CFR 54.4(a)(3).

2.2.2 Summary of Technical Information in the Application

In LRA Tables 2.2-1a, 2.2-1b, and 2.2.3, the applicant listed plant mechanical systems, structures, and EIC systems, respectively, within the scope of license renewal. In LRA Tables 2.2-2 and 2.2-4, the applicant listed mechanical systems and structures that are not within the scope of license renewal. Based on the DBEs considered in the plant's CLB, other CLB information relating to nonsafety-related systems and structures, and certain regulated events, the applicant identified plant-level systems and structures within the scope of license renewal as specified by 10 CFR 54.4.

2.2.3 Staff Evaluation

In LRA Section 2.1, the applicant described its methodology for identifying systems and structures within the scope of license renewal and subject to an AMR. The staff reviewed the scoping and screening methodology and provides its evaluation in SER Section 2.1. To verify that the applicant properly implemented its methodology, the staff's review focused on the implementation results shown in LRA Tables 2.2-1a, 2.2-1b, 2.2-2, 2.2-3, and 2.2-4, to confirm that there were no omissions of plant-level systems and structures within the scope of license renewal.

The staff determined whether the applicant properly identified the systems and structures within the scope of license renewal in accordance with 10 CFR 54.4. The staff reviewed selected systems and structures that the applicant had not identified as falling within the scope of license renewal to verify whether the systems and structures have any intended functions requiring their inclusion within the scope of license renewal. The staff's review of the applicant's implementation was conducted in accordance with the guidance in SRP-LR Section 2.2, "Plant-Level Scoping Results."

In LRA Section 2.2, the staff identified areas in which additional information was necessary to complete the review of the applicant's plant-level scoping results. The applicant responded to the staff's RAIs as discussed below.

LRA Table 2.2-4, "Structures Not within the Scope of License Renewal," identifies the office building (administration and service buildings) as not within the scope of license renewal. The table identifies two UFSAR sections as references for office building. UFSAR Section 12.2.1.1.3 is an appropriate reference that identifies the administration building as a seismic Class II structure. However, the second UFSAR Section 12.2.3 is actually for the turbine building and not the administration or service building. In RAI 2.2-1 dated August 16, 2006, the staff requested that the applicant clarify and correct the reference to UFSAR Section 12.2.3 in LRA Table 2.2-4.

In its response dated September 20, 2006, the applicant stated that the office building is called by various names in VYNPS documents: the office building or area, the service building or area, and the administration building. It is sometimes considered part of the turbine building and in other contexts described as a separate building. In UFSAR Section 12.2.3, this area is listed as the "service area" that is part of the turbine building. Although the reference to UFSAR Section 12.2.3 is correct, this reference could have been omitted since UFSAR Section 12.2.3 only lists the service area and provides no description or further information about the service area. The applicant stated that the office building is not within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.2-1 acceptable because the applicant clarified the use of the term office building; therefore, the staff's concern described in RAI 2.2-1 is resolved.

The pressure regulator and TG control system is described in USFAR Section 7.11. The purpose of the TG control system is to control steam flow and pressure to the turbine and to protect the turbine from overpressure or excessive speed. The TG controls work in conjunction with the "nuclear steam system" controls to maintain essentially constant reactor pressure and limit reactor transients during load variations. The LRA does not address the nuclear steam system, nor does it appear to refer to UFSAR Section 7.11 in the text. In RAI 2.2-3 dated August 16, 2006, the staff requested that the applicant clarify whether the nuclear steam system controls are included within the scope of license renewal, or explain the basis for their exclusion.

In its response dated September 20, 2006, the applicant stated that the pressure regulator and TG control system as described in UFSAR Section 7.11 is an electrical and instrumentation and control (EIC) portion of the main TG system listed in LRA Table 2.2-2. The TG system provides automatic and manual controls to maintain essentially constant reactor pressure and limit reactor transients during load variations. Components in the system control steam flow and pressure to protect the turbine from overpressure or excessive speed. As discussed in the introduction to Table 2.2-1b, "EIC Systems within the Scope of License Renewal (Bounding Approach)," all EIC commodities contained in electrical and mechanical systems are in-scope by default. LRA Table 2.2-1b provides the list of electrical systems that do not include mechanical components that meet the scoping criteria of 10 CFR 54.4. Systems (such as the TG system) with mechanical components that meet the scoping criteria of 10 CFR 54.4 are listed in LRA Table 2.2-la. The pressure regulator and TG control system as described in UFSAR Section 7.1 1 are not considered separate systems and therefore are not listed in LRA Table 2.2-la. However, the components that perform this function are in-scope as EIC components. The applicant stated that the nuclear steam system controls are within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.2-3 acceptable because the applicant stated all EIC commodities contained in electrical and mechanical systems are in-scope by default; therefore, the staff's concern described in RAI 2.2-3 is resolved.

2.2.4 Conclusion

The staff reviewed LRA Section 2.2 and the RAI responses, and the UFSAR supporting information to determine whether the applicant failed to identify any systems and structures within the scope of license renewal. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified in accordance with 10 CFR 54.4 the systems and structures within the scope of license renewal.

2.3 Scoping and Screening Results: Mechanical Systems

This section documents the staff's review of the applicant's scoping and screening results for mechanical systems. Specifically, this section discusses:

- reactor coolant system
- engineered safety features
- auxiliary systems
- steam and power conversion systems

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant's IPA must list passive, long-lived SCs within the scope of license renewal and subject to an AMR. To verify that the applicant properly implemented its methodology, the staff's review focused on the implementation results. This focus allowed the staff to confirm that there were no omissions of mechanical system components that meet the scoping criteria and are subject to an AMR.

The staff's evaluation of the information in the LRA was the same for all mechanical systems. The objective was to determine whether the applicant has identified, in accordance with 10 CFR 54.4, components and supporting structures for specific mechanical systems that appear to meet the license renewal scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived components were subject to an AMR in accordance with 10 CFR 54.21(a)(1).

In its scoping evaluation, the staff reviewed the applicable LRA sections and component drawings, focusing on components that have not been identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the UFSAR, for each mechanical system to determine whether the applicant has omitted from the scope of license renewal components with intended functions as required by 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions as required by 10 CFR 54.4(a). The staff requested additional information to resolve any omissions or discrepancies identified.

After its review of the scoping results, the staff evaluated the applicant's screening results. For those SCs with intended functions, the staff sought to determine whether: (1) the functions are performed with moving parts or a change in configuration or properties or (2) the SCs are subject to replacement after a qualified life or specified time period, as required by 10 CFR 54.21(a)(1). For those meeting neither of these criteria, the staff sought to confirm that these SCs were subject to an AMR, as required by 10 CFR 54.21(a)(1). The staff requested additional information to resolve any omissions or discrepancies identified.

Two-Tier Scoping Review Process for Balance of Plant (BOP) Systems

There are 65 mechanical systems in the LRA, 32 are BOP systems, including most of the auxiliary systems and all the steam and power conversion systems. The staff performed a two-tier scoping review for these BOP systems.

In the two-tier scoping review, the staff reviewed the LRA and UFSAR descriptions focusing on the system intended function to screen all the BOP systems into two groups based on the following screening criteria:

- safety importance/risk significance
- potential for system failure to cause failure of redundant safety system trains
- operating experience indicating likely passive failures
- systems subject to omissions based on previous LRA reviews

Examples of the safety important/risk significant systems are the instrument air (IA) system, the diesel generator (DG) and support systems, and the SW system, based on the results of the individual plant examination (IPE) for VYNPS. An example of a system whose failure could result in common cause failure of redundant trains is a drain system providing flood protection. Examples of systems with operating experience indicating likely passive failures include MS system, feedwater system, and SW system. Examples of systems with identified omissions in previous LRA reviews include spent fuel cooling system and makeup water sources to safety systems.

From the 32 BOP systems, the staff selected 23 systems for a detailed “Tier-2" scoping review as described above. For the remaining 9 BOP systems, the staff performed a “Tier-1" scoping review of the LRA (which may have not included detailed boundary drawings) and UFSAR that would identify apparent missing components for an AMR. The following is a list of these 9 systems:

- service air (SA)
- SA and IA instruments
- condensate demineralizer
- RWCU filter demineralizer
- motor generator lube oil (MGLO)
- potable water
- equipment RIP
- stator cooling
- main steam, extraction steam and auxiliary steam instruments

The staff confirmed that there is no risk-significant system in the above list by examining the IPE results of VYNPS. None of the above nine systems are dominant contributors to core damage frequency, nor are these systems involved in the dominant initiating events.

Systems Identified for Inspection

The staff used an inspection to verify 10 CFR 54.4(a)(2) scoping results. The staff identified several systems for the regional inspection team to include in its scoping and screening inspection. These systems had been included as within the scope of license renewal by the applicant as a result of the 10 CFR 54.4(a)(2) review. The staff requested that the inspection include a sampling review of the engineering report (if available), plant layout drawings and other documentation, and walk-downs of the plant areas that contain these systems and associated components. The systems identified for inspection include:

- augmented off-gas system
- circulating water system
- reactor water clean-up system

2.3.1 Reactor Coolant System

LRA Section 2.3.1 states that the purposes of the reactor coolant system (RCS) are to house the reactor core and to contain and transport the fluids coming from or going to the reactor core. The RCS includes the reactor vessel and internals, the reactor recirculation system, CRD system, and Class 1 components that comprise the reactor coolant pressure boundary (RCPB), including MS and feedwater components. The applicant described the RCS as including the nuclear boiler (NB) system, the CRD system, and the hydraulic control unit (HCU) system associated with the CRDs.

The applicant described the supporting SCs of the RCS in the following LRA sections:

- 2.3.1.1 reactor vessel
- 2.3.1.2 reactor vessel internals
- 2.3.1.3 reactor coolant pressure boundary

The staff's findings on review of LRA Sections 2.3.1.1 - 2.3.1.3 are in SER Sections 2.3.1.1 - 2.3.1.3, respectively. The staff's review of the NB, CRD, and HCU systems proceeded as follows:

Summary of Technical Information in the Application. LRA Section 2.3.1 describes the RCS, including the NB, CRD, and HCU systems. Summaries of each system follow:

NB System. The NB system consists of Class 1 components, non-Class 1 components, and the following subsystems: reactor vessel and internals, reactor recirculation, MS, feedwater (Class 1), and nuclear boiler vessel instrumentation system (NBVIS). The reactor vessel is a welded vertical cylindrical pressure vessel with hemispherical heads. The cylindrical shell and hemispherical heads are fabricated of low-alloy steel plate. The vessel bottom head is welded directly to the vessel shell. The flanged upper head is secured to the vessel shell by studs and nuts. The reactor vessel includes nozzles, safe ends, CRD penetrations, instrument penetrations, and a support skirt. Additional details of the reactor vessel are described in LRA Section 2.3.1.1. The reactor vessel internals distribute the flow of coolant, locate and support the fuel assemblies, and provide an inner volume containing the core that can be flooded following a break in the nuclear system process barrier external to the reactor pressure vessel. Additional details of the reactor vessel internals are described in LRA Section 2.3.1.2.

Reactor recirculation provides a variable moderator (coolant) flow to the reactor core for adjusting reactor power level. Adjustment of the core coolant flow rate changes reactor power output, thus following plant load demand without adjusting control rods. The recirculation system is designed with sufficient fluid and pump inertia that fuel thermal limits cannot be exceeded as a result of recirculation system malfunctions. The reactor core is cooled by demineralized water which enters the lower portion of the core and boils as it flows upward around the fuel rods. The steam leaving the core is dried by steam separators and dryers in the upper portion of the reactor vessel, then directed to the turbine through four MS lines. The steam supply for high-pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) turbine operation is provided by connections to the MS piping. Class 1 feedwater lines provide water to the reactor vessel, entering near the top of the vessel downcomer annulus. Two feedwater lines divide and enter the vessel through four nozzles. Feedwater lines are also for injection of HPCI and RCIC. The NBVIS monitors reactor vessel parameters. The NBVIS is designed (1) to initiate and provide trip signals to interfacing plant safety systems, (2) to provide signals to interfacing plant nonsafety systems, and (3) to provide plant process parameter information necessary for normal, transient, and abnormal (including post-accident) operations. The NBVIS instrument sensing lines, including restriction orifices and excess flow check valves, are parts of the RCPB.

The NB system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the NB system could prevent the satisfactory accomplishment of a safety-related function. In addition, the NB system performs functions that support fire protection safe shutdown capability analysis and SBO coping analysis.

LRA Table 2.3.3-13-25 identifies the following NB system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- flow element
- orifice
- piping
- tubing
- valve body

The NB system component intended function within the scope of license renewal is to provide a pressure boundary.

CRD System. The CRDs provide a means to control changes in core reactivity by incrementally positioning neutron-absorbing control rods within the reactor core in response to manual control signals. The CRD subsystem must shut down the reactor quickly (scram) by inserting control rods rapidly into the core in response to a manual or automatic signal.

The CRD system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the CRD system could prevent the satisfactory accomplishment of a safety-related function. In addition, the CRD system performs functions that support fire protection and ATWS.

LRA Table 2.3.3-13-5 identifies the following CRD system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- orifice
- piping
- pump casing
- strainer housing
- tank
- tubing
- valve body

The CRD component intended function within the scope of license renewal is to provide a pressure boundary.

HCU System. The HCU system controls the water flow to the CRDs both for normal operation and during a reactor scram. Each HCU furnishes pressurized water upon signal to a CRD. The drive then positions its control rod as required. Water discharged from the drives during a scram flows through the HCUs to the scram discharge volume. Water discharged from a drive during a normal control rod positioning operation flows through its HCU and the exhaust header to the RWCU system discharge line.

The HCU system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the HCU system could prevent the satisfactory accomplishment of a safety-related function. In addition, the HCU system performs functions that support fire protection safe shutdown capability analysis and SBO coping analysis.

LRA Table 2.3.3-13-19 identifies the following HCU system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- piping
- tubing
- valve body

The HCU system component intended function within the scope of license renewal is to provide a pressure boundary.

Staff Evaluation. The staff reviewed LRA Section 2.3.1, UFSAR Sections 3.4, 3.5, 4.1 through 4.6, and 7.18 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant had not omitted any components with intended functions from the scope of license renewal required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant had identified as within the scope of license renewal to verify that no passive and long-lived components subject to an AMR had been omitted as required by 10 CFR 54.21(a)(1).

Conclusion. The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the NB, CRD, and HCU systems components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.1.1 Reactor Vessel

2.3.1.1.1 Summary of Technical Information in the Application

LRA Section 2.3.1.1 describes the reactor vessel, which contains the nuclear fuel core, core support structures, control rods, and other parts directly associated with the core. The major components of the reactor vessel are the reactor pressure vessel shell, bottom head, upper closure head, flanges, studs, nuts, nozzles and safe ends. The component evaluation boundaries are the welds between the safe ends and attached piping and the interface flanges for bolted connections. Thermal sleeves welded to vessel nozzles or safe ends, CRD stub tubes, CDR housings, in-core housings, the vessel support skirt, and vessel interior and exterior welded attachments also were included.

LRA Table 2.3.1-1 identifies the following reactor vessel component types within the scope of license renewal and subject to an AMR:

- bolting
- heads and shell
- nozzles and penetrations
- safe ends, thermal sleeves, flanges, and caps
- vessel attachments and supports

The reactor vessel component intended functions within the scope of license renewal include the following:

- pressure boundary
- structural or functional support for safety-related equipment

2.3.1.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.1 and the UFSAR using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

In LRA Table 2.3.1-1, the reactor vessel leakage monitoring piping was not identified as a component within the scope of license renewal and requiring an AMR. In RAI 2.3.1.1-1 dated July 13, 2006, the staff requested that the applicant clarify whether the subject components were included within the scope of license renewal.

In its response dated August 15, 2006, the applicant stated that the subject components were included within the scope of license renewal in accordance with the category ‘piping and fittings less than 4 inches NPS,’ ‘orifices (instrumentation),’ and ‘valve bodies less than 4 inches NPS’ as part of RCPB components in Table 2.3.1-3. Based on its review, the staff finds the applicant’s response to RAI 2.3.1.1-1 acceptable because the reactor vessel leakage monitoring piping was proven to be in-scope. The staff’s concern described in RAI 2.3.1.1-1 is resolved.

In RAI 2.3.1.1-2 dated July 13, 2006, the staff requested that the applicant clarify if the scram discharge piping and volume are within the scope of license renewal because the subject components were not discussed in LRA Section 2.3.1.1.

In its response dated August 15, 2006, the applicant stated that the subject components were included within the scope of license renewal and subject to an AMR in accordance with the category ‘piping and fittings less than 4 inches NPS,’ ‘orifices (instrumentation),’ and ‘valve bodies less than 4 inches NPS’ as part of RCPB components in Table 2.3.1-3. Based on its review, the staff finds the applicant’s response to RAI 2.3.1.1-2 acceptable because the scram discharge piping and volume were proven to be in-scope. The staff’s concern described in RAI 2.3.1.1-2 is resolved.

In RAI 2.3.1.1-3 dated July 13, 2006, the staff requested that the applicant include the CRD housing supports within the scope of license renewal and requiring an AMR because the subject components were not discussed in LRA Section 2.3.1.1, “Reactor Vessel.”

In its response dated August 15, 2006, the applicant stated that the subject components were considered in the category of structural elements and included in the line item for components and piping supports ASME Class 1, 2, 3 in Table 2.4-6, “Bulk Commodities Components Subject to an AMR.” Based on its review, the staff finds the applicant’s response to RAI 2.3.1.1-3 acceptable because the CRD housing supports were proven to be in-scope. The staff’s concern described in RAI 2.3.1.1-3 is resolved.

2.3.1.1.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the reactor vessel components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.1.2 Reactor Vessel Internals

2.3.1.2.1 Summary of Technical Information in the Application

LRA Section 2.3.1.2 describes the reactor vessel internals, which are designed to distribute the reactor coolant flow delivered to the vessel, to locate and support the fuel assemblies, and to contain the core in an inner volume that can be flooded following a break in the nuclear system process barrier. The reactor vessel internals are the control rod guide tubes, core plate, CS lines in the vessel, differential pressure and SLC line, feedwater spargers, fuel support pieces, in-core guide tubes, in-core dry tubes, local power range monitors, jet pump assemblies and jet pump instrumentation, shroud (including shroud stabilizers), shroud head and steam separator assembly, shroud support, steam dryer, surveillance sample holders, top guide, and vessel head spray line.

LRA Table 2.3.1-2 identifies the following reactor vessel internals component types within the scope of license renewal and subject to an AMR:

- control rod guide tubes
- core plate assembly
- CS lines
- fuel support pieces
- in-core dry tubes
- in-core guide tubes
- jet pump assemblies
- jet pump casting
- shroud
- shroud repair hardware
- shroud support
- steam dryer
- top guide

The reactor vessel internals component intended functions within the scope of license renewal include the following:

- flow distribution or spray pattern
- boundary of a volume in which the core can be flooded and adequately cooled in the event of a breach in the nuclear system process barrier external to the reactor vessel

- pressure boundary
- structural or functional support for safety-related equipment
- structural integrity so loose parts are not introduced

2.3.1.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.2 and the UFSAR using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.1.2.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the reactor vessel internals components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.1.3 Reactor Coolant Pressure Boundary

2.3.1.3.1 Summary of Technical Information in the Application

LRA Section 2.3.1.3 describes the RCPB, which maintains a high-integrity pressure boundary and fission product barrier inside the primary containment and to the first isolation outside the primary containment. Class 1 piping attached to the vessel nozzles or safe ends, including the welded joints, Class 1 pumps, and Class 1 boundary isolation valves, are included in this review. Connected Class 2 piping not part of another AMR, including vents, drains, leakoff, sample lines, and instrumentation lines up to the transmitters, is included as far as necessary to complete the RCS pressure boundary.

LRA Table 2.3.1-3 identifies the following RCPB component types within the scope of license renewal and subject to an AMR:

- bolting (flanges, valves, etc.)
- condensing chambers
- detector (CRD)
- drive (CRD)
- driver mount (RR)
- filter housing (CRD)

- flow elements (RR), (SLC)
- orifices (instrumentation)
- piping and fittings < 4 inches NPS
- piping and fittings $\geq$ 4 inches NPS
- pump casing and cover (RR)
- pump cover thermal barrier (RR)
- restrictors (MS)
- rupture disc (CRD)
- tank (CRD accumulator)
- thermowell
- valve bodies < 4 inches NPS
- valve bodies $\geq$ 4 inches NPS

The RCPB component intended functions within the scope of license renewal include the following:

- flow control
- pressure boundary

2.3.1.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.3 and the UFSAR using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.1.3.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RCPB components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2 Engineered Safety Features

In LRA Section 2.3.2, the applicant identified the SCs of the engineered safety features that are subject to an AMR for license renewal.

The applicant described the supporting SCs of the engineered safety features in the following LRA sections:

- 2.3.2.1 residual heat removal
- 2.3.2.2 CS
- 2.3.2.3 automatic depressurization
- 2.3.2.4 high pressure coolant injection
- 2.3.2.5 reactor core isolation cooling
- 2.3.2.6 standby gas treatment
- 2.3.2.7 primary containment penetrations

The staff's review findings regarding LRA Sections 2.3.2.1 - 2.3.2.7 are presented in SER Sections 2.3.2.1 - 2.3.2.7, respectively.

2.3.2.1 Residual Heat Removal

2.3.2.1.1 Summary of Technical Information in the Application

LRA Section 2.3.2.1 describes the RHR system, which removes decay heat energy from the reactor in accordance with both operational and accident conditions. The RHR system consists of two closed loops, each with two pumps in parallel, one heat exchanger, and the necessary valves and instrumentation. The RHR heat exchanger in each loop is cooled by the residual heat removal service water (RHRSW) system. The RHR system has eight modes of operation: (1) the low-pressure coolant injection (LPCI) mode takes suction from the suppression pool and injects flow into the core region of the reactor vessel through one of the two reactor recirculation loops to restore and maintain the water level of the reactor vessel following a loss of coolant accident (LOCA), (2) the containment spray cooling mode takes suction from the suppression pool and injects flow into spray headers located in the drywell and suppression chamber to reduce containment pressure and temperature following a LOCA by cooling any non-condensables and condensing any steam present, (3) the suppression pool cooling mode takes water from the suppression pool, passes it through the RHR heat exchangers, and returns flow to the suppression pool to remove heat added to the suppression pool, (4) the shutdown cooling mode takes water from the reactor vessel via the reactor recirculation A loop suction piping, passes it through the RHR heat exchangers, and returns flow to the reactor through the recirculation lines to remove sensible and decay heat from the reactor during shutdown, (5) the alternate shutdown cooling mode provides a cooling path if the normal shutdown cooling path is inoperable and can be initiated from the control room. RHR pumps take water from the suppression pool, pass it through RHR heat exchangers and inject into the vessel via RHR injection valves. Relief valves on the steam lines are open to allow overflow to the suppression pool, (6) the augmented fuel pool cooling (FPC) mode takes water from the FPC system, passes it through RHR heat exchangers, and returns flow to the FPC system to assist in FPC during reactor shutdown periods and the alternate cooling mode of operation and is not a safety function of RHR, (7) the emergency reactor vessel fill mode, which is beyond the design basis mode of operation, provides a cross-tie between the RHRSW system and RHR piping loop A. The RHRSW pumps take suction from the SW system and inject flow into the reactor vessel through RHR piping to provide a source of water to keep the reactor core covered (and fill containment) in the event that core standby cooling system (CSCS) pumps are lost due to loss of containment pressure or adequate core cooling cannot be assured, and

(8) the alternate shutdown mode uses the RHR alternate shutdown panel to control the minimum valving required for vessel injection, torus cooling, and shutdown cooling modes to achieve and maintain cold shutdown conditions during a postulated control room or cable vault fire which eliminates normal means of system control.

The RHR system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RHR system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RHR system performs functions that support fire protection.

LRA Tables 2.3.2-1 and 2.3.3-13-33 identify the following RHR system component types within the scope of license renewal and subject to an AMR:

- bolting
- cyclone separator
- heat exchanger (bonnet)
- heat exchanger (shell)
- heat exchanger (tubes)
- nozzle
- orifice
- piping
- pump casing
- strainer
- tank
- thermowell
- tubing
- valve body

The RHR system component intended functions within the scope of license renewal include the following:

- flow control
- filtration
- heat transfer
- pressure boundary

2.3.2.1.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.2.1 and 2.3.3.13, and UFSAR Sections 4.8 and 6.4.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The LPCI coupling was identified in the Boiling Water Reactor Vessel and Internals Project (BWRVIP) -06 Report as a safety-related component. In RAI 2.3.2.1-1 dated July 13, 2006, the staff requested that the applicant identify LPCI couplings in the LRA as within the scope of license renewal and subject to an AMR if they are part of VYNPS.

In its response dated August 15, 2006, the applicant responded that VYNPS does not have LPCI couplings. Based on its review, the staff finds the applicant's response to RAI 2.3.2.1-1 acceptable because there are no LPCI couplings in-scope or subject to an AMR since there are no LPCI couplings at VYNPS. The staff's concern described in RAI 2.3.2.1-1 is resolved.

In RAI 2.3.2.1-2 dated July 13, 2006, the staff requested the applicant clarify whether vortex breakers are employed in the emergency core cooling system (ECCS) pump suction lines at VYNPS, and if so, identify and include these passive components in-scope requiring an AMR. In its response dated August 15, 2006, the applicant said that during the IPA for VYNPS, a review of site documentation for all in-scope mechanical systems, including licensing basis and DBDs, as well as the site component database and drawings was completed. The applicant determined that no vortex breakers were required to support system intended functions in the scope of license renewal per 54.4 (a)(1-3), and therefore, vortex breakers are not included in the LRA for VYNPS. Based on its review, the staff finds the applicant's response to RAI 2.3.2.1-2 acceptable because no vortex breakers support the intended function of the ECCS pump suction lines at VYNPS. The staff's concern described in RAI 2.3.2.1-2 is resolved.

2.3.2.1.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RHR system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.2 Core Spray

2.3.2.2.1 Summary of Technical Information in the Application

LRA Section 2.3.2.2 describes the CS system, which in conjunction with other CSCS, provides adequate core cooling for all design basis break sizes up to and including double-ended breaks of the reactor recirculation system piping. The CS system protects the core in large breaks in the nuclear system when the RCIC and HPCI systems are unable to maintain reactor vessel water level. CS system protection also extends to small breaks in which the RCIC and HPCI systems are unable to maintain reactor vessel water level and automatic depressurization lowers reactor vessel pressure so the LPCI and the CS systems can cool the core. The CS system has two independent loops, each with a centrifugal water pump driven by an electric motor, a spray sparger in the reactor vessel above the core, and piping and valves to convey water from the suppression pool (primary safety-related source) or condensate storage tank (backup source) to the sparger.

The CS system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the CS system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the CS system performs functions that support fire protection safe shutdown capability analysis and SBO coping analysis.

LRA Tables 2.3.2-2 and 2.3.3-13-6 identify the following CS system component types within the scope of license renewal and subject to an AMR:

- bolting
- bearing housing
- cyclone separator
- flow nozzle
- orifice
- piping
- pump casing
- strainer
- tubing
- valve body

The CS system component intended functions within the scope of license renewal include the following:

- flow control
- filtration
- pressure boundary

2.3.2.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.2 and UFSAR Sections 6.3 and 6.4.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.2.2.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the CS system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.3 Automatic Depressurization

2.3.2.3.1 Summary of Technical Information in the Application

LRA Section 2.3.2.3 describes the automatic depressurization system (ADS), which actuates nuclear system pressure relief valves to depressurize the nuclear system automatically in a LOCA in which the HPCI system fails to deliver rated flow or break flow exceeds HPCI capacity (intermediate break). The depressurization of the nuclear system allows low-pressure standby cooling systems to supply enough cooling water to cool the fuel adequately. The ADS functions as one of the CSCSs. The ADS, in combination with the LPCI and CS systems, serves as a backup to the HPCI system.

The ADS has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related ADS SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the ADS performs functions that support fire protection safe shutdown capability analysis and SBO coping analysis.

LRA Table 2.3.2-3 identifies the following ADS component types within the scope of license renewal and subject to an AMR:

- bolting
- orifice
- piping
- tubing
- valve body

The ADS component intended functions within the scope of license renewal include the following:

- flow control
- pressure boundary

2.3.2.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.3 and UFSAR Sections 4.4 and 6.4.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.2.3.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the ADS components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.4 High Pressure Coolant Injection

2.3.2.4.1 Summary of Technical Information in the Application

LRA Section 2.3.2.4 describes the HPCI system, which cools the reactor core adequately in a small break in the nuclear system with subsequent coolant loss which does not cause rapid depressurization of the reactor vessel. It performs this function simultaneously with a loss of normal auxiliary power. The HPCI system permits shutdown of the reactor by maintaining sufficient reactor vessel water inventory until the reactor vessel is depressurized. HPCI continues until reactor vessel pressure is below that at which the LPCI or CS system can maintain core cooling.

The HPCI system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the HPCI system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the HPCI system performs functions that support fire protection and SBO coping analysis.

LRA Tables 2.3.2-4 and 2.3.3-13-20 identify the following HPCI system component types within the scope of license renewal and subject to an AMR:

- bearing housing
- bolting
- drain pot
- fan housing
- filter housing
- gear box
- governor housing
- heat exchanger (bonnet)
- heat exchanger (shell)
- heat exchanger (tubes)
- orifice
- piping
- pump casing
- sight glass
- steam trap
- strainer
- strainer housing
- tank

- thermowell
- tubing
- turbine casing
- valve body

The HPCI system component intended functions within the scope of license renewal include the following:

- flow control
- filtration
- heat transfer
- pressure boundary

2.3.2.4.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.2.4 and 2.3.3.13, and UFSAR Sections 6.3 and 6.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.2.4.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the HPCI system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.5 Reactor Core Isolation Cooling

2.3.2.5.1 Summary of Technical Information in the Application

LRA Section 2.3.2.5 describes the RCIC and the condensate storage and transfer (CST) systems. In the event of feedwater isolation with a simultaneous loss of normal auxiliary power, the RCIC system replaces the normal sources of makeup water to the reactor vessel to prevent uncovering of the core when it operates automatically without the use of any CSCSs. The RCIC system consists of a steam turbine-driven pump designed to supply water from either the condensate storage tank or the suppression pool to the reactor via the feedwater spargers. The purpose of the CST system is to provide a source of water to various plant systems, including the HPCI and RCIC systems (preferred source), CS system (as a backup source or for testing), the CRD system (backup source), and the spent fuel pool (fill and makeup source). The CST system connects to the condensate system to make up or draw off condensate to or from the hotwell. The CST system consists of the condensate storage tank, two condensate transfer pumps, piping, and valves.

The RCIC and CST systems have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the systems perform functions that support fire protection safe shutdown capability analysis and SBO coping analysis.

LRA Tables 2.3.2-5, 2.3.3-13-7, and 2.3.3-13-31 identify the following RCIC and CST systems component types within the scope of license renewal and subject to an AMR:

- bolting
- condenser
- drain pot
- filter housing
- flow indicator
- heat exchanger (bonnet)
- heat exchanger (shell)
- heat exchanger (tubes)
- orifice
- piping
- pump casing
- rupture disk
- sight glass
- steam heater
- steam trap
- strainer
- strainer housing
- tank
- thermowell
- tubing
- turbine casing
- valve body

The component intended functions within the scope of license renewal include the following:

- flow control
- filtration
- heat transfer
- pressure boundary

2.3.2.5.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.2.5 and 2.3.3.13, and UFSAR Sections 4.7 and 11.8.3.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.2.5.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RCIC and CST systems components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.6 Standby Gas Treatment

2.3.2.6.1 Summary of Technical Information in the Application

LRA Section 2.3.2.6 describes the standby gas treatment (SBGT) system, which processes gaseous effluent from the primary and secondary containments when required to limit the discharge of radioactive materials to the environs and to limit ex-filtration from the secondary containment during primary containment isolation. This processing is accomplished by two trains, each capable of maintaining a negative pressure in the secondary containment and processing one net secondary containment volume of air per day through high-efficiency filters. The system functions as part of the secondary containment system. The SBGT system consists of two complete, independent trains, each a backup for the other and sized to handle the full system requirement. Each train has a demister, electric heaters, two high-efficiency particulate filters, a carbon absorber, a fan, and miscellaneous valves.

The SBGT system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the SBGT system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Tables 2.3.2-6 and 2.3.3-13-38 identify the following SBGT system component types within the scope of license renewal and subject to an AMR:

- bolting
- duct
- fan housing
- filter

- filter housing
- filter unit housing
- orifice
- piping
- sight glass
- thermowell
- tubing
- valve body

The SBGT system component intended functions within the scope of license renewal include the following:

- filtration
- pressure boundary

2.3.2.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.6 and UFSAR Sections 1.6.2.15 and 5.3.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.2.6.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the SBGT system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.7 Primary Containment Penetrations

2.3.2.7.1 Summary of Technical Information in the Application

LRA Section 2.3.2.7 describes the primary containment penetrations, which can rapidly isolate all pipes or ducts penetrating the primary containment with a containment barrier as effective as required to maintain leakage within permissible limits.

The primary containment penetrations have safety-related components relied upon to remain functional during and following DBEs.

LRA Table 2.3.2-7 identifies the following primary containment penetrations component types within the scope of license renewal and subject to an AMR:

- bolting
- piping
- valve body

The intended function of the primary containment penetrations is to provide a pressure boundary.

2.3.2.7.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.7 and UFSAR Sections 5.2.2, 5.2.3.4, and 5.2.3.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.2.7.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the primary containment penetrations components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3 Auxiliary Systems

In LRA Section 2.3.3, the applicant identified the SCs of the auxiliary systems subject to an AMR for license renewal.

The applicant described the supporting SCs of the auxiliary systems in the following LRA sections:

- 2.3.3.1 standby liquid control
- 2.3.3.2 service water
- 2.3.3.3 reactor building closed cooling water
- 2.3.3.4 emergency diesel generator
- 2.3.3.5 fuel pool cooling
- 2.3.3.6 fuel oil

- 2.3.3.7 instrument air
- 2.3.3.8 fire protection-water
- 2.3.3.9 fire protection-carbon dioxide
- 2.3.3.10 heating, ventilation and air conditioning
- 2.3.3.11 primary containment atmosphere control/containment atmosphere dilution
- 2.3.3.12 John Deere diesel
- 2.3.3.13 miscellaneous systems in-scope for 10 CFR 54.4(a)(2)

The staff's review findings regarding LRA Sections 2.3.3.1 - 2.3.3.13 are presented in SER Sections 2.3.3.1 - 2.3.3.13, respectively.

2.3.3.1 Standby Liquid Control

2.3.3.1.1 Summary of Technical Information in the Application

LRA Section 2.3.3.1 describes the SLC system, which, independent of the control rods, shuts down the reactor from full power and maintains the reactor subcritical during cooldown. Maintaining subcriticality as the nuclear system cools assures that the fuel barrier is not threatened by overheating if not enough control rods can be inserted to counteract the positive reactivity effects of a colder moderator. The system, located in the reactor building, consists of a boron solution tank, a test water tank, two positive-displacement pumps, two explosive valves, an ion exchanger, a flush pump, piping, and valves. The liquid is pumped into the reactor vessel and discharged near the bottom of the core shroud to mix with the cooling water rising through the core.
The SLC system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the SLC system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the SLC system performs functions that support ATWS.

LRA Tables 2.3.3-1 and 2.3.3-13-40 identify the following SLC system component types within the scope of license renewal and subject to an AMR:

- bolting
- gauge
- heater
- orifice
- piping
- pump casing
- sight glass
- strainer housing
- tank
- thermowell
- tubing
- valve body

The SLC system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.1.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.1 and 2.3.3.13, and UFSAR Section 3.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.1.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the SLC system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.2 Service Water

2.3.3.2.1 Summary of Technical Information in the Application

LRA Section 2.3.3.2 describes the SW system and the RHRSW system. The purpose of the SW system is to provide cooling water to various normal and emergency operating loads. The SW system consists of two parallel headers which supply cooling water to the following turbine and reactor auxiliary equipment: a reactor building closed cooling water (RBCCW) heat exchanger, RHR corner room ventilation coolers, a DG cooler, and an RHR heat exchanger (via the RHRSW pumps and piping). Each header is supplied by two pumps. The standby fuel pool cooling (SBFPC) system normally is supplied from the SW Train B header. The header and cross tie can be configured to be fed from the A header with B secured. Other turbine and reactor auxiliary equipment is supplied from a line tied into both headers. The purpose of the RHRSW system is to transfer heat from the RHR system during normal operation and accident conditions. The RHRSW system consists of four RHRSW pumps, two RHR heat exchangers and piping, valves, and instrumentation necessary to ensure system operation. The RHRSW pumps are supplied from the SW system. The cooling water then is pumped through the RHR heat exchangers and returned to the SW system.

The SW and RHRSW systems have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the systems perform functions that support fire protection.

LRA Tables 2.3.3-2, 2.3.3-13-34, and 2.3.3-13-42 identify the following SW and RHRSW system component types within the scope of license renewal and subject to an AMR:

- bolting
- coil
- expansion joint
- fan housing
- heat exchanger (bonnet)
- heat exchanger (tubes)
- heat exchanger (tubesheets)
- indicator
- orifice
- piping
- pump casing
- strainer
- strainer housing
- suction barrel
- thermowell
- tubing
- valve body

The component intended functions within the scope of license renewal include the following:

- flow control
- filtration
- heat transfer
- pressure boundary
- structural or functional support for safety-related equipment

2.3.3.2.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.2 and 2.3.3.13, and UFSAR Sections 10.6, 10.7, and 10.8 using the Tier-2 evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff’s review of LRA Section 2.3.3.2 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff’s RAIs as discussed below.

The staff noted that license renewal drawing LRA-G-191159-SH-01-0, at location H-12, depicts pipe Section 2"-SW- 566C within the scope of license renewal. Upstream from where 2"-SW-566C enters the reactor building from the outside, there is no drawing continuation to depict the license renewal boundary. In RAI 2.3.3.2a-1 dated August 16, 2006, the staff requested that the applicant provide information for the continuation of 2"-SW-566C to the license renewal boundary and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant stated that pipe section 2"-SW-566C contains vacuum breakers to prevent water-hammer in the nonsafety-related portion of the SW system. The portion of this piping outside of the reactor building wall ends at this point. There is no continuation of this portion of the piping.

Based on its review, the staff found the applicant response to RAI 2.3.3.2a-1 acceptable because the applicant confirmed this section of piping ends outside the reactor building wall and does not continue on another drawing. This is a section of piping open to atmosphere immediately outside of the reactor building to allow air flow to the vacuum breakers depicted on pipe Section 2"-SW-566C. Therefore, the staff concern described in RAI 2.3.3.2a-1 is resolved.

The staff noted that license renewal drawing LRA-G-191159-SH-01-0, at location H-11, drawing note 16 indicates Pipe Section 4"-SW-567 and its supports on the reactor building alternate cooling supply piping (where the vacuum breakers tie in) are seismic Class II for structural integrity. This pipe section from valve 23D through valves RBAC-1A, 1B, 1C and 1D is not shown within the scope of license renewal. Failure of this pipe could have an adverse effect on the intended pressure boundary function for the service water piping. In RAI 2.3.3.2a-2 dated August 16, 2006, the staff requested that the applicant provide additional information about why this section of pipe and components are not shown within the scope of license renewal and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant stated that this portion of piping is included for 10 CFR 54.4(a)(2) since it provides structural support for the safety-related portion of the system. As described in LRA Section 2.1.2.1.3, portions of systems included as required by 10 CFR 54.4(a)(2) are not shown on license renewal drawings. However, as discussed in LRA Table 2.3.3.1 3-8 for the SW system, the components outside the safety class pressure boundary, while relied upon to provide structural/seismic support for the pressure boundary are in-scope and subject to an AMR. This includes the portion of line 4"-SW-567 required to provide structural support for the vacuum breakers. In addition, this piping and associated valves are included as required by 10 CFR 54.4(a)(2) due to spatial interaction from spray or leakage since the line is in the reactor building.

Based on its review, the staff found the applicant response to RAI 2.3.3.2a-2 acceptable because the applicant acknowledged this section of piping 4" SW-567 from valve 23D to RBAC-1A, 1B, 1C, and 1D is within the scope of license renewal. As described in LRA Section 2.1.2.1.3, portions of systems included for 10 CFR 54.4(a)(2) are not shown on LRA drawings. Although the applicant did not identify this section of piping as being within the boundary of license renewal on the drawing, the applicant confirmed it is within the scope based on the potential for physical interaction with safety-related systems in accordance with 10 CFR 54.4(a)(2). Therefore, the staff concern described in RAI 2.3.3.2a-2 is resolved.

The staff noted license renewal drawing LRA-G-191159-SH-01-0, at location D-5, depicts the license renewal boundary on the downstream side of flow control valve (FCV)-104-17A. The pipe section from FCV-104-17A to the safety class boundary designation flag located at valve 171A and to the intake screens is not shown within the scope of license renewal. Similarly, the pipe section from FCV-104-17 B, C, D, and E to valves 17B, C, D and E and to the intake screens is also not shown within the scope of license renewal. Failure of these sections of pipe could have an adverse effect on the intended pressure boundary function for the service water piping. In RAI 2.3.3.2a-3 dated August 16, 2006, the staff requested that the applicant provide additional information about why these sections of pipe and components are not shown within the scope of license renewal and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant stated that the license drawings only show the portions of the system with intended functions that meet the requirements of 10 CFR 54.4(a)(1) or (a)(3). As described in LRA Section 2.1.2.1.3, portions of systems included as required by 10 CFR 54.4(a)(2) are not shown on license renewal drawings. Valves FCV-104-17A/B/C/D and E are normally closed valves that are only open when the traveling screens are being washed. Providing water to clean the screens is not a function that meets the requirements of 10 CFR 54.4(a)(1) or (a)(3). These valves fail to a closed position such that failure of the piping downstream of these valves would not affect the ability of the SW system to perform its functions as required by 10 CFR 54.4(a)(1) or (a)(3). However, as described in LRA Table 2.3.3.13-B, the portion of the SW system in the intake structure near the SW pumps and the components outside the safety class pressure boundary, while relied upon to provide structural/seismic support for the pressure boundary are in-scope and subject to an AMR as required by 10 CFR 54.4(a)(2). This includes the portion of lines downstream of FCV-104-17A/B/C/D and E that provide structural support.

Based on its review, the staff found the applicant response to RAI 2.3.3.2a-3 acceptable because the applicant acknowledged these sections of piping are within the scope of license renewal. As described in LRA Section 2.1.2.1.3, portions of systems included for 10 CFR 54.4(a)(2) are not shown on LRA drawings. Although the applicant did not identify these sections of piping as being within the boundary of license renewal on the drawing, the applicant confirmed they are within the scope based on the potential for physical interaction with safety-related systems in accordance with 10 CFR 54.4(a)(2). Therefore, the staff concern described in RAI 2.3.3.2a-3 is resolved.

The staff noted that license renewal drawing LRA-G-191159-SH-02-0, at location G-6, depicts a license renewal boundary flag at the tee of pipe sections 2"-SW-566D and 8"-SW-34. There are no highlighted pipes or components on 2"-SW-566D or 8"-SW-34. In RAI 2.3.3.2a-4 dated August 16, 2006, the staff requested that the applicant clarify which portions of pipe and components are and are not bounded by the aforementioned boundary flag and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant stated license renewal drawings only show the portions of the system with intended functions that meet the requirements of 10 CFR 54.4(a)(1) or (a)(3). As described in LRA Section 2.1.2.1.3, portions of systems included as required by 10 CFR 54.4(a)(2) are not shown on license renewal drawings. The piping and valves on line 2"-SW- 566D are safety-related, since they have a safety function to break vacuum and prevent water hammer in the SW system. As a result, a system intended function boundary flag is provided that points towards and includes all the components on line 2"-SW-566D. The reason these components are not highlighted as subject to an AMR is that they perform their system intended function though the active function of the valves opening and breaking vacuum. In accordance with 10 CFR 54.21 (a)(1)(i), components that perform their intended functions with moving parts or a change in configuration are not subject to an AMR. These components do not have a passive intended function of pressure boundary as required by 10 CFR 54.4(a)(1) or (a)(3), since this portion of the system is isolated when aligned to the ultimate heat sink. However, as described in LRA Table 2.3.3.13-6, the portion of the SW system inside the reactor building and the components outside the safety class pressure boundary, while relied upon to provide structural/seismic support for the pressure boundary are in-scope and subject to an AMR as required by 10 CFR 54.4(a)(2). This includes line 2-SW-566D and portions of lines connected to this line that provide structural support and have the potential to affect safety-related components due to spray or leakage.

Based on its review, the staff found the applicant response to acceptable because the applicant acknowledged that service water piping 2" SW-566D is within the scope of license renewal and subject to an AMR based on the potential for physical interaction with safety-related systems in accordance with 10 CFR 54.4(a)(2). As described in LRA Section 2.1.2.1.3, portions of systems included for 10 CFR 54.4(a)(2) are not shown on LRA drawings. Therefore, the staff concern described in RAI 2.3.3.2a-4 is resolved.

The staff's review of LRA Section 2.3.3.2 identified areas in which information provided in the LRA needed to be confirmed by the NRC Regional Inspection Team to complete the review of the applicant's scoping and screening results.

Inspection Item 2.3.3.2a-1

License renewal drawing LRA-G-191159-SH-01-0, at location H-11, depicts pipe section 2”-SW-566C as within the scope of license renewal. The license renewal boundary flag for 2”-SW-566C is located on an unisolable section of pipe. The actual location of the license renewal scope boundary for this pipe section is not clear. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components meet the requirements of 10 CFR 54.4(a)(2). **This is Confirmatory Item (CI) 2.3.3.2a-1.**

Inspection Item 2.3.3.2a-2

LRA Section 2.1.2.1.2 states in part that nonsafety-related piping systems connected to safety-related systems were included up to the structural boundary or to a point that includes an adequate portion of the nonsafety-related piping run to conservatively include the first seismic or equivalent anchor. In addition, if isometric drawings were not readily available to identify the structural boundary, connected lines were included to a point beyond the safety/nonsafety interface, like a base-mounted component, flexible connection, or the end of a piping run (*i.e*, a drain line).

The staff cannot determine whether all the nonsafety-related piping systems were included up to the structural boundary or to a point that includes an adequate portion of the nonsafety-related piping run to include the first seismic or equivalent anchor. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(2). **This is CI 2.3.3.2a-2.**

2.3.3.2.3 Conclusion

The staff reviewed the LRA, accompanying license renewal drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. Pending resolution of confirmatory items 2.3.3.2a-1 and 2.3.3.2a-2, the staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the SW and RHRSW system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.3 Reactor Building Closed Cooling Water

2.3.3.3.1 Summary of Technical Information in the Application

LRA Section 2.3.3.3 describes the RBCCW system, which supplies demineralized water to the reactor building auxiliary equipment systems from a closed cooling loop. The RBCCW system cools equipment which may contain radioactive fluids. The SW system provides the heat sink for the RBCCW system. The RBCCW cooling function is not a safety function. FPC is not a safety function of RBCCW since the safety-related SBFPC system uses SW as a heat sink. RBCCW supplies the heat sink for the nonsafety-related FPC system. RHR pump seal cooling is normally provided by RBCCW, not SW. This is not a safety function for RBCCW because RHR pump seal cooling is not required to support hot safe shutdown. However, if the SW pumps are inoperable and alternate cooling is in-service, the RHR pump seal coolers are manually aligned to the SW supplied by the ACS. In accordance with these conditions (loss of Vernon Pond, flooding of the SW intake structure, or fire in the SW intake structure which disables all four SW pumps), RHR pump seal cooling is a safety function of SW via ACS and the RBCCW system piping, which provides for seal cooling to be supplied by ACS and performs the safety function of maintaining SW system integrity.

The RBCCW system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RBCCW system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RBCCW system performs functions that support fire protection.

LRA Tables 2.3.3-3 and 2.3.3-13-30 identify the following RBCCW system component types within the scope of license renewal and subject to an AMR:

- bolting
- flow switch housing
- heat exchanger (housing)
- heat exchanger (shell)
- heat exchanger (tubes)
- piping

- pump casing
- sight glass
- strainer housing
- tank
- thermowell
- tubing
- valve body

The RBCCW system component intended functions within the scope of license renewal include the following:

- pressure boundary
- structural or functional support for safety-related equipment

2.3.3.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.3 and UFSAR Section 10.9 using the Tier-2 evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.3 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

The staff noted that license renewal drawing LRA-G-191159-SH-03-0, at location P-10 at valve 29 shows a section of pipe within the scope of license renewal. This section of pipe is the RBCCW return to the ACS. However, a drawing continuation is not provided. In RAI 2.3.3.3-1 dated August 16, 2006, the staff requested that the applicant provide information for the continuation of this piping section to the license renewal boundary and justify the boundary location with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant stated that the RBCCW return to the 2 shown on license renewal drawing LRA-G-191159-SH-03-0, at location P-10 at valve 29 continues on license renewal drawing LRA-G-191159-SH-02-0, at location E-2.

Based on its review, the staff found the applicant response to RAI 2.3.3.3-1 acceptable because the applicant provided the necessary drawings and documentation to demonstrate this section of reactor building closed cooling water piping was connected to the service water system, was identified as being within the scope of license renewal, and with boundaries correctly identified on the service water system flow diagram, LRA-G-191159-SH–2-0. Therefore, the staff concern described in RAI 2.3.3.3-1 is resolved.

2.3.3.3.3 Conclusion

The staff reviewed the LRA, accompanying license renewal drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RBCCW system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.4 Emergency Diesel Generator

2.3.3.4.1 Summary of Technical Information in the Application

LRA Section 2.3.3.4 describes the EDG and the diesel lube oil (DLO) systems. The purpose of the DG system is to provide Class 1E electrical power to the emergency buses in a loss of normal power condition or a LOCA coincident with loss of normal power or degraded grid voltage at the emergency buses and is available to provide Class 1E electrical power to the emergency buses in a LOCA with normal power available. The DG and auxiliary systems will start and be in standby during a LOCA. The purpose of the DLO system is to provide for DLO storage and provide for prelube of the DGs. The DLO system consists of two lube oil day tanks and pre-lube oil pumps only. The DLO system in the component database has only these four components. The remaining components supplying lube oil required during EDG operation are in the DG system.

The DG and DLO systems have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the systems perform functions that support fire protection.

LRA Tables 2.3.3-4, 2.3.3-13-10, and 2.3.3-13-11 identify the following EDG system, DG and auxiliaries system, and DLO system component types within the scope of license renewal and subject to an AMR:

- bolting
- compressor housing
- expansion joint
- filter housing
- heat exchanger (bonnet)
- heat exchanger (fins)
- heat exchanger (shell)
- heat exchanger (tubes)
- heat exchanger (tubesheets)
- heater housing
- orifice
- piping
- pump casing
- sight glass
- silencer

- strainer
- strainer housing
- tank
- thermowell
- tubing
- turbocharger
- valve body

The component intended functions within the scope of license renewal include the following:

- flow control
- filtration
- heat transfer
- pressure boundary

2.3.3.4.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.4 and 2.3.3.13, and UFSAR Section 8.5 using the Tier-2 evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.4.3 Conclusion

The staff reviewed the LRA, accompanying license renewal drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the EDG system, DG and auxiliaries system, and DLO system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.5 Fuel Pool Cooling

2.3.3.5.1 Summary of Technical Information in the Application

LRA Section 2.3.3.5 describes the FPC system, the safety-related SBFPC subsystem, the fuel pool filter-demineralizer (FPFD) system, and the Boral in the spent fuel racks. The FPC system removes the decay heat released from the spent fuel elements. During normal operation, the system maintains a specified fuel pool water temperature, purity, water clarity, and water level. The system cools the fuel storage pool by transferring the spent fuel decay heat through heat exchangers to the RBCCW. The purpose of the SBFPC system is to maintain pool temperature during design basis accidents (including concurrent LOCAs, loss of offsite power, and single failure) or if an unusually high spent fuel decay heat load is placed in the pool. The purpose of the FPFD is to maintain the purity of the spent fuel pool water by minimizing corrosion product buildup and controlling water clarity, minimizing fission product contamination in the water, and controlling removal of water from the fuel pool to the CST system. Boral sheets in the spent fuel storage pool provide neutron absorption.

The FPC and SBFPC systems have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related FPC, SBFPC, and FPFD systems SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the FPC and SBFPC systems perform functions that support fire protection.

LRA Tables 2.3.3-5, 2.3.3-13-16, 2.3.3-13-17, and 2.3.3-13-37 identify the following FPC, FPFD, and SBFPC system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- heat exchanger (shell)
- heat exchanger (tubes)
- neutron absorber (boral)
- orifice
- piping
- pump casing
- thermowell
- tubing
- valve body

The component intended functions within the scope of license renewal include the following:

- heat transfer
- neutron absorption
- pressure boundary

2.3.3.5.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.5 and 2.3.3.13, and UFSAR Sections 10.3 and 10.5 using the Tier-2 evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.5 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

The staff noted that license renewal drawing G-191173, Sheet 1, at location H-5 shows a section of pipe within the scope of license renewal. The section of pipe includes check valve V-30 and a "penetration at concrete wall," with changes in seismic classifications at each end. The section of pipe is isolated from all other in-scope piping and is not in an in-scope flow path. Piping upstream of V-30 (8"-FPC-24, 6"-FPC-24, and 8"-FPC-34) contains two normally closed valves (V-28 and V-53) and is not shown within the scope of license renewal. Piping downstream of V-30 (4"-FPC-24 and 4"-FPC-25) is also not shown within the scope of license renewal. Failure of these sections of piping could have an adverse effect on the intended pressure boundary function for the FPC piping. In RAI 2.3.3.5a-1 dated August 16, 2006, the staff requested that the applicant provide information to justify exclusion from the scope of license renewal the piping from valves V-28 and V-53 to valve V-30 and from the reactor well diffusers to the current license renewal boundary at the penetration upstream of valve V-30.

In its response dated September 20, 2006, the applicant stated that license renewal drawings only show the portions of the system with intended functions that meet the requirements of 10 CFR 54.4(a)(1) or (a)(3). As described in LRA Section 2.1.2.1.3, portions of systems required by 10 CFR 54.4(a)(2) are not shown on license renewal drawings. The piping from valves V-28 and V-53 to valve V-30 and from the reactor well diffusers to the license renewal boundary at the penetration upstream of valve V-30 are within the scope of license renewal and subject to an AMR as required by 10 CFR 54.4(a)(2) and as described in LRA Table 2.3.3.13-B for the FPC system. The description includes portions of the system in the primary containment building and reactor building and components outside the safety class pressure boundary which are relied upon to provide structural/seismic support for the pressure boundary. The piping in question is inside the reactor building and attached to safety-related components so it is within the scope of license renewal and subject to an AMR.

Based on its review, the staff found the applicant response to RAI 2.3.3.5a-1 acceptable because the applicant acknowledged that piping from valves V-28 and V-53 to valve V-30 and from the reactor well diffusers to the license renewal boundary at the penetration upstream of valve V-30 are included within the scope of license renewal. As described in LRA Section 2.1.2.1.3, portions of systems included for 10 CFR 54.4(a)(2) are not shown on LRA drawings. Although the applicant did not identify these sections of piping within the boundary of license renewal on the drawing, the applicant confirmed they are within the scope of license renewal based on the potential for physical interaction with safety-related systems in accordance with 10 CFR 54.4(a)(2). Therefore, the staff concern described in RAI 2.3.3.5a-1 is resolved.

2.3.3.5.3 Conclusion

The staff reviewed the LRA, accompanying license renewal drawings, and RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the FPC, FPFD, and SBFPC system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.6 Fuel Oil

2.3.3.6.1 Summary of Technical Information in the Application

LRA Section 2.3.3.6 describes the fuel oil (FO) system, which supplies FO to the EDGs as well as the nonsafety-related diesel-driven fire pump, John Deere diesel (JDD), and house HB. The portion of the system related to the EDGs consists of a day tank and fuel transfer pump for each diesel, the FO storage tank, valves, and piping. The diesel fire pump FO day tank, JDD day tank, and house HB FO storage tank are not connected to the FO storage tank. Normal makeup to the house HB FO storage tank is by tanker truck. Normal makeup to the diesel fire pump FO day tank and JDD day tank is from a 500-gallon portable tank filled from the FO storage tank.

The FO system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the FO system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the FO system performs functions that support fire protection.

LRA Tables 2.3.3-6 and 2.3.3-13-14 identify the following FO system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- flame arrestor
- flex hose
- injector housing
- piping
- pump casing
- sight glass
- strainer housing
- tank
- thermowell
- tubing
- valve body

The FO system component intended functions within the scope of license renewal include the following:

- flow control
- pressure boundary

2.3.3.6.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.6 and 2.3.3.13, and UFSAR Section 8.5.4 using the Tier-2 evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.6 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

The staff noted that license renewal drawing LRA-G-191162, Sheet 2, provides information about the EDGs, diesel-driven fire pump, and house HB systems, supported by the FO system. However, the drawing does not provide sufficient information about the JDD system, also supported by the FO system. For example, more information is required regarding the transfer system between the 75,000-gallon FO storage tank, the day tanks for the two JDDs, and single fire pump diesel, which is necessary to provide an intended function in accordance with 10 CFR 54.4 (a)(3) in support of the fire protection regulation requirements (10 CFR 50.48). The LRA text states only that a 500-gallon portable tank is used to transport FO to the diesel day tanks. Typical components subject to an AMR for diesels like the day tank, strainer, etc., for the JDDs are not covered. In RAI 2.3.3.6-1 dated August 16, 2006, the staff requested that the applicant provide FO system drawings and describe the JDD system. The staff also requested that the applicant explain the relationship between the JDD and the FO systems and clarify what the AMR tables should include in both Sections 2.3.3.6 and 2.3.3.12. The staff further requested that the applicant also provide information for the license renewal boundary that justifies its location with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant stated that the 350-gallon diesel fire pump FO day tank and 550-gallon fiberglass underground storage tank for the JDD are filled with FO from the FO storage tank. The FO is pumped from the FO storage tank drain line into a portable 500-gallon tank. The portable tank is then moved to the intake structure or JDD building by a fork lift. A 12VDC pump on the portable tank then pumps the FO into the diesel fire pump FO day tank or the fiberglass underground storage tank for the JDD. Since the portable tank and pump are not part of the FO system pressure boundary and since levels in the diesel fire pump FO day tank and underground storage tank for the JDD are maintained, the portable tank and pump do not perform a component intended function and are not subject to an AMR. A dedicated 550-gallon fiberglass underground storage tank provides fuel to the JDD engine. As the JDD is required for compliance with the staff's regulations concerning fire protection (10 CFR 50.48), providing FO for the engine is an intended function of the FO system in accordance with 10 CFR 54.4 (a)(3). Therefore, the storage tank and associated piping and components that supply FO to the diesel engine injectors are within the scope of license renewal and subject to an AMR. JDD FO components are included in LRA Tables 2.3.3.6 and 3.3.2-6. As the JDD is required for compliance with the staff's regulations concerning fire protection (10 CFR 50.48), it is within the scope of license renewal and subject to an AMR in accordance with 10 CFR 54.4 (a)(3). The passive mechanical components of the diesel subject to an AMR that were confirmed by walkdown are included in LRA Tables 2.3.3-12 and 3.3.2-12.

Based on its review, the staff found the applicant response to RAI 2.3.3.6-1 acceptable because the applicant explained that the 550-gal fiberglass underground storage tank and associated piping and components that supply FO to the diesel engine injectors are within the scope of license renewal and an AMR. The applicant stated that flow diagrams are not available for this skid-mounted diesel, or its FO system, and only a few components are represented in the equipment database. The applicant, however, has verified by walkdown of the system that these passive components are identified in AMR tables 2.3.3-12 and 3.3.2-12. Therefore, the staff concern described in RAI 2.3.3.6-1 is resolved.

2.3.3.6.3 Conclusion

The staff reviewed the LRA, accompanying license renewal drawings, and RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the FO system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.7 Instrument Air

2.3.3.7.1 Summary of Technical Information in the Application

LRA Section 2.3.3.7 describes the IA, SA, 105 (IA and SA instruments), and nitrogen (N_2) supply systems. The purpose of the IA system is to provide the station continuously with dry, oil-free air for pneumatic instruments and controls through a dual header system. The IA system includes the containment N_2 supply described in the UFSAR as a separate N_2 subsystem also known as containment air. The purpose of containment N_2 is to provide pneumatically-operated components in the drywell with N_2 when the primary containment is inerted so any component leakage will not dilute the N_2 atmosphere. This N_2 source can be from either the N_2 system (normal supply) or the containment air compressor (automatic backup supply). When neither N_2 supply is available or when the containment is not inerted, IA may be lined up manually as a secondary backup for the containment N_2. When the containment is not inerted, IA will be lined up as the primary source of pneumatic pressure.

The purpose of the SA system is to provide the station with the compressed air requirements for pneumatic instruments and controls and general station services. The IA system also supports this function. The purpose of the 105 system is to provide indication, alarm, and control functions for associated systems. This code is used in the component database for various instrumentation components related to IA and SA. Although the 105 system consists mainly of EIC components, certain IA instrumentation mechanical components are included as well. The purpose of the N_2 system is to provide N_2 gas to the primary containment atmospheric control (PCAC) system to satisfy the primary containment purge and normal make-up requirements.

The IA, SA, 105, and N_2 systems have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the IA and N_2 system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the IA system performs functions that support fire protection and SBO.

LRA Tables 2.3.3-7, 2.3.3-13-22, and 2.3.3-13-24 identify the following IA and N_2 system component types within the scope of license renewal and subject to an AMR:

- bolting
- compressor housing
- piping
- strainer housing
- tank
- trap
- tubing
- valve body

The IA and N_2 system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.7.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.7 and 2.3.3.13, and UFSAR Section 10.14 using the Tier-2 evaluation methodology, for IA and N_2, and the Tier-1 methodology, for SA and 105 systems, described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.7.3 Conclusion

The staff reviewed the LRA and accompanying license renewal drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the IA and N_2 systems components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.8 Fire Protection-Water

2.3.3.8.1 Summary of Technical Information in the Application

LRA Section 2.3.3.8 describes the fire protection-water system. The fire protection system provides fire protection for the station through the use of water, CO_2, dry chemicals, foam, detection and alarm systems, and rated fire barriers, doors, and dampers. Water for the fire protection system is from two vertical turbine-type pumps, one electric motor-driven and one diesel-driven. The pumps and drivers located in the intake structure discharge to an underground piping system serving the exterior and interior fire protection systems. The pressure in the system is maintained at approximately 100 psig by an interconnection to the SW system. A check valve in the connecting pipe prevents backflow. Through an interconnecting valve, the SW system can provide water to fire protection components in the unlikely event that both fire protection pumps are unavailable.

The failure of nonsafety-related SSCs in the fire protection-water system potentially could prevent the satisfactory accomplishment of a safety-related function. The fire protection-water system also performs functions that support fire protection.

LRA Tables 2.3.3-8 and 2.3.3-13-15 identify the following fire protection-water system component types within the scope of license renewal and subject to an AMR:

- bolting
- expansion joint
- filter
- filter housing
- flow nozzle
- gear box
- heat exchanger (bonnet)
- heat exchanger (shell)
- heat exchanger (tubes)
- heater housing
- nozzle
- orifice
- piping
- pump casing
- silencer
- strainer
- strainer housing
- tank
- tubing
- turbocharger
- valve body

In LRA Table 3.3.2-8, the applicant provides the results of the AMR.

The fire protection-water system component intended functions within the scope of license renewal include the following:

- flow control
- filtration
- heat transfer
- pressure boundary

2.3.3.8.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.8 and 2.3.3.13, and UFSAR Section 10.11 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff also reviewed the VYNPS fire protection SER, dated January 13, 1978, and supplemental SERs listed in the VYNPS Operating License Condition g.3.F. These reports are referenced in the VYNPS fire protection CLB and summarize the fire protection program and commitments required by 10 CFR 50.48 using BTP Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," May 1, 1976, and Appendix A to BTP APCSB 9.5-1, August 23, 1976. The staff then reviewed those components that the applicant identified as being within the scope of license renewal to verify that the applicant did not omit any passive and long-lived components that should be subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.8 identified areas requiring additional information necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.8-1, dated August 15, 2006, the staff stated that LRA drawing LRA-G-191163-SH-02-0, "Fire Protection System Outer Loop," shows the yard fire hydrants as out of scope (i.e., not colored in purple). The staff requested that the applicant verify whether the yard fire hydrants are in-scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requested that the applicant provide justification for the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated:

> LRA drawing LRA-G-191163-SH-02-0, "Fire Protection System Outer Loop" shows that the yard fire hydrants are not subject to an AMR since they are not highlighted.
>
> As described in LRA Section 2.3.3.8:
>
> The fire protection–water system has no intended functions as required by 10 CFR 54.4(a)(1).
>
> The fire protection–water system intended functions as required by 10 CFR 54.4(a)(2) include the following:

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The fire protection–water system intended functions as required by 10 CFR 54.4(a)(3) include the following:

- Provide the capability to extinguish fires in vital areas of the plant (10 CFR 50.48).

Therefore, the fire protection system is in-scope for license renewal.

The piping in the outer loop performs a component pressure boundary intended function that supports the ability of the fire protection system to extinguish fires in vital areas of the plant serviced by the inner loop. If the outer loop failed, piping that provides water to fire systems in vital areas of the plant may not perform its intended function. The yard fire hydrants are isolable from the outer loop such that their failure would not impact the support of vital areas. Yard fire hydrants are not required to extinguish fires in vital areas of the plant and their failure cannot impact safety-related components. Therefore, the yard fire hydrants perform no intended function in support of the system intended functions and are not subject to an aging management review.

In evaluating this response, the staff found that it was incomplete and that review of LRA Section 2.3.3.8 could not be completed. Yard fire hydrants are included in-scope of license and excluded from an AMR. The staff finds this contrary to the original VYNPS fire protection safety evaluation (SE) and UFSAR as the CLB. In its response, the applicant stated that the yard fire hydrants perform no intended function in support of the system intended functions and are not subject to an AMR and therefore, not credited in accordance with 10 CFR 50.48. This resulted in the staff holding a telephone conference with the applicant on November 7, 2006, to discuss information necessary to resolve the concern in RAI 2.3.3.8-1. The staff explained that the scope of SSCs required for compliance with 10 CFR 50.48 and 10 CFR 50 Appendix A, GDC 3, goes beyond preserving the ability to maintain safe-shutdown in the event of a fire. The staff stated that the exclusion of fire protection SSCs, on the basis that the intended function is not required for the protection of safe-shutdown equipment or safety-related equipment is not acceptable, if the SSC is required from compliance with 10 CFR 50.48.

By letter dated December 4, 2006, the applicant stated that the yard fire hydrants are in-scope and subject to an AMR. The hydrants are identified as component type “valve body” in LRA Table 2.3.3-8. Results of the AMR are provided in LRA Table 3.3.2-8 for line items “valve body” with carbon steel as the material and raw water as the environment.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.8-1 acceptable because the applicant has committed to interpret yard fire hydrants as included in the “valve body,” which is in the scope for the license renewal and subject to an AMR. The staff is adequately assured that the yard fire hydrants used for the fire suppression will be considered appropriately during the aging management activities. Therefore, the staff’s concern described is RAI 2.3.3.8-1 is resolved.

In RAI 2.3.3.8-2, dated August 15, 2006, the staff stated that LRA drawing LRA-G-191163-SH-02-0, “Fire Protection System Outer Loop,” shows the recirculation pump motor generator set foam system colored in purple (i.e., in-scope). This drawing does not show the 150 gallon foam concentrate tank and its components (piping and valves). The staff requested that the applicant verify whether the 150 gallon foam concentrate tank and its components are in-scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requested applicant provide justification for the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated:

> LRA drawing LRA-G-191163-SH-01-0, “Fire Protection System Inner Loop” shows the recirculation pump motor generator set foam system colored in purple (i.e., subject to an AMR) at coordinates I/J-2. The associated 150 gallon foam concentrate tank (TK76-1B) and its components are in-scope and subject to an AMR as shown on the same drawing at coordinates B-8. LRA Table 3.3.2.8 includes line items for the tank and associated piping, valves, and flow nozzles with fire protection foam as the internal environment.

Based on its review, the staff found the applicant's response to RAI 2.3.3.8-2 acceptable because the recirculation pump motor generator set foam system and the 150 gallon foam concentrate tank and its components (piping and valves) were identified to be in the scope of license renewal and subject to an AMR. Therefore, the staff concludes that this recirculation pump motor generator set foam system and the associated components are correctly included in the scope of license renewal and subject to an AMR. The staff’s concern described in RAI 2.3.3.8-2 is resolved.

In RAI 2.3.3.8-3, dated August 15, 2006, the staff stated that NRC SE Section 3.2.2, dated January 13, 1978, approving the VYNPS fire protection program, discusses the use of flame retardant coating to protect electrical cables in trays and risers in the switchgear room to meet the requirements of 10 CFR 50.48. The LRA does not list flame retardant coating for cables. The staff requested that the applicant verify whether the flame retardant coating is in-scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If flame retardant coating is excluded from the scope of license renewal and not subject to an AMR, the staff requested applicant provide justification for the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated:

> Flame retardant (flamemastic) coatings are in-scope and subject to an AMR and are included in the line item “Fire wrap” in LRA Tables 2.4-6 and 3.5.2-6. Flamemastic was inadvertently omitted from the list of materials for the line item “Fire wrap” in LRA Table 3.5.2-6.

Based on its review, the staff found the applicant's response to RAI 2.3.3.8-3 acceptable because the applicant states that the fire retardant coating “Flamemastic” was inadvertently omitted from the list of materials for the line item “Fire wrap” in LRA Table 3.5.2-6. Because the applicant has committed to interpret fire retardant coating as included in the line item “Fire wrap," which is in the scope for license renewal and subject to an AMR, the staff is adequately assured that the fire retardant coating used to protect electrical cables in trays and risers will be considered appropriately during plant aging management activities. Therefore, the staff's concern described in RAI 2.3.3.8-3 is resolved.

In RAI 2.3.3.8-4, dated August 15, 2006, the staff stated that SE Section 4.3.1(f) discusses a manually-operated foam maker with a permanent storage tank with fire suppression functions in the event of a fire affecting the 75,000 gallon outdoor FO storage tank, the diesel generator day tanks, or the diesel generator room located on the ground floor of the turbine building. The LRA does not list this foam maker and its associated storage tank systems and components. The staff requested that the applicant verify whether the foam maker and storage tank system and components (piping and valves) are in-scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requested applicant provide justification for the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated:

> As discussed in LRA Section 2.3.3.8, in the turbine building, in addition to hose stations and deluge systems, a foam fire protection agent is available that can be used to combat fires at the FO storage tank, turbine lube oil storage tank, main and auxiliary transformers, house HBs, and the emergency diesel generators.

The turbine building foam tank (TK76-1A) and associated piping and valves are in-scope and subject to an AMR as shown on LRA drawing LRA-G-191163-SH-01-0, "Fire Protection System Inner Loop" at coordinates E-8. This manual foam system is used by attaching a fire hose to the outlet and opening valves to enable water from the fire protection header to mix with the foam concentrate from the storage tank and flow through the hose. LRA Table 3.3.2.8 includes line items for the tank and associated piping and valves with fire protection foam as the internal environment.

Fire hoses are periodically replaced and managed by the existing fire protection program, and therefore are not subject to an AMR.

Based on its review, the staff found the applicant's response to RAI 2.3.3.8-4 acceptable because the manually-operated foam maker with a permanent storage tank located on the ground floor of the turbine building was identified to be in the scope of license renewal and subject to an AMR. This foam system is to be used in the event of a 75,000 gallon outdoor FO storage tank fire, or diesel generator day tank fire, or diesel generator room fire.

Further, the applicant states that LRA Table 3.3.2.8 includes line items for the tank and associated piping and valves with fire protection foam as the internal environment. The applicant also states that the fire hoses associated with this foam system are outside the scope of license renewal since they are periodically replaced (short-lived components) and managed by the existing fire protection program. Therefore, the staff concludes that the turbine building foam systems and the associated components are correctly included in the scope of license renewal and subject to an AMR. The staff's concern described in RAI 2.3.3.8-4 is resolved.

In RAI 2.3.3.8-5, dated August 15, 2006, the staff stated that SE Section 4.5 discusses floor drains provided in all plant areas protected with fixed water fire suppression. Are they in the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requested applicant provide justification for the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated:

> Water-filled components in the radioactive waste system (which includes the floor drain system) that could affect safety-related equipment are in-scope and require an AMR in accordance with 10 CFR 54.4(a)(2) due to potential spatial interaction. These components are subject to an AMR and are addressed in LRA Table 3.3.2-13-32.

Based on its review, the staff found the applicant's response to RAI 2.3.3.8-5 acceptable. Although the SE addresses these floor drains as associated with fire suppression, it is not included in LRA Table 3.3.2-8 “Fire Protection–Water System.” Instead, it is included in LRA Table 3.3.2-13-32, “Radwaste Liquid & Solid (RDW) Nonsafety-Related Components Affecting Safety-Related Systems,” which is in the scope for license renewal and subject to an AMR. Because the applicant has committed to interpret these floor drains as included in the radioactive waste system, which is in the scope for license renewal and subject to an AMR, the staff is adequately assured that the floor drains used for fire suppression will be considered appropriately during plant aging management activities. Therefore, the staff’s concern described in RAI 2.3.3.8-5 is resolved.

In RAI 2.3.3.8-6, dated August 15, 2006, the staff stated that the supplement to SE Section 3.3, dated February 20, 1980, discusses the fire protection features for the primary containment (e.g., fixed suppression systems, standpipe and hose stations, and oil collection system). The staff requested that the applicant determine whether fire protection systems and features for primary containment should be included as systems and components in-scope for license renewal and subject to an AMR. If not, the staff requested applicant explain the basis.

In its response, by letter dated September 20, 2006, the applicant stated:

> Section 3.3 of the SE supplement dated February 20, 1980, discusses potential fire protection features for the primary containment in the event the containment is not inerted. As noted in LRA Section 3.3.2.2.7, VYNPS is a BWR with an inert containment atmosphere. Therefore, the primary containment does not have a fixed suppression system or a reactor recirculation pump oil collection system.

As shown on LRA drawing LRA-G-191163-SH-01-0, “Fire Protection System Inner Loop,” hose stations in the reactor building that may be used for fire suppression in primary containment during non-inerted outage periods are in-scope and subject to an AMR.

Based on its review, the staff found the applicant's response to RAI 2.3.3.8-6 acceptable because VYNPS is a BWR with an inert containment atmosphere and the primary containment does not have a fixed suppression system or a reactor recirculation pump oil collection system. Further, the applicant states that during non-inerted outage periods, hose stations in the reactor building, may be used for fire suppression in primary containment. Therefore, the staff concludes that the fire protection features for the primary containment (e.g., fixed suppression systems, standpipe and hose stations, and oil collection system) are correctly excluded from the scope of license renewal and are not subject to an AMR. During the refueling outage, hose stations in the reactor building may be used for fire suppression in the primary containment. This system was identified to be in the scope of license renewal and subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.8-6 is resolved.

In RAI 2.3.3.8-7, dated August 15, 2006, the staff stated that the supplement to SE Section 3.3, dated October 24, 1980, discusses the deluge system used to protect the turbine building lay-down area. The staff requested that the applicant determine whether the turbine building lay-down deluge system and its components should be included as systems and components in-scope for license renewal and subject to an AMR. If not, the staff requested applicant explain the basis.

In its response, by letter dated September 20, 2006, the applicant stated:

> The turbine building loading bay is the area referred to in the SE supplement as the turbine building lay-down area. The sprinkler system for this area is in-scope and subject to an AMR as shown on LRA drawing LRA-G-191163-SH-01-0, "Fire Protection System Inner Loop" at coordinate G-9.

Based on its review, the staff found the applicant's response to RAI 2.3.3.8-7 acceptable because the deluge system and its components were identified to be in the scope of license renewal and subject to an AMR. Therefore, the staff concludes that this turbine building lay-down area deluge system and its associated components are correctly included in the scope of license renewal and subject to an AMR. The staff's concern described in RAI 2.3.3.8-7 is resolved.

In RAI 2.3.3.8-8, dated August 15, 2006, the staff stated that SE Section 4.3.1(e) discusses the automatic sprinkler systems used for various areas including the outdoor transformer. The LRA does not list the sprinkler systems nor associated components to protect the outdoor transformer. The staff requested that the applicant verify whether the sprinkler system and associated components are in-scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requested applicant provide justification for the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated:

> As described in LRA Section 2.3.3.8, the fire protection system is in the scope of license renewal in accordance with 10 CFR 54.4(a)(3) because it is credited in the Appendix R safe-shutdown analysis as required by 10 CFR 50.48.
>
> The main transformer and auxiliary transformer sprinkler fire protection subsystems do not mitigate fires in areas containing equipment important to safe operation of the plant, nor are they credited with achieving safe-shutdown in the event of a fire. These subsystems are only required to meet state, municipal, or

> insurance requirements. Therefore, these subsystems have no intended function and are not included in the AMR summarized in LRA Table 3.3.2-8.
>
> Since they are outdoors and away from safety-related equipment, the main transformer and auxiliary transformer sprinkler subsystems cannot affect safety-related equipment by spatial interaction and therefore, have no intended function as required by 10 CFR 54.4(a)(2). Therefore, these subsystems are not included in the AMR summarized in LRA Table 3.3.2-13-15.

Based on its review, the staff found the applicant's response to RAI 2.3.3.8-8 acceptable. Although the main transformer and auxiliary transformer sprinkler systems are addressed in the SE, these systems in question are not credited to meet the requirements of Appendix R for achieving safe-shutdown in the event of a fire. In addition, the staff reviewed commitments made by the applicant to satisfy Appendix A to BTP APCSB 9.5-1, which discussed that the main transformer and auxiliary transformer are either located at least 50 feet from the building containing safety-related equipment or the wall of the building is a 3-hour fire-rated wall. Therefore, the staff finds that the main transformer and auxiliary transformer cannot affect safety-related equipment by spatial interaction and the sprinkler systems for the main transformer and auxiliary transformer were correctly excluded from the scope of license renewal and not subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.8-8 is resolved.

In RAI 2.3.3.8-9, dated August 15, 2006, the staff stated that SE Section 5.12.6 discusses the use of a 3-hour rated fire protection coating to protect the structural steel supporting the wall and ceiling of diesel generator rooms. The LRA does not list 3-hour rated fire protection coating for structural steel. The staff requested that the applicant verify whether the fire protection coating for structural steel is in-scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If fire protection coating is excluded from the scope of license renewal and not subject to an AMR, the staff requested applicant provide justification for the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated:

> Subsequent to the January 17, 1978, NRC Safety Evaluation, VYNPS notified the NRC (in letter WVY 78-85) that a protective coating with a "fire resistant rating of approximately 1-hour" would be utilized for the structural steel supporting the roof and ceiling. This is based on the conclusion that a fire in one diesel generator room will not result in structural damage that could result in fire spread to the other room. The fire retardant coatings are in-scope and subject to an AMR and are included in the line item "Fire proofing" in LRA Tables 2.4-6 and 3.5.2-6.

Based on its review, the staff found the applicant's response to RAI 2.3.3.8-9 acceptable. The SE addresses the use of a 3-hour rated fire retardant coating to protect the structural steel supporting the wall and ceiling of the diesel generator rooms. The staff has confirmed that the applicant correctly identified the actual fire resistance rating of the structural steel coating (i.e., 1 hour). The fire resistance rating of the structural steel coating was clarified and included in the LRA Tables 2.4-6 and 3.5.2-6 and the coating is within the scope of license renewal and subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.8-9 is resolved.

In RAI 2.3.3.8-10, dated August 15, 2006, the staff stated that LRA Table 2.3.3-8 excludes several types of fire protection components that appear in the SE and its supplements and/or updated UFSAR, and which also appear in the LRA drawings colored in purple. These components are listed below.

- hose stations
- hose connections
- hose racks
- pipe fittings
- pipe supports
- couplings
- threaded connections
- flexible hoses
- restricting orifices
- interface flanges
- chamber housings
- heat-actuated devices
- gauge snubbers
- tank heaters
- thermowells
- water motor alarms
- fire hydrants (casing)
- sprinkler heads
- dikes (contain oil spill)
- flame retardant coating for cables
- fire barrier penetration seals
- fire barrier walls, ceilings, floors, and slabs
- fire doors
- fire rated enclosures
- fire retardant coating for structural steel supporting walls and ceilings

For each, the staff requested applicant determine whether the component should be included in Table 2.3.3.8, and if not, justify the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated the following:

- hose stations – Since they support criterion (a)(3) equipment, hose stations are included in the structural AMR. They are included in the "Fire hose reels" line item in LRA Table 2.4-6.

- hose connections – Hose connections are included in the "Piping" line item in LRA Table 2.3.3-8.

- hose racks – Since they support criterion (a)(3) equipment, hose racks are included in the structural AMR. They are included in the “Fire hose reels” line item in LRA Table 2.4-6.

- pipe fittings – As stated in LRA Section 2.0, the term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. Pipe fittings are included in the “Piping” line item in LRA Table 2.3.3-8.

- pipe supports – Since they support criterion (a)(3) equipment, piping supports are included in the structural AMR. They are included in the “Component and piping supports” line item in LRA Table 2.4-6.

- couplings – As stated in LRA Section 2.0, the term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. Couplings are pipe fittings included in the “Piping” line item in LRA Table 2.3.3-8.

- threaded connections – As stated in LRA Section 2.0, the term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. Threaded connections are pipe fittings included in the “Piping” line item in LRA Table 2.3.3-8.

- flexible hoses – Hoses are replaced on a specified periodicity and therefore, are not subject to an AMR as required by 10 CFR 54.21(a)(1)(ii).

- restricting orifices – As stated in LRA Section 2.0, the term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. Restricting orifices are included in the “Piping” line item in LRA Table 2.3.3-8.

- interface flanges – As stated in LRA Section 2.0, the term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. Interface flanges are pipe fittings included in the “Piping” line item in LRA Table 2.3.3-8.

- chamber housings – As shown on LRA drawing LRA-G-191163-SH-01-0, the turbine building lube oil room sprinkler system includes a retard chamber, piping, and valves whose purpose is to prevent false alarms due to system pressure surges and to provide a flow path to the water gong alarm during system actuation. Since failure of these components downstream of valve DV-76-200D would not prevent fire suppression capability for the lube oil room sprinkler system, they are not subject to an AMR.

- heat-actuated devices – As stated in UFSAR Section 10.11.3, the pre-action fire protection subsystems for the hydrogen seal oil area and the turbine building condenser and heater bay area have heat-actuated devices to initiate opening of the deluge valves. Heat-actuated devices are active components; not subject to an AMR.

- gauge snubbers – Gauge snubbers are integral parts of tubing runs that protect instrumentation from pressure surges. Gauge snubbers in tubing runs to instruments are included in the “tubing” line item in LRA Table 2.3.3-8.

- tank heaters – Neither the SE and its supplements nor the UFSAR discuss tank heaters. Tank heaters do not appear on the LRA drawings colored in purple. VYNPS does not have fire water storage tanks and the foam concentrate tanks do not have heaters. Therefore, the fire protection - water system does not have tank heaters.

- thermowells – As stated in LRA Section 2.0, the term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. Thermowells are included in the “Piping” line item in LRA Table 2.3.3-8.

- water motor alarms – This response assumes that reviewer means water flow alarms which are provided in critical locations and annunciate in the control room to provide positive indication of fire water system operation. Water flow alarms are active components; not subject to an AMR.

- fire hydrants (casing) – As described in response to RAI 2.3.3.8-1, the yard fire hydrants are not subject to an AMR. By letter dated December 4, 2006, the applicant stated that the yard fire hydrants are in-scope and subject to an AMR. The hydrants are identified as component type “valve body” in LRA Table 2.3.3-8. Results of the AMR are provided in LRA Table 3.3.2-8 for line items “valve body” with carbon steel as the material and raw water as the environment.

- sprinkler heads – Sprinkler heads are included in the “Flow nozzle” line item in LRA Table 2.3.3-8.

- dikes (contain oil spill) – Dikes are included in the structural AMR. They are included in the “Flood curb” line items in LRA Table 2.4-6.

- flame retardant coating for cables – As described in response to RAI 2.3.3.8-3, flame retardant (flamemastic) coatings are subject to an AMR and are included in the line item “Fire wrap” in LRA Table 2.4-6. Flamemastic was inadvertently omitted from the list of materials for the line item “Fire wrap” in LRA Table 3.5.2-6.

- fire barrier penetration seals – Fire barrier penetration seals are included in the structural AMR. They are included in the “Penetration sealant (fire, flood, radiation)” line item in Table 2.4-6.

- fire barrier walls, ceilings, floor, and slabs – Fire barrier walls, ceilings, floor, and slabs are included in the structural AMR. They are included in the concrete line items in Tables 2.4-2 through 2.4-4.

- fire doors – Fire doors are included in the structural AMR. They are included in the “Fire doors” line item in Table 2.4-6.

- fire rated enclosures – As stated in SE Section 5.17.1, the diesel day tank for the fire pump is located in a separate 3-hour fire rated enclosure. This enclosure consists of concrete block walls in the intake structure and is included in the structural AMR. It is included in the “Masonry walls” line item in Table 2.4-3.

- fire retardant coating for structural steel supporting wall and ceiling – As described in response to RAI 2.3.3.8-9, fire retardant (flamemastic) coatings are subject to an AMR and are included in the line item “Fire wrap” in LRA Table 2.4-6. Flamemastic was inadvertently omitted from the list of materials for the line item “Fire wrap” in LRA Table 3.5.2-6.

Based on its review, the staff found the applicant's response to RAI 2.3.3.8-10 acceptable. Although the applicant states that they consider these components to be included in other line items, the descriptions of the line items in the LRA do not list all these components specifically. The applicant properly identified the following components to be included in the other line items in the scope of license renewal and subject to an AMR: hose racks, pipe fittings, pipe supports, couplings, threaded connections, restricting orifices, interface flanges, gauge snubbers, thermowells, sprinkler heads, dikes, flame retardant coating for cables, fire barrier penetration seals, fire barrier walls, ceilings, floors, slabs, fire doors, fire rated enclosures, and fire retardant coating for structural steel supporting walls and ceilings. The staff is adequately assured that these components will be considered appropriately during the plant aging management activities. For each of the following components, the staff found that they were not included in the line item descriptions in the LRA: flexible hoses, chamber housings, heat-actuated devices, tank heaters, and water motor alarms. The staff recognizes the applicant’s interpretation of these components as active (short-lived components) will result in more vigorous oversight of the condition and performance of the components. Because the applicant has interpreted that these components are active, the staff concludes that the components were correctly excluded from the scope of license renewal and are not subject to an AMR. Therefore, the staff’s concern described in RAI 2.3.3.8-10 is resolved.

In RAI 2.3.3.8-11, dated August 15, 2006, the staff stated that LRA Table 2.3.3-8 listed flow nozzles (flow control) as in-scope and subject to an AMR, but does not list spray nozzles (water). The staff requested applicant to explain why the water spray nozzles are not subject to an AMR.

In its response, by letter dated September 20, 2006, the applicant stated:
Water spray nozzles are in-scope and subject to an AMR. They are included in the line item "Flow nozzles" in LRA Table 2.3.3-8.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.8-11 acceptable because it adequately explains that the spray nozzles in question are within the scope of license renewal and subject to an AMR. Further, the applicant stated that the spray nozzles are represented in the LRA Table by the component type "Flow nozzles" in LRA Table 2.3.3-8." Therefore, the staff's concern described in RAI 2.3.3.8-11 is resolved.

2.3.3.8.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the fire protection-water system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.9 Fire Protection-Carbon Dioxide

2.3.3.9.1 Summary of Technical Information in the Application

LRA Section 2.3.3.9 describes the fire protection-CO_2 system. The purpose of the fire protection system is to provide fire protection for the station through the use of water, CO_2, dry chemicals, foam, detection and alarm systems, and rated fire barriers, doors, and dampers. The cable vault and switchgear rooms are protected by fully automatic total flooding CO_2 suppression systems initiated by ionization detectors. Bottles located in the west switchgear room also may provide a backup or second shot to the cable vault if desired. The diesel fire pump FO storage tank room is protected by a total flooding CO_2 suppression system initiated by heat detectors. The automatic total flooding high-pressure CO_2 gas suppression systems for the cable vault and diesel fire pump FO storage tank room store high-pressure CO_2 at ambient temperatures in steel CO_2 tanks. Empty fixed piping systems convey CO_2 from the tanks to open nozzles in the fire area. The cable vault CO_2 system (automatic total flooding system with CO_2 tanks in the cable vault) is cross-connected to the CO_2 tanks in the west switchgear room for back-up capability for cable vault fire protection. The east and west switchgear rooms are protected by automatic total flooding low-pressure CO_2 systems. Low-pressure CO_2 is stored at approximately 0 °F in an outside storage tank. Empty fixed piping systems convey CO_2 from the storage tank to open nozzles in the fire area.

The fire protection-CO_2 system performs functions that support fire protection.

LRA Table 2.3.3-9 identifies the following fire protection-CO_2 system component types within the scope of license renewal and subject to an AMR:

- bolting
- coil
- filter housing

- heater housing
- nozzle
- orifice
- piping
- pump casing
- siren body
- strainer
- tank
- tubing
- valve body

In LRA Table 3.3.2-9, the applicant provides the results of the AMR.

The fire protection-CO_2 system component intended functions within the scope of license renewal include the following:

- flow control
- filtration
- pressure boundary

2.3.3.9.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.9 and UFSAR Section 10.11 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff also reviewed the approved fire protection SER, dated January 13, 1978, approving the VYNPS fire protection program and supplemental SERs listed in the VYNPS Operating License Condition g.3.F. This report is referenced directly in the VYNPS fire protection CLB and summarizes the fire protection program and commitments to requirements of 10 CFR 50.48 using BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," May 1, 1976, and Appendix A to BTP APCSB 9.5-1, August 23, 1976. The staff then reviewed those components that the applicant identified as being within the scope of license renewal to verify that the applicant did not omit any passive and long-lived components that should be subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.9 identified areas requiring additional information necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.9-1, dated August 15, 2006, the staff stated that SE Sections 3.1.5 and 4.3.2 discuss a total flooding CO_2 system for the cable spreading area, battery room, and diesel driven fire water pump tank room. The LRA does not list the CO_2 system for the cable spreading area, battery room, and diesel driven fire water pump tank room. The staff requested that the applicant verify whether the CO_2 system and its components are in-scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject an AMR, the staff requested applicant to provide justification for the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated:

> As described in LRA Section 2.3.3.9, the cable vault and switchgear rooms are protected by fully automatic total flooding CO_2 suppression systems initiated by ionization detectors. Bottles located in the west switchgear room may also provide a backup or second shot to the cable vault if desired. The diesel fire pump FO storage tank room is protected by a total flooding CO_2 suppression system initiated by heat detectors.
>
> As further described in LRA Section 2.3.3.9, the fire protection–CO_2 system is within the scope of license renewal and has the following intended function as required by 10 CFR 54.4(a)(3).
>
> - Provide the capability to extinguish fires in vital areas of the plant (10 CFR 50.48).
>
> The cable vault is the area referred to in the SE as the cable spreading area and battery room. Therefore, the CO_2 systems for the cable spreading area, battery room, and diesel driven fire water pump tank room are in-scope and subject to an AMR.

Based on its review, the staff found the applicant's response to RAI 2.3.3.9-1 acceptable because the total flooding CO_2 systems for the cable spreading area, battery room, and diesel driven fire water pump tank room were identified to be in the scope of license renewal and subject to an AMR. Further, the applicant clarified that the cable vault is the area referred to in the SE as the cable spreading area and battery room. Therefore, the staff concludes that the total flooding CO_2 systems for the cable spreading area, battery room, and diesel driven fire water pump tank room and the associated components are correctly included in the scope of license renewal and subject to an AMR. The staff’s concern described in RAI 2.3.3.9-1 is resolved.

In RAI 2.3.3.9-2, dated August 15, 2006, the staff stated that LRA Table 2.3.3-9 excludes several types of CO_2 fire suppression system components that appear in the SE and its supplements and/or UFSAR, and which also appear in the LRA drawings colored in purple. These components are listed below.

- strainer housings
- pipe fittings
- pipe supports
- couplings
- odorizer
- threaded connections

- flexible hose
- latch door pull box
- pneumatic actuators
- CO_2 bottles (CO_2 storage cylinders)

For each, determine whether the component should be included in Table 2.3.3.9, and if not, the staff requested applicant justify the exclusion.

In its response, by letter dated September 20, 2006, the applicant stated:

- strainer housings – The CO_2 fire protection storage tank (TK-115-1) recirculation heater pump suction strainer (S-76-3) shown on LRA drawing LRA-G-191163-SH-03-0 has both filtration and pressure boundary functions. The strainer and its housing are both included in the “Strainer” line item in LRA Table 2.3.3-9.

- pipe fittings – As stated in LRA Section 2.0, the term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. Pipe fittings are included in the “Piping” line item in LRA Table 2.3.3-9.

- pipe supports – Since they support criterion (a)(3) equipment, piping supports are included in the structural AMR. They are included in the “Component and piping supports” line item in LRA Table 2.4-6.

- couplings – As stated in LRA Section 2.0, the term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. Couplings are pipe fittings included in the “Piping” line item in LRA Table 2.3.3-9.

- odorizer – Odorizer cylinders (OC-700, 701, 702, and 703) on switchgear room discharge lines are shown on LRA drawing LRA-G-191163-SH-03-0. The odorizer cylinders are included in the “Tank” line item in LRA Table 2.3.3-9.

- threaded connections – As stated in LRA Section 2.0, the term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. Threaded connections are pipe fittings included in the “Piping” line item in LRA Table 2.3.3-9.

- flexible hose – Hoses are replaced on a specified schedule and therefore, are not subject to an AMR as required by 10 CFR 54.21(a)(1)(ii).

- latch door pull box – This response assumes the reviewer means emergency manual release stations to initiate CO_2 flow. Manual release stations are active components; not subject to an AMR.

- pneumatic actuators – Pneumatic actuators (discharge delay timers) on deluge valves for the switchgear rooms are shown on LRA drawing LRA-G-191163-SH-03-0. Since the actuator subcomponents have a pressure boundary function, they are included in the line items for “Tank,” “Valve body,” and “Tubing” in Table 2.3.3-9.

- CO_2 bottles (CO_2 storage cylinders) – The CO_2 bottles, or storage cylinders, are included in the line item “Tank” in Table 2.3.3-9.

Based on its review, the staff found the applicant's response to RAI 2.3.3.9-2 acceptable. Although the applicant states that they consider these components to be included in other line items, the LRA descriptions of the line items do not specifically list all these components. The applicant identified the following components to be included in other line items in the scope of license renewal and subject to an AMR: strainer housings, pipe fittings, pipe supports, couplings, odorizer, threaded connections, pneumatic actuators, and CO_2 bottles. The staff is assured that the listed components will be considered appropriately during plant aging management activities. The staff found that the following components were not included in the line item descriptions in the LRA: flexible hoses and latch door pull box (emergency manual release stations to initiate CO_2 flow). The staff recognizes the applicant’s interpretation of these components as active (short-lived components), which will result in more vigorous oversight of the condition and performance of the components. Because the applicant has interpreted these components are active, the staff concludes that the components were correctly excluded from the scope of license renewal and are not subject to an AMR. Therefore, the staff’s concern described in RAI 2.3.3.9-2 is resolved.

In RAI 2.3.3.9-3, dated August 15, 2006, the staff stated that LRA Table 2.3.3-9 listed nozzles with an intended function of flow control as in-scope and subject to an AMR. Nozzles with intended functions of total flood, vent, and S nozzles are not listed. The staff requested that the applicant explain why these nozzles are not subject to an AMR.

In its response, by letter dated September 20, 2006, the applicant stated:

> The total flood nozzles in the CO_2 system are subject to an AMR, as indicated on drawings LRA-G-191163-SH-03-0 and LRA-G-191163-SH-04-0. They are included in the “Nozzle” line item in Table 2.3.3-9. As shown on the LRA drawings the CO_2 system does not have vent or S nozzles.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.9-3 acceptable because it adequately explains that the flood nozzles in question are within the scope of license renewal and subject to an AMR. Further, the applicant stated that the flood nozzles are represented in the LRA Table 2.3.3-9 by the component type "Nozzles,” and the CO_2 system does not have vent or S nozzles. Therefore, the staff’s concern described in RAI 2.3.3.9-3 is resolved.

2.3.3.9.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of License renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the fire protection-CO_2 system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.10 Heating, Ventilation, and Air Conditioning

2.3.3.10.1 Summary of Technical Information in the Application

LRA Section 2.3.3.10 describes the heating, ventilation, and air conditioning (HVAC) and the house HB systems. The purpose of the HVAC system is to maintain the general area environment for personnel and equipment. It consists of several ventilation systems serving ten different areas of the plant: (1) primary containment ventilation normally operates to maintain drywell ambient temperature within acceptable ranges, (2) reactor building ventilation provides filtration and controls temperature, humidity, and migration of air from clean areas to areas of higher contamination, including exhaust to the plant stack. It also purges the drywell, (3) turbine building ventilation provides filtration and controls temperature, humidity, and migration of air from clean areas to areas of higher contamination. It exhausts building air to the plant stack (normal intake and exhaust function) in a monitored release path, (4) DG room ventilation supports operation of the EDGs, (5) control building ventilation maintains the environment in the main control room, (6) service building ventilation provides filtration, controls temperature and humidity, and exhausts potential contaminants to the plant stack. It maintains the hydrogen concentration well below 2 percent by volume in the HVAC equipment room (hydrogen is potentially generated from the AS-1 batteries), (7) radwaste building ventilation provides filtration (including filtration of exhaust sent to the plant stack) and controls temperature, humidity, and migration of air from clean areas to areas of higher contamination, (8) augmented off-gas building ventilation provides filtration (including filtration of exhaust sent to the plant stack) and temperature and humidity control, (9) intake structure ventilation maintains an environment suitable for operating personnel and equipment, including the diesel-driven fire pump, and (10) JDD building ventilation cools the JDD, which provides emergency lighting credited in the Appendix R safe shutdown capability assessment. The purpose of the HB system is to provide a source of steam for space heating and process requirements during all phases of station operation and heats the control room during normal operation. The system has two 50-percent boilers, various heaters, steam traps, valves, and piping.

The HVAC and HB systems have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related systems SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the systems perform functions that support fire protection.

LRA Tables 2.3.3-10, 2.3.3-13-18, and 2.3.3-13-21 identify the following HVAC and HB system component types within the scope of license renewal and subject to an AMR:

- bolting
- compressor housing
- damper housing
- duct
- duct flexible connection
- expansion joint

- fan housing
- filter housing
- heat exchanger (fins)
- heat exchanger (housing)
- heat exchanger (shell)
- heat exchanger (tubes)
- heater housing
- humidifier housing
- louver housing
- piping
- pump casing
- sight glass
- steam trap
- strainer
- strainer housing
- tank
- tubing
- valve body

The HVAC and HB system component intended functions within the scope of license renewal include the following:

- filtration
- heat transfer
- pressure boundary

2.3.3.10.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.10 and UFSAR Sections 5.2.3.7, 5.3.5, 10.7.6, and 10.12 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.10.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the HVAC and HB system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.11 Primary Containment Atmosphere Control / Containment Atmosphere Dilution

2.3.3.11.1 Summary of Technical Information in the Application

LRA Section 2.3.3.11 describes the PCAC system, the containment atmosphere dilution (CAD) system, and the post-accident sampling system (PASS). The purpose of the PCAC system is to ensure that the containment atmosphere is inerted with N_2 during station power operation. The PCAC system establishes and maintains the required differential pressure between the drywell and torus. System instrumentation monitors key drywell and torus parameters, including temperature, pressure, moisture, drywell to torus differential pressure, and torus water level. The CAD system limits the concentration of oxygen in the primary containment so ignition of hydrogen and oxygen from a metal-water reaction following a LOCA will not occur. The PASS is included in this evaluation. The purpose of PASS is to provide representative samples of reactor coolant indicative of the extent and development of core damage.

The PCAC system, CAD system, and PASS have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Tables 2.3.3-11, 2.3.3-13-3, 2.3.3-13-27, and 2.3.3-13-28 identify the following PCAC system, CAD system, and PASS component types within the scope of license renewal and subject to an AMR:

- bolting
- diaphragm
- dryer
- duct
- filter housing
- heat exchanger
- orifice
- piping
- pump casing
- tank
- trap
- tubing
- valve body

The component intended functions within the scope of license renewal include the following:

- flow control
- heat transfer
- pressure boundary

2.3.3.11.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.11 and UFSAR Sections 5.2.3.6, 5.2.6, 5.2.7, and 10.20 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.11 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.11-1 dated August 16, 2006, the staff stated that license renewal drawing LRA-VY-E-75-002-0, at location K-13, penetration X209D to the H_2O_2 analyzers, shows a section of pipe to be within the scope of license renewal. However, this same section of pipe on drawing LRA-G-191165-0, at location E-16 from penetration X209D through the continuation to drawing LRA-VY-E-75-002-0, is not shown to be within the scope of license renewal. The staff requested that the applicant confirm that this section of pipe is within the scope of license renewal, or if not, justify its exclusion.

In its response dated September 20, 2006, the applicant stated that the section of pipe shown on license renewal drawing LRA-VY-E-75-002-0, at location K-13 at penetration X209D to the H_2O_2 analyzers and on drawing LRA-G-191165-0, at location E-16 from penetration X209D through the continuation to drawing LRA-VY-E-75-002-0 is within the scope of license renewal and subject to an AMR. Dashed lines (or phantom lines) on the drawings indicate that the actual line is shown on its primary system drawing. Phantom lines are not highlighted on the license renewal drawings.

Based on its review, the staff found the applicant's response to RAI 2.3.3.11-1 acceptable because the applicant confirmed that containment atmosphere dilution system piping 1"-VG-122-D1 connecting the H_2O_2 analyzers to the torus through penetration X-209D is within the scope of license renewal and subject to an AMR. Therefore, the staff concern described in RAI 2.3.3.11-1 is resolved.

In RAI 2.3.3.11-2 dated August 16, 2006, the staff stated that license renewal drawing LRA-VY-E-75-002-0, at location J-9 shows a pipe section, including valve NG-16 to pipe section 20-AC-13, within the scope of license renewal. However, this same section of pipe on drawing LRA-G-191175-SH-01-0, at location K-10 is not shown within the scope of license renewal. The staff requested that the applicant confirm that this section of pipe is within the scope of license renewal, or if not, to justify its exclusion.

In its response dated September 20, 2006, the applicant stated that the section of pipe shown on license renewal drawing LRA-VY-E-75-002-0, at location J-9, including valve NG-16 to pipe section 20-AC-13 and on drawing LRA-G-191175-SH-01-0, at location K-10 is within the scope of license renewal and subject to an AMR. Dashed lines (or phantom lines) on the drawings indicate that the actual line is shown on its primary system drawing. Phantom lines are not highlighted on the license renewal drawings.

Based on its review, the staff found the applicant response to RAI 2.3.3.11-2 acceptable because the applicant confirmed that containment atmosphere dilution system piping from primary containment and atmosphere control system piping 20"- AC-13 to valve NG-16 (1" NG-101A-EIN2) is within the scope of license renewal and subject to an AMR. Therefore, the staff concern described in RAI 2.3.3.11-2 is resolved.

In RAI 2.3.3.11-3 dated August 16, 2006, the staff stated that license renewal drawing LRA-VY-E-75-002-0, at location G-7 provides a continuation from valve VG-77 to drawing LRA-G-191165-0 (at location B-17) that is within the scope of license renewal. However, the license renewal boundary could not be located on drawing LRA-G-191165-0 (at location B-17). The staff requested that the applicant provide additional information for the continuation of this pipe section to the license renewal boundary and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant stated that license renewal drawing LRA-VY-E-75-002-0, at location G-17 provides a continuation from valve VG-77 to drawing LRA-G-191165-0 that is within the scope of license renewal. The drawing references location B-17 on drawing LRA-G-191165-0. The hydrogen/oxygen analyzers are shown at location H-14 on drawing LRA-G-191165-0. Therefore, the appropriate reference location for the continuation on drawing LRA-G-191165-0 is H-14. An engineering request was submitted to correct the discrepancy on license renewal drawing LRA-VY-E-75-002-0. The piping to VG-77 is connected to ¾" pipe VG-109-TI prior to valve VG-20. As shown on the drawings, all of the piping and components from the primary containment air space to the analyzers and from the analyzers to the torus are within the scope of license renewal and subject to an AMR.

Based on its review, the staff found the applicant response to RAI 2.3.3.11-3 acceptable because the applicant provided appropriate documentation to demonstrate that piping upstream of valve VG-77 was connected to primary containment sample system line 3/4" VG-109-T1, piping and components were correctly identified within the scope of license renewal, and license renewal boundaries were appropriately identified on the sampling system flow diagram, LRA-G-191165-0. Therefore, the staff concern described in RAI 2.3.3.11-3 is resolved.

In RAI 2.3.3.11-4 dated August 16, 2006, the staff stated that license renewal drawing LRA-VY-E-75-002-0, at location J-18 shows a pipe section downstream of valve VG30A within the scope of license renewal. A drawing continuation to the license renewal boundary was not provided. The staff requested that the applicant provide additional information for the continuation of this pipe section to the license renewal boundary and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant stated that license renewal drawing LRA-VY-E-75-002-0 shows hydrogen/oxygen analyzer panel SII within a dotted rectangular box at locations H-17 through J-18. Above the box, at location G-18, VG-29A is shown going to hydrogen/oxygen analyzer panel SI, which is not shown but is the same as the SII panel. Valve VG-30A, below the box at location J-18, is coming back from the SI panel. As shown on the drawing, all of the piping and components from the analyzer panels to the torus are within the scope of license renewal and subject to an AMR.

Based on its review, the staff found the applicant response to RAI 2.3.3.11-4 acceptable because the applicant adequately identified the piping and components in the H_2O_2 analyzer SAH-VG-5A SI panel which are within the scope of license renewal and subject to an AMR. These components were identified as those corresponding to components identified in panel SII on drawing LRA-VY-E-75-002-0. Therefore, the staff concern described in RAI 2.3.3.11-4 is resolved.

In RAI 2.3.3.11-5 dated August 16, 2006, the staff stated that license renewal drawing LRA-VY-191165-0, at location I-15 provides a continuation of a pipe section from the H_20_2 analyzers to drawing LRA-VY-E-75-002-0 that is within the scope of license renewal. However, the license renewal boundary could not be located on drawing LRA-VY-E-75-002-0. The staff requested that the applicant provide additional information for the continuation of this pipe section to the license renewal boundary and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant stated that an engineering request was submitted to correct the license renewal drawing discrepancies. Also, as shown on the drawings, all of the piping and components from the primary containment air space to the analyzers and from the analyzers to the torus are within the scope of license renewal and subject to an AMR.

Based on its review, the staff found the applicant response to RAI 2.3.3.11-5 acceptable because the applicant confirmed that sample system piping located on drawing LRA-G-191165-0, at location I-15 and H-14, is continued on drawing LRA-VY-E-75-002-0. Additionally, the applicant demonstrated these components and all of the piping and components from the primary containment air space to the analyzers and from the analyzers to the torus are within the scope of license renewal and subject to an AMR. Therefore, the staff concern described in RAI 2.3.3.11-5 is resolved.

In RAI 2.3.3.11-6 dated August 16, 2006, the staff stated that license renewal drawing LRA-VY-191165-0, at location C-12 provides continuations to drawing LRA-G-191267 (at locations H-12 and H-5) for two pipe lines from the post-accident sampling panel that are within the scope of license renewal. The license renewal boundary could not be located on LRA-G-191267-SH-01-0. The staff requested that the applicant provide additional information for the continuation of these pipe sections to the license renewal boundary and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated September 20, 2006, the applicant confirmed that the two pipe lines from the post-accident sampling panel shown on license renewal drawing LRA-VY-191165-0, at location C-12 are continued on drawing LRA-G-191267-SH-01-0 (at location H-12 and H-5). The lines are depicted as “TYPICAL FOR FT63A” and “TYPICAL FOR FT63C” with reference to FT63B and FT63D piping which are identified within dashed rectangles on drawing LRA-G-191267-SH-01-0 at the specified locations. The table on drawing LRA-G-191267-SH-02-0, at location A-16, notes the instrument root valves associated with each jet pump. Drawing LRA-G-191267-SH-01-0 identifies the piping and components from the jet pump to the instruments as being within the scope of license renewal and subject to an AMR as part of the RCS pressure boundary described in LRA Section 2.3.1.3. Drawing LRA-G-191165-0 shows piping continuing from jet pump instrument root valve V-20B (typical) to PASS valve 102 and 101 and from root valve V-20D (typical) to PASS valve 104 and 103. The applicant confirmed that components in the sample line are within the scope of license renewal and subject to an AMR as part of the post-accident sampling system as described in LRA Section 2.3.3.11. Therefore, in accordance with 10 CFR 54.4(a)(1), the entire reactor coolant pressure boundary out to the second isolation valve on the PASS sample lines is within the scope of license renewal and subject to an AMR.

Based on its review, the staff found the applicant response to RAI 2.3.3.11-6 acceptable because the applicant submitted appropriate documentation acknowledging that all piping and components associated with primary containment atmosphere control and containment atmosphere dilution are within the scope of license renewal and subject to an AMR including all the reactor coolant pressure boundary up to and including the second post-accident sampling system (PASS) isolation valves. Therefore, the staff concern described in RAI 2.3.3.11-6 is resolved.

2.3.3.11.3 Conclusion

The staff reviewed the LRA accompanying license renewal drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the PCAC system, CAD system, and PASS components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.12 John Deere Diesel

2.3.3.12.1 Summary of Technical Information in the Application

LRA Section 2.3.3.12 describes the JDD as a nonsafety-related skid-mounted engine powering a generator that supplies back-up electric power to plant lighting. It is located in a separate structure, the JDD building. The diesel is started electrically with batteries and does not require cooling water from other plant systems. Its license renewal purpose is to provide power to lighting panels credited as emergency lighting in the Appendix R safe shutdown capability analysis.

The JDD performs functions that support fire protection.

LRA Table 2.3.3-12 identifies the following JDD component types within the scope of license renewal and subject to an AMR:

- bolting
- expansion joint
- filter housing
- heat exchanger (radiator)
- heat exchanger (shell)
- heat exchanger (tubes)
- heater housing
- piping

- pump casing
- silencer
- tubing
- turbocharger

The JDD component intended functions within the scope of license renewal include the following:

- heat transfer
- pressure boundary

2.3.3.12.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.12 using the Tier-2 evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.12 identified areas in which information provided in the LRA needed to be confirmed by the NRC Regional Inspection Team to complete the review of the applicant's scoping and screening results.

Inspection Item 2.3.3.12-1

LRA Section 2.3.3.12 indicts that the John Deere Diesel is installed in compliance with 10 CFR 50, Appendix R, requirements. However, due to a lack of available drawings and/or detailed description of the diesel equipment listed in LRA Table 2.3.3-12, it is difficult to determine if any AMR category components may have been omitted from the table. It is recommended that the JDD be inspected to assure all AMR category components are included in the list of LRA Table 2.3.3-12. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a) (3). **This is CI 2.3.3.12-1.**

2.3.3.12.3 Conclusion

The staff reviewed the LRA and accompanying license renewal drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. Pending resolution of CI 2.3.3.12-1, the staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the JDD components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13 Miscellaneous Systems In-scope as required by 10 CFR 54.4(a)(2)

2.3.3.13.1 Summary of Technical Information in the Application

LRA Section 2.3.3.13 describes the miscellaneous systems within the scope of license renewal requirements of 10 CFR 54.4(a)(2). Such systems interact with safety-related systems in one of two ways: (1) a functional failure where the failure of a nonsafety-related SSC to perform its function impacts a safety function or (2) a physical failure where a safety function is impacted by the loss of structural or mechanical integrity of an SSC in physical proximity to a safety-related component.

LRA Section 2.3.3.13.1 states that functional failures of nonsafety-related SSCs which could impact a safety function were identified only for systems with components supporting the main condenser and MSIV leakage pathway. Two of these systems are the augmented off-gas (AOG) and sampling systems, which are not described elsewhere in the LRA. Descriptions of these systems follow.

2.3.3.13A Augmented Off-gas

2.3.3.13A.1 Summary of Technical Information in the Application

LRA Section 2.3.3.13.1 describes the AOG system whose purpose is to collect, process, and discharge radioactive gaseous wastes to the atmosphere through the plant stack during normal operation. The system reduces the released quantities of gaseous and particulate radioactive material from the site to levels as low as practical during normal operation. The AOG system has subsystems that dispose of gases from the main condenser air ejectors, the start-up vacuum pump, and the gland seal condenser. The various subsystems are monitored continuously for radiation.

The failure of nonsafety-related SSCs in the AOG system could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3.13-1 identifies the following AOG system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- piping
- tank
- tubing
- valve body

The AOG system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.13A.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.1 and UFSAR Section 9.4 using the Tier-2 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.13.1 identified areas in which information provided in the LRA needed to be confirmed by the NRC Regional Inspection Team to complete the review of the applicant's scoping and screening results.

Inspection Item 2.3.3.13a-1

The LRA states that the AOG system is within the scope of license renewal based on requirements of 10 CFR 54.4(a)(2) because of the potential for physical interaction with safety-related components described in LRA Table 2.3.3.13-A. The determination of whether a component meets the requirements of 10 CFR 54.4(a)(2) for physical interactions is based on where it is located in a building and its proximity to safety-related equipment or where a structural/seismic boundary exists. This information is not provided on license renewal drawings nor was a detailed description provided in the LRA. Consequently, any omission of AOG components subject to an AMR cannot be determined. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components meet the requirements of 10 CFR 54.4(a)(2) and all the components subject to an AMR are included in LRA Table 2.3.3-13-1. **This is CI 2.3.3.13a-1.**

2.3.3.13A.3 Conclusion

The staff reviewed the LRA and accompanying license renewal drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. Pending resolution of CI 2.3.3.13a-1, the staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the AOG system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13B Sampling

2.3.3.13B.1 Summary of Technical Information in the Application

LRA Section 2.3.3.13.1 describes the sampling system whose purpose is to provide a means for sampling and testing various process fluids in the station in centralized locations. Fluids and gases are sampled continuously or periodically from equipment or systems reflecting station performance.

The failure of nonsafety-related SSCs in the sampling system could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3.13-41 identifies the following sampling system component types within the scope of license renewal and subject to an AMR:

- bolting
- piping
- tubing
- valve body

The sampling system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.13B.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.1 and UFSAR Section 10.17 using the Tier-2 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13B.3 Conclusion

The staff reviewed the LRA and accompanying license renewal drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the sampling system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

The other systems with components supporting the main condenser and MSIV leakage pathway where functional failures of nonsafety-related SSCs could impact a safety function are addressed in LRA Section 2.3.4.

LRA Table 2.3.3.13-A shows systems within the scope of license renewal with potential for physical interactions with safety-related components. Of these systems, the applicant stated that the following are not described elsewhere in the LRA:

- condensate demineralizer
- RWCU filter demineralizer
- circulating water
- demineralized water
- feedwater
- MG lube oil
- neutron monitoring

- potable water
- radwaste, liquid and solid
- equipment retired in place
- reactor water clean-up
- stator cooling

A description of each system follows.

2.3.3.13C Condensate Demineralizer

2.3.3.13C.1 Summary of Technical Information in the Application

LRA Section 2.3.3.13.2 describes the condensate demineralizer (CD) system which maintains the required purity of feedwater supplied to the reactor. The system minimizes corrosion product in the nuclear system so it does not affect fuel performance, nuclear system component accessibility, or the capacity required of the RWCU system. The CD system protects the nuclear system against the entry of foreign material due to condenser leaks. The system uses finely ground, mixed ion-exchange resins deposited upon the tubular elements of pressure precoat type filters (the filter-demineralizer units). The CD consist of five filter-demineralizer units (including an installed spare) operating in parallel. All are normally operated but sized so four units can support operation.

The failure of nonsafety-related SSCs in the CD system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-4 identifies the following CD system component types within the scope of license renewal and subject to an AMR:

- piping
- strainer housing
- valve body

The CD system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13C.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2 and UFSAR Section 11.7 using the evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13C.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the CD system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13D RWCU Filter Demineralizer

2.3.3.13D.1 Summary of Technical Information in the Application

The RWCU filter demineralizer (CUFD) system filters and cleans reactor water. The CUFD is the filter-demineralizer portion of the RWCU system and consists of the filter/demineralizer tanks, piping, and valves.

The failure of nonsafety-related SSCs in the CUFD system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-8 identifies the following CUFD system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- orifice
- piping
- pump casing
- sight glass
- strainer housing
- tank
- tubing
- valve body

The CUFD system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13D.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2 and UFSAR Section 4.9 using the Tier-1 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13D.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the CUFD system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13E Circulating Water

2.3.3.13E.1 Summary of Technical Information in the Application

The circulating water (CW) system is a heat sink for steam condensation for the main condensers. Heat removal in the condensers is accomplished by a continuous supply of cooling water pumped from and returned to the Connecticut River or by recirculation flow pumped through cooling towers by three vertical circulating water pumps in the intake structure. Trash racks and traveling water screens protect the circulating water pumps from debris. During cold weather, recirculation of water from the discharge structure to the intake structure prevents icing at the screens and intakes. Two cooling towers have the capacity to remove the total heat load from the circulating water. Three vertical circulating water booster pumps provide the necessary head for cooling tower operation and the recirculation mode.

The CW system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the CW system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-9 identifies the following CW system component types within the scope of license renewal and subject to an AMR:

- bolting
- piping
- pump casing
- tubing
- valve body

The CW system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13E.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2, and UFSAR Sections 10.8, 11.6, and 11.9 using the Tier-2 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

In conducting its review, the evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.13 identified areas in which information provided in the LRA needed to be confirmed by the NRC Regional Inspection Team to complete the review of the applicant's scoping and screening results.

Inspection Item 2.3.3.13e-1

The LRA states that the circulating water system is within the scope of license renewal based on the potential for physical interaction with safety-related components as required by 10 CFR 54.4(a)(2) and described in LRA Table 2.3.3.13-A. The applicant did not provide drawings highlighting in-scope components required by 10 CFR 54.4(a)(2), stating that the drawings would not provide significant additional information because they do not indicate proximity of components to safety-related equipment and do not identify structural/seismic boundaries. Without license renewal drawings and/or detailed description of the circulating water system, the omission of components subject to an AMR cannot be determined (see LRA Table 2.3.3-13-9). The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(2) and all the components subject to an AMR are included in LRA Table 2.3.3-13-9. **This is CI 2.3.3.13e-1.**

2.3.3.13E.3 Conclusion

The staff reviewed the LRA and accompanying license renewal drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. Pending resolution of CI 2.3.3.13e-1, the staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the CW system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13F Demineralized Water

2.3.3.13F.1 Summary of Technical Information in the Application

The demineralized water (DW) system provides treated makeup water for such plant components as the condensate storage tank, spent fuel pool, RBCCW, and turbine building closed cooling water systems. This supply function is not a safety function. The DW system consists of the demineralized water transfer system including the demineralized water storage tank, demineralized water transfer pumps, piping, and valves, but not including the condensate storage tank or CST system components.

The failure of nonsafety-related SSCs in the DW system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-12 identifies the following DW system component types within the scope of license renewal and subject to an AMR:

- bolting
- orifice
- piping
- pump casing
- tank
- tubing
- valve body

The DW system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13F.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2 and UFSAR Section 10.13.3 using the Tier-2 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13F.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the DW system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13G Feedwater

2.3.3.13G.1 Summary of Technical Information in the Application

The feedwater (FW) system provides demineralized water from the condensate system to the reactor vessel at a rate sufficient to maintain adequate reactor vessel water level. The FW system consists of three reactor feedwater pumps, four high-pressure feedwater heaters (two per train), valves, and piping.

The failure of nonsafety-related SSCs in the FW system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-13 identifies the following FW system component types within the scope of license renewal and subject to an AMR:

- bolting

- piping
- tubing
- valve body

The FW system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13G.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2 and UFSAR Section 11.8 using the Tier-2 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13G.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the FW system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13H MG Lube Oil

2.3.3.13H.1 Summary of Technical Information in the Application

The MGLO system lubricates the reactor recirculation pump motor generator set during its operation. The MGLO system has lube oil pumps, heat exchangers, piping, and valves.

The failure of nonsafety-related SSCs in the MGLO system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-23 identifies the following MGLO system component types within the scope of license renewal and subject to an AMR:

- bolting
- heat exchanger (shell)
- piping
- pump casing
- tubing
- valve body

The MGLO system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13H.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2 and UFSAR Section 7.9.4.4.1 using the evaluation methodology described in SER Section 2.3. and guidance described in SRP-LR Section 2.3.

In conducting its review, the evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13H.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the MGLO system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13I Neutron Monitoring

2.3.3.13I.1 Summary of Technical Information in the Application

The neutron monitoring (NM) system indicates neutron flux, which can be correlated to thermal power level, for the entire range of flux conditions in the core. The system consists of in-core neutron detectors and out-of-core electronic monitoring equipment. The source-range and intermediate-range monitors indicate flux levels during reactor startup and lower power operation. The local-power range and average-power range monitors assess local and overall flux conditions during power range operation. Rod block monitors prevent rod withdrawal when reactor power should not be increased at the current reactor coolant flow rate. The traversing in-core probe system calibrates individual neutron monitoring sensors. The safety function of the NM system is to detect conditions in the core that threaten the overall integrity of the fuel barrier by excessive power generation and to provide signals to the reactor protection system to limit the release of radioactive material from the fuel barrier.

The NM system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the NM system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-26 identifies the following NM system component types within the scope of license renewal and subject to an AMR:

- piping
- tubing
- valve body

The NM system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13I.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2, and UFSAR Sections 1.6.2.2, 1.6.4.1.3, and 7.5 using the evaluation methodology described in SER Section 2.3. The staff conducted its review in accordance with the guidance described in SRP-LR Section 2.3.

The staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13I.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the NM system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13J Potable Water

2.3.3.13J.1 Summary of Technical Information in the Application

The potable water (PW) system supplies treated water suitable for drinking and for sanitary purposes to lavatories, service sinks, combination emergency showers and eyewashes, kitchen sinks, bench sinks, showers, and wall hydrants.

The failure of nonsafety-related SSCs in the PW system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-29 identifies the following PW system component types within the scope of license renewal and subject to an AMR:

- bolting
- piping

The PW system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13J.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2 and UFSAR Section 10.15 using the Tier-1 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13J.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the PW system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13K Radwaste, Liquid and Solid

2.3.3.13K.1 Summary of Technical Information in the Application

The purpose of the liquid radwaste (RDW) system is to collect potentially radioactive liquid wastes, treats them, and returns the processed radioactive liquid wastes to the station for reuse. The solid RDW system collects and processes radioactive solid wastes for temporary onsite storage and offsite shipment for permanent disposal. The RDW system monitors the drywell floor and equipment drain sump pump-out rate for reactor coolant leak detection. The liquid portion of the RDW system consists of floor and equipment drains for handling tanks, piping, pumps, process equipment, instrumentation, and auxiliaries necessary to collect, process, store, and dispose of potentially radioactive wastes. A small portion of the system connected to the RHR system maintains the RHR system pressure boundary.

The RDW system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RDW system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-32 identifies the following RDW system component types within the scope of license renewal and subject to an AMR:

- bolting
- orifice
- piping

- pump casing
- strainer housing
- tank
- tubing
- valve body

The RDW system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13K.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2, and UFSAR Sections 9.2 and 9.3 using the Tier-2 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13K.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RDW system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13L Equipment Retired in Place

2.3.3.13L.1 Summary of Technical Information in the Application

This system designation in the component database is for obsolete equipment. It has no safety-related components and no system intended functions; however, certain components supporting safety-related components are required to maintain structural integrity.

The failure of nonsafety-related SSCs of equipment retired in place (RIP) potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-35 identifies the following component types of equipment RIP within the scope of license renewal and subject to an AMR:

- bolting
- piping
- valve body

The equipment RIP component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13L.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2 using the Tier-1 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

In conducting its review, staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13L.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the equipment RIP components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13M Reactor Water Clean-Up

2.3.3.13M.1 Summary of Technical Information in the Application

The RWCU system maintains high reactor water purity to limit chemical and corrosive action, to remove corrosion products, and to limit impurities that would activate neutron flux. The RWCU system purifies the reactor coolant water by continuously removing a portion of the reactor recirculation flow from the suction side of a recirculation pump, sending the removed flow through filter-demineralizer units to undergo mechanical filtration and ion exchange processes, and returning the processed fluid back to the reactor via the feedwater line.

The RWCU system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RWCU system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-36 identifies the following RWCU system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- heat exchanger (shell)
- orifice
- piping
- pump casing

- strainer housing
- tank
- tubing
- valve body

The RWCU system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13M.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2 and UFSAR Section 4.9 using the Tier-2 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.13.2 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

The staff stated that license renewal drawing LRA-G-191178-SH-01-0, at location D-4, shows the common elbow differential flow element upstream piping and high side instrument lines connected to flow transmitters FT-12-1A and FT-12-1 B as not within the scope of license renewal. A failure of the flow element upstream RWCU piping or common high side instrument line could prevent the flow transmitters from detecting a high flow condition and the subsequent auto isolation of the RWCU isolation valves. The UFSAR states that the high flow auto closure of the RWCU isolation valves prevents excessive loss of reactor coolant and reduces the amount of radioactive material released from the nuclear system caused by an RWCU line break. In RAI 2.3.3.13k-1 dated August 16, 2006, the staff requested that the applicant confirm whether the RWCU high flow auto isolation will occur when negative differential pressure is caused by either failure of the flow element upstream piping or the common high side instrument line. If not, explain why the flow element upstream piping and the common high side instrument lines are not shown to be within the scope of license renewal.

In its response dated September 20, 2006, the applicant stated that the flow element upstream piping and the common high side instrument lines are within the scope of license renewal based on the requirements of 10 CFR 54.4(a)(2) and thus are not shown as highlighted on the drawing. As stated in LRA Table 2.3.3.1B, "Description of Nonsafety-Related System Components Subject to Aging Management Review Based on 10 CFR 54.4(a)(2) for Physical Interactions," the nonsafety-related portion of the RWCU system located inside the reactor building is within the scope of license renewal and subject to an AMR. The common elbow differential flow element upstream piping and high side instrument lines connected to flow transmitters FT-12-1A and FT-12-1B are located inside the reactor building and are included in Table 2.3.3-13-36, "Reactor Water Clean-Up (RWCU) System Nonsafety-Related Systems and

Components Affecting Safety-Related Systems Components Subject to Aging Management Review." They are listed as component types of piping, tubing and valve body. As discussed in LRA Section 2.1.2.1.3, "Mechanical System Drawings," in-scope components required by 10 CFR 54.4(a)(2) are not highlighted on the drawings.

Based on its review, the staff found the applicant response to RAI 2.3.3.13k-1 acceptable because the applicant acknowledged that the flow element upstream piping and the common high side instrument lines connected to flow transmitters FT-12-1A and FT-12-1B are within the scope of license renewal and subject to aging management review based on the potential for physical interaction with safety-related systems in accordance with 10 CFR 54.4(a)(2). Therefore, the staff concern described in RAI 2.3.3.13k-1 is resolved.

The staff’s review of LRA Section 2.3.3.13.2 identified areas in which information provided in the LRA needed to be confirmed by the NRC Regional Inspection Team to complete the review of the applicant's scoping and screening results.

Inspection Item 2.3.3.13m-1

The LRA states that the RWCU system is within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) because of the potential for physical interaction with safety-related components as described in LRA Table 2.3.3.13-A. The determination of whether a component meets the requirements of 10 CFR 54.4(a)(2) for physical interactions is based on where it is located in a building and its proximity to safety-related equipment or where a structural/seismic boundary exists. This information is not provided on license renewal drawings nor was a detailed description provided in the LRA. Consequently, any omission of RWCU components subject to an AMR cannot be determined. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(2) and all the components subject to an AMR are included in LRA Table 2.3.3-13-36. **This is CI 2.3.3.13m-1.**

2.3.3.13M.3 Conclusion

The staff reviewed the LRA and RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. Pending resolution of CI 2.3.3.13m-1, the staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RWCU system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13N Stator Cooling

2.3.3.13N.1 Summary of Technical Information in the Application

The stator cooling system cools the stator winding of the main generator. The system permits generator load changes with minimum variation of stator winding temperature. The stator copper is in direct contact with low-conductivity water of automatically-controlled temperature and pressure; therefore, average copper temperature can be kept essentially constant, practically eliminating thermal stress cycling of the insulation.

The failure of nonsafety-related SSCs in the stator cooling system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-13-39 identifies the following stator cooling system component types within the scope of license renewal and subject to an AMR:

- cooler
- piping
- valve body

The stator cooling system component intended function within the scope of license renewal is to provide pressure boundary.

2.3.3.13N.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13.2 and UFSAR Section 8.2.3.11.2 using the Tier-1 evaluation methodology described in SER Section 2.3. and the guidance described in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.3.13N.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the stator cooling system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

The remaining systems shown in LRA Table 2.3.3.13-A as within the scope of license renewal with potential for physical interaction with safety-related components are addressed elsewhere in other LRA sections listed here:

- 2.3.1 CRD
- 2.3.1 HCUs
- 2.3.1 NB
- 2.3.2.1 RHR
- 2.3.2.2 CS
- 2.3.2.4 HPCI
- 2.3.2.5 CST
- 2.3.2.5 RCIC
- 2.3.2.6 SBGT

- 2.3.3.1 SLC
- 2.3.3.2 SW
- 2.3.3.2 RHRSW
- 2.3.3.3 RBCCW
- 2.3.3.4 DG and auxiliaries
- 2.3.3.4 DLO
- 2.3.3.5 FPC
- 2.3.3.5 FPC filter demineralizer
- 2.3.3.5 SBFPC
- 2.3.3.6 FO
- 2.3.3.7 IA
- 2.3.3.7 N_2
- 2.3.3.8 fire protection
- 2.3.3.10 HB
- 2.3.3.10 HVAC
- 2.3.3.11 containment air dilution
- 2.3.3.11 PASS
- 2.3.3.11 PCAC
- 2.3.4.2 condensate

2.3.4 Steam and Power Conversion Systems

In LRA Section 2.3.4, the applicant identified the SCs of the steam and power conversion systems that are subject to an AMR for license renewal.

The applicant described the supporting SCs of the steam and power conversion systems in the following LRA Sections:

- 2.3.4.1 auxiliary steam
- 2.3.4.2 condensate
- 2.3.4.3 main steam
- 2.3.4.4 101 (main steam, extraction steam, and auxiliary steam instruments)

The staff's review findings regarding LRA Sections 2.3.4.1 – 2.3.4.4 are presented in SER Sections 2.3.4.1 – 2.3.4.4, respectively.

2.3.4.1 Auxiliary Steam

2.3.4.1.1 Summary of Technical Information in the Application

LRA Section 2.3.4.1 describes the auxiliary steam (AS) system, which provides steam from MS piping to the steam jet air ejector to maintain main condenser vacuum. The AS system consists of the steam jet air ejector and associated equipment.

The failure of nonsafety-related SSCs in the AS system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.4-1 identifies the following AS system component types within the scope of license renewal and subject to an AMR:

- bolting
- condenser
- orifice
- expansion joint
- heat exchanger (tubes)
- piping
- strainer housing
- thermowell
- steam trap
- tubing
- valve body

The AS system component intended functions within the scope of license renewal include the following:

- pressure boundary
- holdup and plateout of fission products

2.3.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.1 and UFSAR Section 11.4 using the Tier-2 evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.4.1.3 Conclusion

The staff reviewed the LRA and accompanying license renewal drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the AS system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.2 Condensate

2.3.4.2.1 Summary of Technical Information in the Application

LRA Section 2.3.4.2 describes the condensate system, which receives condensed steam from the condenser and supplies it to the reactor feedwater system as well as such other components and systems as the air ejector condensers, steam packing exhausters, and CRD pumps. The condensate system consists of a single train with three parallel pumps drawing condensate from the two main condenser hotwells and includes the main condenser. During normal operation, all three pumps provide sufficient condensate flow capacity and net positive suction head to the reactor feedwater pumps during full power operation. Condensate flow to the reactor feed pumps passes through two parallel low-pressure feedwater heater strings, each with three heaters. Condensate flow exiting the low-pressure heaters is provided to a common reactor feed pump suction header.

The failure of nonsafety-related SSCs in the condensate system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Tables 2.3.4-1 and 2.3.3-13-2 identify the following condensate component types within the scope of license renewal and subject to an AMR:

- bolting
- condenser
- orifice
- expansion joint
- heat exchanger (tubes)
- piping
- strainer housing
- thermowell
- steam trap
- tubing
- valve body

The condensate system component intended functions within the scope of license renewal include the following:

- pressure boundary
- holdup and plateout of fission products

2.3.4.2.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.4.2 and 2.3.3.13, and UFSAR Section 11.8 using the Tier-2 evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.4.2.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the condensate components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.3 Main Steam

2.3.4.3.1 Summary of Technical Information in the Application

LRA Section 2.3.4.3 describes the MS system, which completes the transmission of steam from the seismic Class I steam piping to the main turbine at a controlled pressure during normal operation. The MS system consists of nonsafety-related components. (The nuclear boiler system contains the seismic Class I portion of the MS system which extends from the reactor vessel to the restraint at the second MS isolation valve. The system consists of the non-seismic Class I components beyond this point.) The MS system includes the turbine stop and control valves. A low-point drain line is downstream of each turbine control valve continuously draining the steam line low points through an orificed header to the condenser hotwell. The MS system has the ability to bypass the turbine when necessary. The main turbine bypass system has two valve chests, each with five automatically operated regulating bypass valves proportionally controlled by the turbine pressure regulator and control system. The bypass system opens whenever the amount of steam admitted into the turbine is less than that generated by the reactor. The MS system provides main turbine sealing steam.

The failure of nonsafety-related SSCs in the MS system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.4-1 identifies the following MS system component types within the scope of license renewal and subject to an AMR:

- bolting
- condenser
- orifice
- expansion joint
- heat exchanger (tubes)
- piping
- strainer housing
- thermowell
- steam trap
- tubing
- valve body

The MS system component intended functions within the scope of license renewal include the following:

- pressure boundary
- holdup and plateout of fission products

2.3.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.3 and UFSAR Sections 11.4 and 11.5 using the Tier-2 evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.4.3.3 Conclusion

The staff reviewed the LRA and accompanying license renewal drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the MS system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.4 101 (Main Steam, Extraction Steam, and Auxiliary Steam Instruments)

2.3.4.4.1 Summary of Technical Information in the Application

LRA Section 2.3.4.4 describes the 101 system (main steam, extraction steam, and auxiliary steam instruments), which provides indication, alarm, and control functions for its associated systems. This system code includes various instrumentation components for main steam, extraction steam, and auxiliary steam. Although the 101 system consists mainly of EIC components, certain mechanical instrumentation components are included as well.

The failure of nonsafety-related SSCs in the 101 system (main steam, extraction steam, and auxiliary steam instruments) potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.4-1 identifies the following 101 system (main steam, extraction steam, and auxiliary steam instruments) component types within the scope of license renewal and subject to an AMR:

- bolting
- condenser
- orifice
- expansion joint
- heat exchanger (tubes)
- piping
- strainer housing
- thermowell
- steam trap

- tubing
- valve body

The 101 (main steam, extraction steam, and auxiliary steam instruments) component intended functions within the scope of license renewal include the following:

- pressure boundary
- holdup and plateout of fission products

2.3.4.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.4 using the Tier-1evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.3.4.4.3 Conclusion

The staff reviewed the LRA and accompanying license renewal drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the 101 (main steam, extraction steam, and auxiliary steam instruments) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4 Scoping and Screening Results: Structures

This section documents the staff's review of the applicant's scoping and screening results for structures. Specifically, this section discusses:

- primary containment
- reactor building
- intake structure
- process facilities
- yard structures
- bulk commodities

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list passive, long-lived SCs within the scope of license renewal and subject to an AMR. To verify that the applicant properly implemented its methodology, the staff's review focused on the implementation results. This focus allowed the staff to confirm that there were no omissions of SCs that meet the scoping criteria and are subject to an AMR.

The staff's evaluation of the information in the LRA was the same for all structures. The objective was to determine whether the applicant has identified, in accordance with 10 CFR 54.4, components and supporting structures for structures that appear to meet the license renewal scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived components were subject to an AMR as required by 10 CFR 54.21(a)(1).

In its scoping evaluation, the staff reviewed the applicable LRA sections and component drawings, focusing on components that have not been identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the UFSAR, for each structure to determine whether the applicant has omitted from the scope of license renewal components with intended functions as required by 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions as required by 10 CFR 54.4(a). The staff requested additional information to resolve any omissions or discrepancies identified.

After its review of the scoping results, the staff evaluated the applicant's screening results. For those SCs with intended functions, the staff sought to determine whether: (1) the functions are performed with moving parts or a change in configuration or properties or (2) the SCs are subject to replacement after a qualified life or specified time period, as required by 10 CFR 54.21(a)(1). For those meeting neither of these criteria, the staff sought to confirm that these SCs were subject to an AMR, as required by 10 CFR 54.21(a)(1). The staff requested additional information to resolve any omissions or discrepancies identified.

2.4.1 Primary Containment

2.4.1.1 Summary of Technical Information in the Application

LRA Section 2.4.1 describes the primary containment, which limits the release of fission products in postulated design basis accidents so offsite doses do not exceed the values specified in 10 CFR 50.67. Located inside the reactor building, the primary containment is a General Electric Mark I containment with a drywell (which encloses the reactor vessel and recirculation system), a pressure suppression chamber (commonly known as the torus), and a connecting vent system. When operating at power, the containment is flooded with N_2 to preclude the availability of oxygen. The drywell surrounds the reactor vessel and primary systems. The torus, containing water, is below the drywell and the vent system connecting it to the drywell terminates below the water surface. Access to the drywell is by its steel drywell head and personnel hatch as well as a double door air lock, equipment hatch, and one CDR access hatch. Access to the torus is by two personnel hatches. The primary containment components include the drywell, the torus, the reactor vessel and drywell bellows, and the shield wall. The drywell is a carbon steel structure that houses the reactor pressure vessel and its components. A reinforced concrete support structure, founded on bedrock, is part of the drywell support system. The torus is a toroid-shaped carbon steel pressure vessel below and encircling the drywell. The reactor vessel refueling bulkhead has two stainless steel bellows with backing plates, spring seals, and removable guard rings. The drywell to reactor building bellows assembly is similar to that of the reactor vessel refueling bulkhead. The shield wall (also known as the sacrificial shield wall) is a high-density, steel-reinforced, concrete cylindrical structure surrounding the vessel. The concrete is contained by inner and outer steel liner plates that also attach various system supports. The sacrificial shield wall provides lateral support for the reactor vessel to accommodate both seismic forces and jet forces from the breakage of any pipe attached to the vessel.

The primary containment has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related primary containment SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the primary containment performs functions that support fire protection.

LRA Table 2.4-1 identifies the following primary containment component types within the scope of license renewal and subject to an AMR:

- steel and other metals
- concrete
- elastomers and other materials
- fluoropolymers and lubrite sliding surfaces

The primary containment component intended functions within the scope of license renewal include the following:

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- protective barrier for flood events
- heat sink during SBO or DBAs
- missile barrier
- pressure boundary
- structural or functional support for safety-related equipment

2.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.4.1 and UFSAR Sections 5.1.2 and 5.2 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4, "Scoping and Screening Results: Structures."

The staff evaluated the structural component functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.4.1.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR.

The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the primary containment components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.2 Reactor Building

2.4.2.1 Summary of Technical Information in the Application

LRA Section 2.4.2 describes the reactor building, which in design basis accidents contains leakage of airborne fission products to the environment within the dose limits specified in 10 CFR 50.67 and supports and protects the reactor and its systems. The reactor building completely encloses the primary containment and houses the refueling and reactor servicing equipment (platforms and cranes), new and spent fuel storage facilities, reactor core isolation cooling system, SBGT system, reactor cleanup demineralizer system, SLC system, CDR system equipment, reactor core and containment cooling systems, and electrical equipment components. The seismic Class I reactor building is constructed of monolithic reinforced concrete floors and walls up to the refueling level and of steel framing covered by insulated sealed siding and roof decking above. The siding and roofing can withstand limited internal overpressure before it is relieved by venting through blowout panels. A biological shield wall, part of the reactor building, encircles the primary containment, protects the containment vessel and the reactor system against potential external missiles, and shields personnel to reduce dose.

The reactor building bridge crane, which services the reactor and the refueling area, is designed seismic Class II with supports designed seismic Class I. The crane bridge and trolley wheels have seismic holddown lugs for crane stability in a hypothetical maximum earthquake. The new fuel storage vault, part of the seismic Class I reactor building, houses new fuel storage racks, each designed as seismic Class I while loaded with fuel. The spent fuel storage pool in the reactor building is lined with stainless steel. The pool liner is seam-welded ASTM-A240 Type 304 stainless steel with pipe sleeves welded to both sides of the liner plate. The spent fuel storage racks are assemblies of individual storage cells consisting of Type 304L stainless steel boxes welded together. The seismic Class I refueling platform, the principal means of transporting fuel assemblies back and forth, travels on tracks extending along each side between the reactor well and the storage pool.

The reactor building has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related reactor building SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the reactor building performs functions that support fire protection, ATWS, and SBO.

LRA Table 2.4-2 identifies the following reactor building component types within the scope of license renewal and subject to an AMR:

- steel and other metals
- concrete

The reactor building component intended functions within the scope of license renewal include the following:

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- rated fire barrier to confine or retard a fire from spreading
- protective barrier for flood events
- missile barrier
- pressure boundary
- structural or functional support to nonsafety-related equipment the failure of which could impact safety-related equipment
- structural or functional support for safety-related equipment

2.4.2.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2 and UFSAR Sections 5.3, 10.4, and 12.2.2 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

The staff evaluated the structural component functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

2.4.2.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the reactor building components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.3 Intake Structure

2.4.3.1 Summary of Technical Information in the Application

LRA Section 2.4.3 describes the intake structure, which supports and protects equipment that draws water from the intake canal, located east of the station on the riverbank and divided into two rooms: the SW pump room (which also contains the diesel and electric fire pumps) and the circulating water pump room. The room housing the SW pumps is seismic Class I; the other is seismic Class II. The reinforced concrete and steel intake structure is founded entirely on bedrock. It has three pump bays for the vertical circulating water pumps, two SW bays for four SW pumps and two fire water pumps, three roller gates, and one sluice gate. Recirculation of warm discharge water by a concrete pipe connecting the discharge structure to the intake structure keeps the intake bays and SW bays free of ice. All bays have trash racks and stop log guides, traveling screens, and fine screen guides. Interconnection of the three pump bays is by removal of stop logs in center walls.

The intake structure has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related intake structure SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the intake structure performs functions that support fire protection.

LRA Table 2.4-3 identifies the following intake structure component types within the scope of license renewal and subject to an AMR:

- steel and other metals
- concrete

The intake structure component intended functions within the scope of license renewal include the following:

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- rated fire barrier to confine or retard a fire from spreading
- protective barrier for flood events
- missile barrier
- structural or functional support to nonsafety-related equipment the failure of which could impact safety-related equipment
- structural or functional support for equipment required to meet fire protection, environmental qualification, pressurized thermal shock (PTS), ATWS, or SBO regulations
- structural or functional support for safety-related equipment

2.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.4.3 and UFSAR Sections 10.6.5, 10.11.3, and 12.2.6 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

The staff evaluated the structural component functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

In RAI 2.4.3-1 dated August 3, 2006, the staff stated that Table 2.4.3 does not include the sluice gate, roller gates, trash racks, stop log guides, traveling screens, and fine screen guides within the intake structure, and the concrete pipe that connects the intake structure to the discharge structure. The staff requested that the applicant provide justification for not including them within the scope of license renewal.

In its response dated September 5, 2006, the applicant provided the following response:

> <u>Sluice gates and roller gates</u>
>
> The roller gates isolate the circulating water bays from the river and have no license renewal intended function. The sluice gate is used for de-icing. De-icing supports normal plant operation and is not credited for emergency operation, since warm circulating water flow would not be available with a loss of offsite power. The gates have no license renewal intended function and are not included in LRA Table 2.4-3.
>
> <u>Trash racks and traveling screens</u>
>
> The trash racks and traveling screens remove debris from the circulating and SW system flow path to prevent plugging of the condenser water box inlets and loss of SW flow. The circulating water bays and the SW bays have separate flow paths sharing a common wall. The trash racks prevent the high circulating water velocity from drawing large debris into the circulating water bays during normal plant operation. However, during emergency operations, the circulating water pumps are unnecessary and, in fact, may be unavailable due to a loss of offsite power. For normal and emergency operations, the SW pumps draw a much lower volume of water through the SW bays. The lower flow rates of the SW system are insufficient to transport large debris that could prevent the traveling screens from passing adequate flow to the SW pumps to allow for safe shutdown. Therefore, trash racks do not provide a license renewal intended function as required by 10 CFR 54.4(a)(1), (a)(2) or (a)(3).
>
> The structural supports for the traveling screens are part of the screen-house structure, which is within the scope of license renewal and subject to an AMR. The traveling screens themselves perform their function with moving parts and a change in configuration and are therefore, not subject to an AMR in accordance with 10 CFR 54.21 (a)(I)(i), and are not included in LRA Table 2.4-3.
>
> <u>Stop log guides and fine screen guides</u>
>
> The stop log guides and fine screen guides do not perform a license renewal intended function. The purpose of the stop log guides is to hold temporary stop logs in place to allow inspections or maintenance. The fine screen guides do not perform a license renewal intended function because a fine screen is not utilized at VYNPS. Therefore, the stop log and fine screen guides do not provide a license renewal intended function as required by 10 CFR 54.4(a)(1), (a)(2) or (a)(3).

Concrete pipe

The concrete pipe connecting the intake structure to the discharge structure provides recirculation of warm condenser circulating water to keep the circulating water intake bays and SW bays free of ice. De-icing supports normal plant operation and is not credited for emergency operation, since warm circulating water flow would not be available with a loss of offsite power. Therefore, the concrete pipe does not provide a license renewal intended function as required by 10 CFR 54.4(a)(1), (a)(2) or (a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.4.3-1 acceptable because the applicant has provided sufficient explanations for the function of the sluice gate, roller gates, trash racks, stop log guides, traveling screens and fine screen guides within the intake structure, and the concrete pipe that connects the intake structure to the discharge structure, and the basis of their exclusion from the license renewal intended function requirements of 10 CFR 54.4(a)(1), (2) or (3). The staff's concern described in RAI 2.4.3-1 is resolved.

2.4.3.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the intake structure components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.4 Process Facilities

2.4.4.1 Summary of Technical Information in the Application

LRA Section 2.4.4 describes the process facilities, buildings or structures designated as either seismic Class I or II for power generation and supporting processes with concrete floor slabs, structural steel floors, and platforms as required supported by concrete or structural steel columns, base slabs, and walls. Process facilities include alternate cooling cells and the cooling tower No. 2 deep basin, the control building, the plant stack, and the turbine building. Alternate cooling cell No. 2-1 and the cooling tower No. 2 deep basin provide a heat sink to remove decay heat and sensible heat from the primary system so the reactor can be shut down safely when the SW pumps are not available. Alternate cooling cell No. 2-1, adjoining cooling cell 2-2, and the cooling tower No. 2 deep basin, support and protect structures necessary for the heat sink.

The control building houses instrumentation and switches required for station operation with major instrumentation in the main control room. The cable vault and east and west switchgear rooms occupy the lower levels of the building. The plant stack (or main stack) discharges gases to the atmosphere from portions of the turbine building, reactor building, RDW building, SBGT system, and advanced off-gas system. The height of the stack ensures an elevated release and an enclosure at its base contains monitoring equipment. The turbine building houses the TG and auxiliaries including the condensate, feedwater, DG, and water treatment systems. Portions of the turbine building support and protect the EDGs and FO day tank areas.

The process facilities have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related process facility SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the process facilities perform functions that support fire protection.

LRA Table 2.4-4 identifies the following process facilities component types within the scope of license renewal and subject to an AMR:

- steel and other metals
- concrete
- elastomer and other materials

The process facilities component intended functions within the scope of license renewal include the following:

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- rated fire barrier to confine or retard a fire from spreading
- protective barrier for flood events
- heat sink during SBO or DBAs
- missile barrier
- pressure boundary
- structural or functional support to nonsafety-related equipment the failure of which could impact safety-related equipment
- structural or functional support for equipment required to meet fire protection, environmental qualification, PTS, ATWS, or SBO regulations
- structural or functional support for safety-related equipment

2.4.4.2 Staff Evaluation

The staff reviewed LRA Section 2.4.4 and UFSAR Sections 10.8, 11.9, 12.2.3, 12.2.4, 12.2.5, and 12.2.6.4 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

The staff evaluated the structural component functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

In RAI 2.4.4-1 dated August 3, 2006, the staff stated that Table 2.4.4 lists "Structural steel" as a component, and "Structural steel: beams, columns, plates ” as another component. The staff requested that the applicant provide clarification for the two different components.

In its response dated September 5, 2006, the applicant provided the following response:

> Table 2.4.4 lists these two different components.
>
> "Structural steel: beams, columns, plates" is defined as:
>
> - substructure or superstructure steel that is part of the primary structural support function of a building or structure, such as structural columns, support girders, beams, plates, connections, roofing joists, purlins, and wind bracing.
>
> "Structural steel" is defined as:
>
> - steel which does not perform a primary structural integrity function for a building but does provide secondary structural support for equipment or components within the building, or it may provide protection around openings in floors or walls and metal decking on the bottom of reinforced concrete floor slabs. Structural steel includes items such as grating, grating supports, embedded channels, angles, frames, and embedded inserts such as Unistrut™.

Based on its review, the staff finds the applicant’s response to RAI 2.4.4-1 acceptable because it distinguishes the primary structural support function from a secondary structural support function of steel members. The staff’s concern described in RAI 2.4.4-1 is resolved.

2.4.4.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the process facilities components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.5 Yard Structures

2.4.5.1 Summary of Technical Information in the Application

LRA Section 2.4.5 describes the yard structures, structures not contained within the primary containment, reactor building, intake structure, or process facilities. Yard structures include the condensate storage tank foundation and enclosure structure, FO storage tank foundation and transfer pump house, N_2 storage tank foundation and enclosure, low-pressure CO_2 tank foundation and enclosure, JDD building, startup transformer foundation, switchyard relay house, trenches, manholes, duct banks, Vernon tie transformer foundation, Vernon Dam and hydroelectric station, and transmission towers. The condensate storage tank is near the southeast corner of the turbine building. The carbon steel enclosure houses safety-related equipment of the CST system. The FO storage tank holds make-up fuel for the EDG day tanks. A FO transfer pump house contains the FO pumps. The liquid N_2 storage tank enclosure is a seismic Class I structure designed so no instantaneous introduction of a high concentration of N_2 gas into the DG air intake occurs if the storage tank fails. A restraining wall around the base of the tank collects liquid N_2 and minimizes surface area to limit the boil-off rate of spilled N_2. The tank, located adjacent to the east side of the reactor building, is supported by a reinforced concrete foundation and structural steel support columns to meet seismic design requirements. The reinforced concrete CO_2 tank (TK-115-1) foundation is adjacent to the northeast corner of the switchgear room. A metal enclosure houses and protects electrical and mechanical equipment for the tank against the environment.

The JDD powers emergency lighting credited for alternate shutdown in the safe shutdown capability analysis. The start-up transformers (T-3A & B) on the west side of the turbine building are supported by reinforced concrete pedestals raised above a crushed rock bed. The startup transformers provide power during recovery from SBO. The switchyard control house, also known as the switchyard relay house, a single-story structure in the main switchyard, houses relays that control the offsite 115 kV lines. The trenches, manholes and duct banks throughout the VYNPS site, support and protect plant equipment. Those that support or protect equipment within the scope of license renewal are also in-scope. Duct banks route electrical cables between buildings and in the switchyard area.

The Vernon tie transformer is on a reinforced concrete slab located approximately 50 feet northwest of the west cooling tower and formed on a gravel and sand base to minimize frost heaving. The Vernon tie transformer is credited for SBO. Vernon Dam on the Connecticut River is constructed of concrete and steel and used for hydro-electric generation as an alternate source of AC power in an SBO. The dam and powerhouse are founded on compact rock and the power block superstructure is comprised of reinforced concrete, masonry brick, and structural steel. The dam is not a site structure owned by the applicant. Transmission towers are constructed of galvanized steel reinforced concrete foundations. In-scope towers are the 115 kV tower in the 115 kV switchyard, the 115KV angle tower located west of the turbine building, and the 115/345 kV shared tower in the 345 kV switchyard.

The yard structures have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related yard structure SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the yard structures perform functions that support fire protection and SBO.

LRA Table 2.4-5 identifies the following yard structures component types within the scope of license renewal and subject to an AMR:

- steel and other metals
- concrete

The yard structures component intended functions within the scope of license renewal include the following:

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- protective barrier for flood events
- missile barrier
- structural or functional support to nonsafety-related equipment the failure of which could impact safety-related equipment
- structural or functional support for equipment required to meet fire protection, environmental qualification, PTS, ATWS, or SBO regulations
- structural or functional support for safety-related equipment

2.4.5.2 Staff Evaluation

The staff reviewed LRA Section 2.4.5 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

The staff evaluated the structural component functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

In RAI 2.4.5-1 dated August 3, 2006, the staff stated that Table 2.4.5 lists "Vernon Dam external walls above/below grade" as a component, and "Vernon Dam external walls, floor slabs and interior walls" as another component. The staff requested that the applicant provide clarification for the two different components.

In its response dated September 5, 2006, the applicant provided the following response:

> In Table 2.4.5, item "Vernon Dam external walls above/below grade" refers to the outside surface of the exterior walls and the second line item "Vernon Dam external walls, floor slabs and interior walls" refers to the interior surface of the exterior walls along with floors and interior walls. This distinction is consistent with the treatment of each of these as having separate environments as shown in Table 3.5.2-5.

Based on its review, the staff finds the applicant's response to RAI 2.4.5-1 acceptable because it distinguishes the exterior surface of the Vernon Dam wall from the interior surface of the wall, which are subjected to different environments. The staff's concern described in RAI 2.4.5-1 is resolved.

2.4.5.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the yard structures components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.6 Bulk Commodities

2.4.6.1 Summary of Technical Information in the Application

LRA Section 2.4.6 describes the bulk commodities, structural components or commodities that perform or support intended functions of in-scope SSCs. Bulk commodities unique to specific structures are included in the reviews for those structures (SER Sections 2.4.1 through 2.4.5). This section addresses bulk commodities common to in-scope SSCs (e.g., anchors, embedments, pipe and equipment supports, instrument panels and racks, cable trays, and conduits).

The bulk commodities have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related bulk commodity SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the bulk commodities perform functions that support fire protection, ATWS, SBO, and environmental qualification.

LRA Table 2.4-6 identifies the following bulk commodity component types within the scope of license renewal and subject to an AMR:

- steel and other metals
- concrete
- elastomers and other materials
- fluoropolymers and lubrite sliding surfaces

The bulk commodity component intended functions within the scope of license renewal include the following:

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- rated fire barrier to confine or retard a fire from spreading
- protective barrier for flood events
- insulation
- missile barrier
- pressure boundary
- structural or functional support to nonsafety-related equipment the failure of which could

impact safety-related equipment

- structural or functional support for equipment required to meet fire protection, Environmental qualification, PTS, ATWS, or SBO regulations
- structural or functional support for safety-related equipment

2.4.6.2 Staff Evaluation

The staff reviewed LRA Section 2.4.6 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

The staff evaluated the structural component functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions as required by 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR as required by 10 CFR 54.21(a)(1).

In RAI 2.4.6-1 dated August 3, 2006, the staff stated that Table 2.4.6 lists "Flood curbs" as a component with intended functions for flood barrier and shelter or protection, and another component "Flood curbs" with an intended function for flood barrier. The staff requested that the applicant provide clarification for the two different components.

In its response dated September 5, 2006, the applicant provided the following response:

> For VYNPS, flood curbs constructed of either concrete or steel perform the same intended function, which is to provide shelter or protection by serving as flood barriers. In essence, flood barrier and shelter or protection are the same function and both entries for flood curbs fulfill the same function.

Based on its review, the staff finds the applicant’s response to RAI 2.4.6-1 acceptable because the applicant explained that the two entries for flood curbs perform the same intended function. The staff’s concern described in RAI 2.4.6-1 is resolved.

2.4.6.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal or subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the bulk commodities components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.5 Scoping and Screening Results: Electrical and Instrumentation and Control Systems

This section documents the staff's review of the applicant's scoping and screening results for electrical and instrumentation and control (EIC) systems.

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list passive, long-lived SCs within the scope of license renewal and subject to an AMR. To verify that the applicant properly implemented its methodology, the staff's review focused on the implementation results. This focus allowed the staff to confirm that there were no omissions of EIC system components that meet the scoping criteria and subject to an AMR.

The staff's evaluation of the information in the LRA was the same for all EIC systems. The objective was to determine whether the applicant has identified, as required by 10 CFR 54.4, components and supporting structures for EIC systems that appear to meet the license renewal scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived components were subject to an AMR as required by 10 CFR 54.21(a)(1).

In its scoping evaluation, the staff reviewed the applicable LRA sections and component drawings, focusing on components that have not been identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the UFSAR, for each EIC system to determine whether the applicant has omitted from the scope of license renewal components with intended functions as required by 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions as required by 10 CFR 54.4(a). The staff requested additional information to resolve any omissions or discrepancies identified.

Once the staff completed its review of the scoping results, the staff evaluated the applicant's screening results. For those SCs with intended functions, the staff sought to determine: (1) if the functions are performed with moving parts or a change in configuration or properties, or (2) if they are subject to replacement based on a qualified life or specified time period, as required by 10 CFR 54.21(a)(1). For those that did not meet either of these criteria, the staff sought to confirm that these SCs were subject to an AMR, as required by 10 CFR 54.21(a)(1). If discrepancies were identified, the staff requested additional information to resolve them.

2.5.1 Summary of Technical Information in the Application

LRA Section 2.5 describes the EIC systems. Plant EIC systems are included within the scope of license renewal as are EIC components in mechanical systems. The default inclusion of plant EIC systems within the scope of license renewal reflects the method for IPAs of electrical systems. This method differs from those used for IPAs of mechanical systems and structures.

VYNPS electrical commodity groups correspond to two of the commodity groups identified in NEI 95-10: (1) high-voltage insulators and (2) cables and connections, busses, and electrical portions of EIC penetration assemblies. The IPA eliminated commodity groups and specific plant systems from further review as the intended functions of commodity groups were examined. In addition to the plant electrical systems, certain switchyard components required to restore offsite power following a SBO were conservatively included within the scope of license renewal although they are not relied on in safety analyses or plant evaluations to perform functions for compliance with SBO regulations. The offsite power system provides the electrical interconnection between the generator and the offsite transmission network and between the offsite network and the auxiliary buses as well as other buildings and facilities.

The EIC systems perform functions that support SBO.

LRA Table 2.5-1 identifies the following EIC systems component types within the scope of license renewal and subject to an AMR:

- cable connections (metallic parts)
- electrical cables, connections, and fuse holders (insulation) not subject to 10 CFR 50.49 Environmental qualification requirements
- electrical cables not subject to 10 CFR 50.49 Environmental qualification requirements used in instrumentation circuits
- fuse holders (insulation material)
- high-voltage insulators
- inaccessible medium-voltage (4.16 kV to 22 kV) cables (e.g., installed underground in conduit or direct buried) not subject to 10 CFR 50.49 Environmental qualification requirements
- switchyard bus
- transmission conductors

The EIC systems component intended functions within the scope of license renewal include the following:

- electrical connections to deliver voltage, current, or signals
- electrical conductor insulation and support

2.5.2 Staff Evaluation

The staff reviewed LRA Section 2.5 and UFSAR Sections 7 and 8 using the evaluation methodology described in SER Section 2.5. The staff conducted its review in accordance with the guidance described in SRP-LR Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Controls Systems.” The staff reviewed the scoping methodology of the applicant, and considered it to be acceptable in accordance with the “Plant Spaces” approach method in NUREG-1800, Revision 1, Table 2.5.1. This approach eliminates the need for unique identification of every component and its specific location. This assures components are not excluded from an AMR.

As documented in SER, Section 3.6.2.3.1, the staff determined that uninsulated ground conductors are not in the scope of licence renewal and do not require an AMR.

In RAI 2.5-1, the staff requested the applicant to provide brief descriptions of the systems, listed in LRA Table 2.2-1b, explaining how each system serves one or more functions listed in 10 CFR 54.4(a).

In its response dated September 5, 2006, the applicant stated that:

> As described in LRA Section 2.5, all plant electrical and Instrumentation and Control (EIC) systems are included in the scope of license renewal. EIC equipment in mechanical systems is included in the scope of license renewal, regardless of whether the mechanical system is included in-scope. Including components beyond those actually required is referred to as an encompassing review. This method eliminates the need for unique identification of each system and its specific function. This assures components are not improperly excluded from the scope of license renewal.

Based on its review, the staff finds the above response to the RAI 2.5-1 acceptable because when used with “Plant Spaces”approach, this method eliminates the need for unique identification of each system and its specific function. The staff’s concern described in RAI 2.5-1 is resolved.

In RAI 2.5-2, the staff requested the applicant to provide details of Vermont Yankee Nuclear Power Station used as an alternate current (AAC) source, and also describe the offsite power recovery paths from switchyard to the onsite distribution which are in the license renewal scope to satisfy the requirements of 10 CFR 50.63.

In its response dated September 5, 2006, the applicant stated that:

> The parts of the AAC that are subject to AMR are explained in the response to RAI 3.6.2.2-N-08. The offsite power recovery paths from switchyard to the onsite distribution system which are in the license renewal scope are the source fed through the start-up transformers and a delayed access circuit from the 345 kV switchyard through the main and auxiliary transformers via the isophase bus. Specifically, the start-up transformer path includes; the 115 kV switchyard circuit breaker feeding the start-up transformers, the start-up transformers, the circuit breaker-to-transformers and transformer-to-onsite electrical distribution interconnections, and the associated control circuits and structures. The delayed access circuit is made available by opening the generator no-load disconnect switch and establishing a feed from the 345kV switchyard through the main and auxiliary transformers via the isophase bus.

The staff reviewed the applicant response to RAI 3.6.2.2-N-08, provided in the letter dated July 14, 2006, in which it stated that the VHS is the AAC source credited for Vermont Yankee Nuclear Power Station (VYNPS) to demonstrate compliance with 10 CFR 50.63, loss of all alternating current power (the station blackout rule). As such, all VHS structures, systems, and components (SSCs) are in the scope of license renewal.

Based on its review of the response to RAI 3.6.2.2-N-08, and further clarifications provided by the applicant in its letter dated January 4, 2007, Attachment 4, the staff finds the applicant's response to RAI 2.5-2 acceptable because the applicant has included all necessary components of the AAC source in the scope of license renewal. The staff's concern described in RAI 2.5-2 is resolved.

The applicant initially excluded metal-enclosed bus connections, and bus enclosure assemblies and insulators from the AMR. However, in its response dated September 5, 2006 to the staff's RAI 2.5-3, the applicant clarified that the metal-enclosed isophase bus is now included in the AMR. This isophase bus is part of the delayed access circuit (to support SBO recovery actions) from the 345 kV switchyard through the main generator step-up transformer and unit auxiliary transformer. The applicant stated that the VYNPS Metal Enclosed Bus Program will manage the effects of aging of the isophase bus and will be consistent with the GALL Report aging management program X1.E4 (NUREG-1801, Volume 2, Rev 1).

Based on above response provided by the applicant in its letter dated September 5, 2006, the staff considers that the applicant has included necessary components of the metal-enclosed bus connections, bus enclosure assemblies and insulators subject to an AMR. The RAI 2.5-3 response is considered acceptable. The staff's concern described in RAI 2.5-3 is resolved.

In RAI 2.5-4, the staff asked the applicant to provide justification, in detail, why the cable connections (metallic portion) was not included in the scope of an AMR although the GALL Report aging management program XI.E6, "Electrical Cable Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements," recommended such an aging managing program.

In its letter dated September 5, 2006, the licensee provided the following justification:

> Metallic parts of electrical cable connections that are exposed to thermal cycling and ohmic heating are those carrying significant current in power supply circuits. VYNPS power cables are in a continuous run from the supply to the load. The connections to the supply and to the load are parts of active components that are not subject to aging management review in accordance with 10 CFR 54.21. As discussed in the statement of considerations for the license renewal rule, maintenance rule activities are credited with managing the effects of aging on active components.
> The fast action of circuit protective devices at high currents mitigates stresses associated with electrical faults and transients. In addition, mechanical stress associated with electrical faults is not a credible aging mechanism because of the low frequency of occurrence for electrical faults. Therefore, electrical transients are not aging mechanisms.
>
> Metallic parts of electrical cable connections exposed to vibration are those associated with active components that cause vibration. Active components are not subject to aging management review in accordance with 10 CFR 54.21. As discussed in the statement of considerations for the license renewal rule, maintenance rule activities are credited with managing the effects of aging on active components.

Corrosive chemicals are not stored in most areas of the plant. Routine releases of corrosive chemicals to areas inside plant buildings do not occur during plant operation and corrosive chemicals are not a normal environment for electrical connections. Contamination of electrical connections causes rapid degradation independent of the age of the connection components. Corrosion due to contamination is due to the contamination event rather than aging. Therefore, chemical contamination is not an aging mechanism for electrical connections.

Corrosion and oxidation occur in the presence of moisture or contamination such as industrial pollutants and salt deposits. Enclosures and splice materials protect metal connections from moisture and contamination. Therefore, oxidation and corrosion are not applicable aging mechanisms.

Electrical cable connections at VYNPS are inspected in accordance with the maintenance rule program as directed by plant procedures. The maintenance rule program, based on industry guidance provided in NUMARC 93-01 and Reg. Guide 1.160, complies with 10 CFR 50.65. The maintenance rule program includes performance monitoring and trending. Monitoring and trending includes normal plant maintenance activities. Maintenance includes activities associated with identifying and correcting actual or potential degraded conditions (e.g., repair, surveillance, diagnostic examinations, and preventive measures).

Thermography is used to detect potential degraded conditions. Thermography can detect "hot spots" in cable connections that are indicative of a high resistance connection.

As a part of the maintenance rule program, periodic assessments are performed. A periodic assessment is performed to evaluate the effectiveness of maintenance activities. This assessment is performed at least every operating cycle, not to exceed 24 months. Plant operating experience has shown that the maintenance rule program has been effective at detecting, evaluating and repairing electrical cable connection degradation.

The maintenance rule program includes scoping, performance monitoring, trending and periodic assessments. This program provides reasonable assurance that electrical cable connections will remain capable of performing their intended functions through the period of extended operation. No aging management program (AMP) for license renewal is required at VYNPS since the regulatory mandated maintenance rule program effectively maintains electrical cable connections.

Subsequent to above response, on November 30, 2006, NEI held a meeting with NRC. Based on this meeting, XI.E6 program was revised to be a one-time inspection of a representative sample of cable connections subject to aging management review. In its letter dated January 4, 2007, Attachment 7, the applicant agreed to plant-specific, Bolted Cable Connection Program.

Based on licensee agreeing to a Bolted Cable Connection Program as detailed in its letter dated January 4, 2007, the staff considers the issue raised in RAI 2.5-4 resolved.

2.5.3 Conclusion

The staff reviewed the LRA Section 2.5, the UFSAR, and the supplemental information provided by the applicant in its letters dated September 5, 2006, and January 4, 2007, to determine whether any SSCs that should be within the scope of license renewal or subject to an AMR had not been identified by the applicant. No omissions were identified. On the basis of its review, the staff concluded that there is reasonable assurance that the applicant had adequately identified the electrical commodity group components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.6 Conclusion for Scoping and Screening

The staff reviewed the information in LRA Section 2, “Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results,” and determines that the applicant’s scoping and screening methodology was consistent with the requirements of 10 CFR 54.21(a)(1) and the staff’s positions on the treatment of safety-related and nonsafety-related SSCs within the scope of license renewal and on SCs subject to an AMR is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

On the basis of its review, the staff concludes, pending resolution of Confirmatory Items 2.3.3.2-1, 2.3.3.2-2, 2.3.3.12-1, 2.3.3.13a-1, 2.3.3.13e-1, and 2.3.3.13m-1, that the applicant has adequately identified those systems and components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

The staff concludes that there is reasonable assurance that the applicant will continue to conduct the activities authorized by the renewed license in accordance with the CLB and any changes to the CLB in order to comply with 10 CFR 54.21(a)(1), in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

SECTION 3

AGING MANAGEMENT REVIEW RESULTS

This section of the safety evaluation report (SER) evaluates aging management programs (AMPs) and aging management reviews (AMRs) for Vermont Yankee Nuclear Power Station (VYNPS), by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff). In Appendix B of its license renewal application (LRA), Entergy Nuclear Operations, Inc. (ENO or the applicant) described the 36 AMPs that it relies on to manage or monitor the aging of passive, long-lived structures and components (SCs).

In LRA Section 3, the applicant provided the results of the AMRs for those SCs identified in LRA Section 2 as within the scope of license renewal and subject to an AMR.

3.0 Applicant's Use of the Generic Aging Lessons Learned Report

In preparing its LRA, the applicant credited US NRC NUREG-1801, Volume 2, Revision 1, "Generic Aging Lessons Learned (GALL) Report," dated September 2005. The GALL Report contains the staff's generic evaluation of the existing plant programs and documents the technical basis for determining where existing programs are adequate without modification, and where existing programs should be augmented for the period of extended operation. The evaluation results documented in the GALL Report indicate that many of the existing programs are adequate to manage the aging effects for particular license renewal SCs. The GALL Report also contains recommendations on specific areas for which existing programs should be augmented for license renewal. An applicant may reference the GALL Report in its LRA to demonstrate that its programs correspond to those reviewed and approved in the report.

The purpose of the GALL Report is to provide a summary of staff-approved AMPs to manage or monitor the aging of SCs subject to an AMR. If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources for LRA review will be greatly reduced, improving the efficiency and effectiveness of the license renewal review process. The GALL Report also serves as a quick reference for applicants and staff reviewers to AMPs and activities that the staff determines will adequately manage or monitor aging during the period of extended operation.

The GALL Report identifies: (1) systems, structures, and components (SSCs), (2) SC materials, (3) environments to which the SCs are exposed, (4) the aging effects of the materials and environments, (5) the AMPs credited with managing or monitoring the aging effects, and (6) recommendations for further applicant evaluations of aging management for certain component types.

To determine whether use of the GALL Report would improve the efficiency of LRA review, the staff conducted a demonstration of the GALL Report process in order to model the format and content of safety evaluations (SEs) based on it. The results of the demonstration project confirmed that the GALL Report process will improve the efficiency and effectiveness of LRA review, while maintaining the staff's focus on public health and safety. NUREG-1800, Revision 1, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (SRP-LR), dated September 2005, was prepared based on both the GALL Report model and lessons learned from the demonstration project.

The staff’s review was in accordance with Title 10, Part 54, of the *Code of Federal Regulations* (10 CFR 54), “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” and the guidance of the SRP-LR and the GALL Report.

In addition to its review of the LRA, the staff conducted an onsite audit of selected AMRs and associated AMPs, during the weeks of April 17-21, 2006, May 15-19, 2006 and June 26-28, 2006. The staff documented the results of its audit and review in “Audit and Review Report for Plant Aging Management Reviews and Programs, Vermont Yankee Nuclear Power Station” (Audit and Review Report). The onsite audits and reviews are designed for maximum efficiency of the staff’s LRA review. The applicant can respond to questions and, the staff can readily evaluate the applicant's responses, the need for formal correspondence between the staff and the applicant is reduced, and the result is an improvement in review efficiency.

3.0.1 Format of the License Renewal Application

The applicant submitted an application that follows the standard LRA format agreed to by the staff and the Nuclear Energy Institute (NEI) agreed by letter dated April 7, 2003 (ML030990052). This revised LRA format incorporates lessons learned from the staff's reviews of the previous five LRAs, which used a format developed from information gained during a staff-NEI demonstration project conducted to evaluate the use of the GALL Report in the LRA review process.

The organization of LRA Section 3 parallels that of SRP-LR Chapter 3. LRA Section 3 presents AMR results information in the following two table types:

(1) Table 1s: Table 3.x.1 – where “3” indicates the LRA Section number, “x” indicates the subsection number from the GALL Report, and “1” indicates that this table type is the first in LRA Section 3.
(2) Table 2s: Table 3.x.2-y – where “3” indicates the LRA Section number, “x” indicates the subsection number from the GALL Report, “2” indicates that this table type is the second in LRA Section 3, and “y” indicates the system table number.

The content of the previous LRAs and of the VYNPS application is essentially the same. The intent of the revised format of the VYNPS LRA was to modify the tables in LRA Section 3 to provide additional information that would assist in the staff’s review. In its Table 1s, the applicant summarized the portions of the application that it considered to be consistent with the GALL Report. In its Table 2s, the applicant identified the linkage between the scoping and screening results in LRA Section 2 and the AMRs in LRA Section 3.

3.0.1.1 Overview of Table 1s

Each Table 1 compares in summary how the facility aligns with the corresponding tables in the GALL Report. The tables are essentially the same as Tables 1 through 6 in the GALL Report, except that the “Type” column has been replaced by an “Item Number” column and the “Item

Number in GALL" column has been replaced by a "Discussion" column. The "Item Number" column is a means for the staff reviewer to cross-reference Table 2s with Table 1s. In the "Discussion" column the applicant provided clarifying information. The following are examples of information that might be contained within this column:

- further evaluation recommended - information or reference to where that information is located
- The name of a plant-specific program
- exceptions to GALL Report assumptions
- discussion of how the line is consistent with the corresponding line item in the GALL Report when the consistency may not be obvious
- discussion of how the item is different from the corresponding line item in the GALL Report (e.g., when an exception is taken to a GALL AMP)

The format of each Table 1 allows the staff to align a specific row in the table with the corresponding GALL Report table row so that the consistency can be checked easily.

3.0.1.2 Overview of Table 2s

Each Table 2 provides the detailed results of the AMRs for components identified in LRA Section 2 as subject to an AMR. The LRA has a Table 2 for each of the systems or structures within a specific system grouping (e.g., reactor coolant systems, engineered safety features (ESF), auxiliary systems, etc.). For example, the ESF group has tables specific to the core spray system (CSS), high pressure coolant injection system (HPCIS), and residual heat removal system (RHRS). Each Table 2 consists of nine columns:

(1) Component Type – The first column lists LRA Section 2 component types subject to an AMR in alphabetical order.

(2) Intended Function – The second column identifies the license renewal intended functions, including abbreviations, where applicable, for the listed component types. Definitions and abbreviations of intended functions are in LRA Table 2.0-1.

(3) Material – The third column lists the particular construction material(s) for the component type.

(4) Environment – The fourth column lists the environments to which the component types are exposed. Internal and external service environments are indicated with a list of these environments in LRA Tables 3.0-1, 3.0-2, and 3.0-3.

(5) Aging Effect Requiring Management – The fifth column lists aging effects requiring management (AERM). As part of the AMR process, the applicant determined any AERMs for each combination of material and environment.

(6) Aging Management Programs – The sixth column lists the AMPs that the applicant uses to manage the identified aging effects.

(7) NUREG-1801 Volume 2 Item – The seventh column lists the GALL Report item(s) identified in the LRA as similar to the AMR results. The applicant compares each

combination of component type, material, environment, AERM, and AMP in LRA Table 2 with the GALL Report items. If there are no corresponding items in the GALL Report, the applicant leaves the column blank in order to identify the AMR results in the LRA tables corresponding to the items in the GALL Report tables.

(8) Table 1 Item – The eighth column lists the corresponding summary item number from LRA Table 1. If the applicant identifies in each LRA Table 2 AMR results consistent with the GALL Report, the associated Table 1 line item summary number should be listed in LRA Table 2. If there is no corresponding item in the GALL Report, column eight is left blank. In this manner, the information from the two tables can be correlated.

(9) Notes – The ninth column lists the corresponding notes used to identify how the information in each Table 2 aligns with the information in the GALL Report. The notes, identified by letters, were developed by an NEI work group and will be used in future LRAs. Any plant-specific notes identified by numbers provide additional information about the consistency of the line item with the GALL Report.

3.0.2 Staff's Review Process

The staff conducted three types of evaluations of the AMRs and AMPs:

(1) For items that the applicant stated were consistent with the GALL Report the staff conducted either an audit or a technical review to determine such consistency.

(2) For items that the applicant stated were consistent with the GALL Report with exceptions, enhancements, or both, the staff conducted either an audit or a technical review of the item to determine such consistency. In addition, the staff conducted either an audit or a technical review of the applicant's technical justifications for the exceptions or the adequacy of the enhancements.

The SRP-LR states that an applicant may take one or more exceptions to specific GALL AMP elements; however, any deviation from or exception to the GALL AMP should be described and justified. Therefore, the staff considers exceptions as being portions of the GALL AMP that the applicant does not intend to implement.

In some cases, an applicant may choose an existing plant program that does not meet all the program elements defined in the GALL AMP. However, the applicant may make a commitment to augment the existing program to satisfy the GALL AMP prior to the period of extended operation. Therefore, the staff considers these augmentations or additions to be enhancements. Enhancements include, but are not limited to, activities needed to ensure consistency with the GALL Report recommendations. Enhancements may expand, but not reduce, the scope of an AMP.

(3) For other items, the staff conducted a technical review to verify conformance with 10 CFR 54.21(a)(3) requirements.

Staff audits and technical reviews of the applicant's AMPs and AMRs determine whether the effects of aging on SCs can be adequately managed to maintain their intended function(s) consistent with the plant's current licensing basis (CLB) for the period of extended operation, as required by 10 CFR Part 54.

3.0.2.1 *Review of AMPs*

For AMPs for which the applicant claimed consistency with the GALL AMPs, the staff conducted either an audit or a technical review to verify the claim. For each AMP with one or more deviations, the staff evaluated each deviation to determine whether the deviation was acceptable and whether the modified AMP would adequately manage the aging effect(s) for which it was credited. For AMPs not evaluated in the GALL Report, the staff performed a full review to determine their adequacy. The staff evaluated the AMPs against the following 10 program elements defined in SRP-LR Appendix A.

Scope of the Program – Scope of the program should include the specific SCs subject to an AMR for license renewal.

(1) Preventive Actions – Preventive actions should prevent or mitigate aging degradation.

(2) Parameters Monitored or Inspected – Parameters monitored or inspected should be linked to the degradation of the particular structure or component intended function(s).

(3) Detection of Aging Effects – Detection of aging effects should occur before there is a loss of structure or component intended function(s). This includes aspects such as method or technique (i.e., visual, volumetric, surface inspection), frequency, sample size, data collection, and timing of new/one-time inspections to ensure timely detection of aging effects.

(4) Monitoring and Trending – Monitoring and trending should provide predictability of the extent of degradation, as well as timely corrective or mitigative actions.

(5) Acceptance Criteria – Acceptance criteria, against which the need for corrective action will be evaluated, should ensure that the structure or component intended function(s) are maintained in accordance with all CLB design conditions during the period of extended operation.

(6) Corrective Actions – Corrective actions, including root cause determination and prevention of recurrence, should be timely.

(7) Confirmation Process – Confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.

(8) Administrative Controls - Administrative controls should provide for a formal review and approval process.

(9) Operating Experience – Operating experience of the AMP, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support the conclusion that the effects of aging will be adequately managed so that the SC intended function(s) will be maintained during the period of extended operation.

Details of the staff’s audit evaluation of program elements (1) through (6) are documented in SER Section 3.0.3.

The staff reviewed the applicant's quality assurance (QA) program and documented its evaluations in SER Section 3.0.4. The staff's evaluation of the QA program included assessment of the “corrective actions,” “confirmation process,” and “administrative controls” program elements.

The staff reviewed the information on the “operating experience” program element and documented its evaluation in SER Section 3.0.3.

The staff reviewed the Updated Final Safety Analysis Report (UFSAR) Supplement for each AMP to determine if it provided an adequate description of the program or activity, as required by 10 CFR 54.21(d).

3.0.2.2 Review of AMR Results

Each LRA Table 2 contains information concerning whether or not the AMRs identified by the applicant align with the GALL Report AMRs. For a given AMR in a Table 2, the staff reviewed the intended function, material, environment, AERM, and AMP combination for a particular system component type. Item numbers in LRA column seven, “GALL Report Volume 2 Item,” correlates to an AMR combination as identified in the GALL Report. The staff also conducted onsite audits to verify these correlations. A blank in column seven indicates that the applicant was unable to identify an appropriate correlation in the GALL Report. The staff also conducted a technical review of combinations not consistent with the GALL Report. The next column, “Table 1 Item,” refers to a number indicating the correlating row in Table 1.

3.0.2.3 UFSAR Supplement

Consistent with the SRP-LR for the AMRs and AMPs that it reviewed, the staff also reviewed the UFSAR supplement, which summarizes the applicant’s programs and activities for managing the effects of aging for the period of extended operation, as required by 10 CFR 54.21(d).

3.0.2.4 Documentation and Documents Reviewed

In its review, the staff used the LRA, LRA supplements, the SRP-LR, and the GALL Report.

During the onsite audit, the staff also examined the applicant’s justifications to verify that the applicant’s activities and programs will adequately manage the effects of aging on SCs. The staff also conducted detailed discussions and interviews with the applicant’s license renewal project personnel and others with technical expertise relevant to aging management.

3.0.3 Aging Management Programs

SER Table 3.0.3-1 presents the AMPs credited by the applicant and described in LRA Appendix B. The table also indicates the SSCs that credit the AMPs and the GALL AMP with which the applicant claimed consistency and shows the SER section in which the staff's evaluation of the program is documented.

Table 3.0.3-1 VYNPS Aging Management Programs

VYNPS AMP (LRA Section)	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Existing AMPs				
Buried Piping Inspection Program (B.1.1)	Consistent with exceptions and enhancement	XI.M34	ESF systems / auxiliary systems / steam and power conversion systems	3.0.3.2.1
BWR CRD Return Line Nozzle Program (B.1.2)	Consistent with exception	XI.M6	reactor vessel, internals, and reactor coolant system	3.0.3.2.2
BWR Feedwater Nozzle Program (B.1.3)	Consistent with exception	XI.M5	reactor vessel, internals, and reactor coolant system	3.0.3.2.3
BWR Penetrations Program (B.1.4)	Consistent with exceptions	XI.M8	reactor vessel, internals, and reactor coolant system	3.0.3.2.4
BWR Stress Corrosion Cracking Program (B.1.5)	Consistent with exception	XI.M7	reactor vessel, internals, and reactor coolant system	3.0.3.2.5
BWR Vessel Inside Diameter Attachment Welds Program (B.1.6)	Consistent with exception	XI.M4	reactor vessel, internals, and reactor coolant system	3.0.3.2.6
BWR Vessel Internals Program (B.1.7)	Consistent with exceptions and enhancement	XI.M9	reactor vessel, internals, and reactor coolant system	3.0.3.2.7
Containment Leak Rate Program (B.1.8)	Consistent with exception	XI.S4	ESF systems / SC supports	3.0.3.2.8
Diesel Fuel Monitoring Program (B.1.9)	Consistent with exceptions and enhancements	XI.M30	auxiliary systems	3.0.3.2.9
Environmental Qualification of Electric Components Program (B.1.10)	Consistent	X.E1	electrical and instrumentation and controls	3.0.3.1.1

VYNPS AMP (LRA Section)	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Fatigue Monitoring Program (B.1.11)	Consistent with exceptions and enhancements	X.M1	reactor vessel, internals, and reactor coolant system / ESF systems / auxiliary systems / steam and power conversion systems / SC supports	3.0.3.2.10
Fire Protection Program (B.1.12.1)	Consistent with exceptions and enhancements	XI.M26	auxiliary systems / SC supports	3.0.3.2.11
Fire Water System Program (B.1.12.2)	Consistent with exception and enhancements	XI.M27	auxiliary systems	3.0.3.2.12
Flow-Accelerated Corrosion Program (B.1.13)	Consistent	XI.M17	reactor vessel, internals, and reactor coolant system / ESF systems / auxiliary systems / steam and power conversion systems	3.0.3.1.2
Containment Inservice Inspection Program (B.1.15.1)	Plant-specific	NA	SC supports	3.0.3.3.2
Inservice Inspection Program (B.1.15.2)	Plant-specific	NA	reactor vessel, internals, and reactor coolant system / SC supports	3.0.3.3.3
Instrument Air Quality Program (B.1.16)	Plant-specific	NA	auxiliary systems	3.0.3.3.4
Oil Analysis Program (B.1.20)	Consistent with exception	XI.M39	ESF systems / auxiliary systems	3.0.3.2.13
Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Plant-specific	NA	ESF systems / auxiliary systems / steam and power conversion systems / SC supports	3.0.3.3.5
Reactor Head Closure Studs Program (B.1.23)	Consistent with exception	XI.M3	reactor vessel, internals, and reactor coolant system	3.0.3.2.14
Reactor Vessel Surveillance Program (B.1.24)	Consistent with enhancement	XI.M31	reactor vessel, internals, and reactor coolant system	3.0.3.2.15
Service Water Integrity Program (B.1.26)	Consistent with exceptions	XI.M20	ESF systems / auxiliary systems	3.0.3.2.16
Masonry Wall Program (B.1.27.1)	Consistent	XI.S5	SC supports	3.0.3.1.8
Structures Monitoring Program (B.1.27.2)	Consistent with enhancements	XI.S6	SC supports	3.0.3.2.17

VYNPS AMP (LRA Section)	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Vernon Dam Federal Energy Regulatory Commission Inspection (B.1.27.3)	Plant-specific	NA	SC supports	3.0.3.3.6
System Walkdown Program (B.1.28)	Consistent	XI.M36	reactor vessel, internals, and reactor coolant system / ESF systems / auxiliary systems / steam and power conversion systems	3.0.3.1.9
Water Chemistry Control - Auxiliary Systems Program (B.1.30.1)	Plant-specific	NA	ESF systems / auxiliary systems	3.0.3.3.7
Water Chemistry Control - BWR Program (B.1.30.2)	Consistent	XI.M2	reactor vessel, internals, and reactor coolant system / ESF systems / auxiliary systems / steam and power conversion systems	3.0.3.1.11
Water Chemistry Control - Closed Cooling Water Program (B.1.30.3)	Consistent with exception	XI.M21	reactor vessel, internals, and reactor coolant system / ESF systems / auxiliary systems / steam and power conversion systems	3.0.3.2.18
New AMPs				
Heat Exchanger Monitoring Program (B.1.14)	Plant-specific	NA	ESF systems / auxiliary systems	3.0.3.3.1
Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program (B.1.17)	Consistent	XI.E3	electrical and instrumentation and controls	3.0.3.1.3
Non-Environmental Qualification Instrumentation Circuits Test Review Program (B.1.18)	Consistent	XI.E2	electrical and instrumentation and controls	3.0.3.1.4
Non-Environmental Qualification Insulated Cables and Connections Program (B.1.19)	Consistent	XI.E1	electrical and instrumentation and controls	3.0.3.1.5

VYNPS AMP (LRA Section)	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
One-Time Inspection Program (B.1.21)	Consistent	XI.M32 XI.M35	ESF systems / auxiliary systems	3.0.3.1.6
Selective Leaching Program (B.1.25)	Consistent	XI.M33	ESF systems / auxiliary systems	3.0.3.1.7
Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program (B.1.29)	Consistent	XI.M13	reactor vessel, internals, and reactor coolant system	3.0.3.1.10
Bolting Integrity Program (B.1.31)	Consistent with enhancements	XI.M18	reactor vessel, internals, and reactor coolant system; ESF systems; auxiliary systems; steam and power conversion systems; SC supports	3.0.3.2.19
Metal-Enclosed Bus Inspection Program (B.1.32)	Consistent with exceptions	XI.E4	electrical and instrumentation and controls	3.0.3.2.20
Bolted Cable Connections Program (B.1.33)	Plant-specific	NA	electrical and instrumentation and controls	3.0.3.3.8

3.0.3.1 AMPs Consistent with the GALL Report

In LRA Appendix B, the applicant identified the following AMPs as consistent with the GALL Report:

- Environmental Qualification of Electric Components Program
- Flow-Accelerated Corrosion Program
- Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program
- Non-Environmental Qualification Instrumentation Circuits Test Review Program
- Non-Environmental Qualification Insulated Cables and Connections Program
- One-Time Inspection Program
- Selective Leaching Program
- Masonry Wall Program

- System Walkdown Program
- Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program
- Water Chemistry Control - BWR Program

3.0.3.1.1 Environmental Qualification of Electric Components Program

Summary of Technical Information in the Application. LRA Section B.1.10 describes the existing Environmental Qualification of Electric Components Program as consistent with GALL AMP X.E1, “Environmental Qualification of Electric Components.”

The Environmental Qualification of Electric Components Program manages component thermal, radiation, and cyclical aging by aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, environmental qualification components not qualified for the current license term are refurbished or replaced or their qualifications are extended prior to reaching the aging limits established in the evaluation. Aging evaluations for environmental qualification components are considered time-limited aging analyses (TLAAs) for license renewal.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report documents the details of the staff's evaluation of this AMP.

The staff noted that the results of electrical equipment in LRA Section 4.4 indicate that the aging effects of the Environmental qualification electrical equipment identified as a TLAA will be managed during the extended period of operation in accordance with 10 CFR 54.21(c)(1)(iii). However, no information is provided on the attributes of a re-analysis of aging evaluation to extend the qualification life of electrical equipment identified as TLAA. The important attributes of a re-analysis are the analytical methods, the data collection, the reduction methods, the underlying assumptions, the acceptance criteria, and corrective actions. The staff asked the applicant to provide information on these important attributes of re-analysis of an aging evaluation of electrical equipment identified in the TLAA to extend the qualification in accordance with 10 CFR 50.49(e). In its response, the applicant stated that it would supplement VYNPS AMP B.1.10 to include the “Environmental Qualification Component Re-analysis Attributes” specified in GALL AMP X.E1 as follows:

Environmental Qualification Component Re-analysis Attributes:

> The re-analysis of an aging evaluation is normally performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Re-analysis of an aging evaluation to extend the qualification of a component is performed on a routine basis in accordance with 10 CFR 50.49(e) as part of an Environmental Qualification program. While a component life limiting condition may be due to thermal, radiation, or cyclical aging, the vast 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, an unrealistically low activation energy,

or in the application of a component (de-energized versus energized). The re-analysis of an aging evaluation is documented according to the station's quality assurance program requirements, which requires verification of assumptions and conclusions. As already noted, important attributes of a re-analysis 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.

Analytical Methods: The analytical models used in the re-analysis of an aging evaluation are the same as those previously applied during the prior evaluation. The Arrhenius methodology is an acceptable model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation demonstrates qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (that is 60 years/40 years). 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 methods may be justified on a case-by-case basis.

Data Collection and Reduction Methods: Reducing excess conservatism in the component service conditions (for example, temperature, radiation, cycles) used in the prior aging evaluation is the chief method used for a re-analysis. Temperature data used in an aging evaluation is to be conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways, including monitors used for technical specification compliance, other installed monitors, measurement made by plant operators during rounds, and temperature sensors on large motors (while the motor is not running). A representative number of temperature measurement are conservatively evaluated to establish the temperatures used in an aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as (a) directly applying the plant temperature data in the evaluation, or (b) using the plant temperature data to demonstrate conservatism when using plant design temperature for an evaluation. Any changes to material activation energy values as part of a re-analysis are to be justified on a plant-specific basis. Similar methods of reducing excess conservatism in the component service conditions used in prior aging evaluation can be used for radiation and cyclical aging.

Underlying Assumption: environmental qualification component aging evaluation contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected environmental qualification component is evaluated and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.

> Acceptance Criteria and Corrective Actions: The re-analysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by re-analysis, the component is to be refurbished, replaced, or re-qualified prior to exceeding the period for which the current qualification remains valid. A re-analysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace, or re-qualify the component if the re-analysis is unsuccessful.

The staff finds the applicant's response acceptable because a re-analysis of the attributes, which is consistent with the attribute recommended in the GALL Report. In a letter dated January 4, 2007, the applicant revised VYNPS AMP B.1.10 to include the “Environmental Qualification Component Re-Analysis Attributes” as described above.

The staff also asked the applicant to address how it will analyze and evaluate the equipment in the Environmental Qualification of Electric Components Program for 60 years per 10 CFR 54.21. The staff asked the applicant to address in its response whether the environmental conditions (both ambient and accident) resulting from the extended power uprate (EPU) will be used as the basis for the analysis and evaluation going forward. In addition, the staff asked the applicant to confirm that the approach described in the response to this question is consistent with its LRA. In its response, the applicant stated that VYNPS will continue to use the analysis and evaluation techniques described in 10 CFR 50.49 and Institute of Electrical and Electronics Engineers (IEEE) 323 during the renewal period. The equipment in the Environmental Qualification of Electric Components Program is both active and passive. The equipment in the Environmental Qualification of Electric Components Program documentation has recently been updated to reflect the normal and accident environments in accordance with EPU conditions. The program considers equipment degradation from EPU radiation dose, normal and accident (loss of coolant accident (LOCA), high energy line break) temperatures as well as cycling, pressure, humidity, etc. For the period of extended operation, the Environmental Qualification of Electric Components Program requires VYNPS to update the environmental qualification document to reflect the additional life. The environmental conditions (both ambient and accident) resulting from EPU are the basis for evaluations and analysis going forward. This is consistent with the description of the Environmental Qualification of Electric Components Program in the LRA.

The staff finds the applicant's response acceptable because the Environmental Qualification of Electric Components Program is an existing program established to meet VYNPS commitments in accordance with 10 CFR 50.49. The program considers equipment degradation from EPU radiation dose, normal and accident (LOCA, high energy line break) temperatures as well as cycling, pressure, humidity, etc. Compliance with 10 CFR 50.49 provides reasonable assurance that components can perform their intended functions during accident conditions after experience the effects of inservice aging.

The staff reviewed those portions of the applicant’s Environmental Qualification of Electric Components Program for which the applicant claimed consistency with GALL AMP X.E1 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant’s Environmental Qualification of Electric Components Program provided assurance that the applicant’s environmental qualification program provided assurance of aging management of thermal, radiation, and cyclical for electrical equipment, important to safety and located in harsh environments. The staff finds the applicant's Environmental Qualification of Electric Components Program acceptable because it conformed to the recommended GALL AMP X.E1, "Environmental Qualification of Electric Components."

Operating Experience. LRA Section B.1.10 states that Licensee Event Report 97-20 notified the staff of significant program deficiencies including nonconservative analytical methods. Supplementary and confirmatory analyses were completed because the environmental qualification analyses were determined to be nonconservative. This operating experience demonstrates that the corrective action process documents program deficiencies and tracks corrective actions when necessary. QA audits in 2000 and 2002 identified deficiencies in maintenance and content of program documentation. However, a 2004 QA audit and engineering program health report determined that the program is effective and that its administration and maintenance meet regulatory requirements and commitments. The applicant further states that the VYNPS program is in compliance with 10 CFR 50.49. Therefore, the VYNPS program is effective at managing aging effects for electric components.

The staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. On the basis of its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's Environmental Qualification of Electric Components Program will adequately manage the aging effects that are identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies there recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.10, the applicant provided the UFSAR supplement for the Environmental Qualification of Electric Components Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Environmental Qualification of Electric Components Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.2 Flow-Accelerated Corrosion Program

Summary of Technical Information in the Application. LRA Section B.1.13 describes the existing Flow-Accelerated Corrosion Program as consistent with GALL AMP XI.M17, "Flow-Accelerated Corrosion."

This program applies to safety-related and nonsafety-related carbon steel components in systems carrying two phase or single phase high energy fluid greater than or equal to two percent of plant operating time. The program, based on Electric Power Research Institute (EPRI) Report NSAC-202L-R2 recommendations for an effective flow-accelerated corrosion (FAC) program, predicts, detects, and monitors FAC in plant piping and other pressure-retaining components. This program includes (a) an evaluation to determine critical locations, (b) initial operational inspections to determine the extent of thinning at these locations, and (c) followup inspections to confirm predictions or repair or replace components as necessary.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's evaluation of this AMP.

The staff reviewed the VYNPS FAC procedures and noted that VYNPS performs wall thickness examinations in areas adjacent to those locations where the detected wall thickness was less than predicted, and in similar locations in parallel trains, as recommended by EPRI Report NSAC-202L-R2. The staff noted that VYNPS had performed calculations to determine the required minimum wall thickness for all classes of piping, safety-related and non-safety-related, and applied the results to its FAC procedure acceptance criteria. The impact of the 20 percent increased power level on FAC was evaluated in the SER for the EPU license amendment. In the staff's SER for EPU dated March 2, 2006, the staff found that the CHECKWORKS modeling would be updated to account for uprated power conditions. The staff also noted that VYNPS calculates the number of operating cycles remaining before each component reaches its minimum allowable wall thickness, as recommended by CHECKWORKS.

In a letter dated January 31, 2004, VYNPS provided information on typical expected wall thickness changes due to FAC in the main steam drains, moisture separator drains, and turbine across around piping subsequent to power uprate. In this letter, the applicant provided its expected changes to its FAC program. The applicant described the changes to criteria for the selection of piping components for inspection and sample expansion guidelines. The staff noted that the selection criteria were based on CHECKWORKS database, Vermont Yankee operation, and industry operating experience on pipe wall thinning. Computer programs, such as CHECKWORKS, used to predict and track pipe wall thicknesses as a result of FAC are benchmarked against a general range of plant parameters including flow rate. The staff reviewed the changes to the FAC Program and finds that after change the parameters remain in the range that was benchmarked. The staff concluded that, with the changes, the applicant will be able to reestablish the wear rate for those piping which may be impacted by power uprate. On this basis, the staff found the applicant's modified FAC program acceptable.

The staff reviewed those portions of the applicant's Flow-Accelerated Corrosion Program for which the applicant claimed consistency with GALL AMP XI.M17 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant's FAC program provided assurance that the aging effects due to Flow-Accelerated Corrosion Program will be adequately managed during the period of extended operation. The staff finds the applicant's Flow-Accelerated Corrosion Program acceptable because it conformed to the recommended GALL AMP XI.M17, "Flow-Accelerated Corrosion."

Operating Experience. LRA Section B.1.13 states that recent inspection results (refueling outage (RFO) 23) revealed that repairs or replacements were not necessary. Turbine cross-around piping inspections found that 1995 repairs mitigated the rate of erosion and that wall thickness is acceptable. Absence of loss of material due to Flow-Accelerated Corrosion Program proves that the program is effective for managing loss of material for carbon steel lines containing high-energy fluids. Past repairs, replacements, and modifications also have been effective in mitigating Flow-Accelerated Corrosion Program. QA surveillances and self-assessments from 1999 to 2004 revealed no issues or findings that could impact program effectiveness.

The applicant also stated that its has a comprehensive operating experience program that monitors industry events and issues, and assesses them for applicability to its own operations. In addition, VYNPS has a corrective action program (CAP) that is used to track, trend, and evaluate significant plant issues and events. Those issues and events, whether from the industry or plant-specific, that are potentially significant to the Flow-Accelerated Corrosion Program at VYNPS are evaluated. The Flow-Accelerated Corrosion Program is augmented, as appropriate, when these evaluations show that changes to this program will enhance its effectiveness.

In addition, the applicant stated that NRC inspection reports, audits, self assessments, and the CAP for VYNPS were reviewed for pertinent information; however, no findings indicating that the FAC program was ineffective were identified. Some findings identified FAC program weaknesses, which resulted in corrective actions and FAC program enhancements.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the applicant's FAC program, with the corrective actions and enhancements mentioned above, has been effective in identifying, monitoring, and correcting the effects of FAC and can be expected to ensure that piping wall thickness will be maintained above the minimum required by design.

On the basis of its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's FAC program will adequately manage the aging effects that are identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.14, the applicant provided the UFSAR supplement for the Flow-Accelerated Corrosion Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Flow-Accelerated Corrosion Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.3 Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program

Summary of Technical Information in the Application. LRA Section B.1.17 describes the new Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program as consistent with GALL AMP XI.E3, “Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

In this program, periodic actions like inspecting for water collection in cable manholes and conduit and draining water as needed will be taken to prevent cable exposure to significant moisture. In-scope medium-voltage cables exposed to significant moisture and voltage will be tested for an indication of the condition of the conductor insulation. The specific type of test will be determined prior to the initial test. The program will be implemented prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's evaluation of this AMP.

The staff noted that GALL AMP XI.E3, in accordance with the detection of aging effects program element, recommends that the inspection for water collection should be performed based on actual plant experience with water accumulation in the manhole. However, the inspection frequency should be at least once every two years. In the program basis document, in accordance with the same attribute, VYNPS requires inspection for water collection in cable manholes and conduit at least once every two years. It was not clear to the staff that actual plant experience would be considered in the manhole inspection frequency. The staff asked the applicant to explain how actual plant experience was considered in the manhole inspection frequency, as consistent with the GALL Report's recommendation. In its response, the applicant stated that Non-EQ Inaccessible Medium-Voltage Cable Program will be revised to include the following:

> VYNPS inspection for water accumulation in manholes is conducted by a plant procedure. An evaluation per the Corrective Action Process will be used to determine the need to revise manhole inspection frequency based on inspection results.

The staff finds the applicant’s response acceptable because actual plant operating experience will be used to determine the manhole inspection frequency. However, the inspection frequency should be at least once every two years. This is consistent with GALL AMP XI.E3. In a letter dated July 14, 2006, the applicant revised LRA Section B.1.17 as described above.

The staff also noted that GALL AMP XI.E3, in accordance with the program description, recommends, in part, that periodic actions be taken such as inspecting for water collection in cable manholes and draining water, as needed, to prevent cables from being exposed to significant moisture. The above actions are not sufficient to assure water is not trapped elsewhere in the raceways. In addition to the periodic actions, in-scope inaccessible medium-voltage cables are tested to verify the condition of the conductor insulation. In the program basis document, in accordance with the same attribute, VYNPS stated that periodic actions will be taken to prevent cables from being exposed to significant moisture, such as inspecting for water collection in cable manholes and draining water, as needed. In-scope medium-voltage cables exposed to significant moisture and voltage will be tested to provide an indication of the condition of the conductor insulation. It was not clear to the staff if periodic action would be used to preclude cable testings. The staff asked the applicant to confirm that the intent of its Non-EQ Inaccessible Medium-Voltage Cable Program is to test in-scope cables and inspect water accumulation regardless of whether or not water accumulates in the manholes. In its response, the applicant stated that the intent of its Non-EQ Inaccessible Medium-Voltage Cable Program is to inspect for water in manholes and to test in-scope medium voltage cables. The staff finds the applicant’s response acceptable.

In addition, the staff noted that GALL AMP XI.E3 recommends testing of all non-environmental qualification inaccessible medium-voltage cables within the scope of license renewal. The staff asked the applicant to confirm that all inaccessible medium-voltage cables within the scope of license renewal are tested. The applicant responded that all of the in-scope medium-voltage cables will be subject to testing per the program requirements. The staff finds the applicant’s response acceptable because it is consistent with the GALL Report's recommendation.

Further, the staff noted that GALL AMP XI.E3, in accordance with the parameters monitored/inspected program element, recommends that the specific type of test performed will be determined prior to the initial test. Moreover, that it is a proven test for detecting deterioration of the insulation system due to wetting such as power factor, partial discharge test, or polarization index, as described in an EPRI technical report, or other test that is state-of-the-art at the time the test is performed. In the program basis document, in accordance with the same attribute, the applicant stated that the specific type of test performed will be determined prior to initial test. The staff asked the applicant to revise its program basis document to be consistent with the GALL Report or explain how it ensured that the test to be performed will be in accordance with industry guidelines. In its response, the applicant stated that it would revise the LRA to replace the last sentence in the Program Description with:

> The specific type of test to be performed will be determined prior to the initial test and is to be a proven test for detecting deterioration of the insulation system due to wetting as described in the EPRI technical report or other testing that is state-of-the-art at the time the test is performed.

The staff finds the applicant’s response acceptable because it is consistent with the GALL Report in that the type of test will be in accordance with industrial guidelines as described in EPRI technical report or another test that is state-of-the-art at the time the test is performed. In a letter dated July 14, 2006, the applicant revised LRA Section B.1.17 as described above.

Finally, the staff noted that GALL AMP XI.E3 defines a medium-voltage cable as having a voltage level from 2kV to 35kV. The applicant’s Non-EQ Inaccessible Medium-Voltage Cable Program defines a medium-voltage cable as having a voltage level from 2kV to 15kV. The staff asked the applicant to revise the scope of inaccessible medium-voltage levels to be consistent with the GALL Report or provide a technical basis of why the water tree phenomenon is not applicable to a voltage level greater than 15kV. In its response, the applicant stated that VYNPS does not have any in-scope medium-voltage cable that is greater than 15kV. The applicant also stated that they would revise LRA Section B.1.17 to state medium-voltage cables include cables with operating voltage level from 2kV to 35kV. The staff finds the applicant’s response acceptable because the scope of the program would be consistent with the GALL Report. In a letter dated July 14, 2006, the applicant revised LRA Section B.1.17 as described above.

The underground power lines, which run from the adjacent Vernon Hydroelectric Station (VHS) to station switchgear, have been designated as the station blackout (SBO) alternate ac (AAC) source. Thus, they are used to meet SBO requirements 10 CFR 50.63. During the audit and review, the staff asked the applicant if all of these cables were included within the scope of VYNPS AMP B.1.17. The applicant replied that the underground power lines that run from the Vernon Dam switchyard to VYNPS safety-related buses are included in VYNPS AMP B.1.17. The staff noted that there are other underground medium-voltage cables which run from VHS generators to the Vernon Dam switchyard that are not included within the scope of the applicant’s Non-EQ Inaccessible Medium-Voltage Cable Program. The staff issued RAI 3.6.2.2-N-08-3 to address this concern, which is evaluated in SER Section 3.6.2.3.2.

The staff noted that GALL AMP XI.E3 recommends testing of all in-scope inaccessible medium-voltage cables. In addition, the staff asked the applicant to confirm that all in-scope inaccessible medium-voltage cables are tested. The applicant confirmed that all of the in-scope medium-voltage cables will be subject to testing per the program requirements.

The staff reviewed those portions of the applicant's Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program for which the applicant claimed consistency with GALL AMP XI.E3 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant's Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program provided assurance of aging management of conductor insulation due to significant moisture while energized. The staff finds the applicant's Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program acceptable because it conforms to the recommended GALL AMP XI.E3, “Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

Operating Experience. LRA Section B.1.17 states that there is no operating experience for the new Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program.

During the audit and review, the staff noted that GALL AMP X1.E3, in accordance with operating experience, has shown that cross-linked polyethylene or high molecular weight polyethylene insulation materials are most susceptible to water tree formation. The formation and growth of water trees varies directly with operating voltage. Also, minimizing exposure to moisture minimizes the potential for the development of water treeing. As additional operating experience is obtained, lessons learned can be used to adjust the program, as needed. In VYNPS AMP B.1.17, the applicant stated that its Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program is a new program for which there is no operating experience. The staff asked the applicant to address industrial and plant-specific operating experience and confirm that the review did not reveal any degradation not bound by industrial experience. In its response, the applicant stated that it would replace the operating experience discussion in LRA

Section B.1.17 with the following:

> This program is a new AMP. Industry experience that forms the basis for the program is described in the operating experience element of NUREG-1801 program description. VYNPS plant-specific operating has been reviewed against the industry operating experience identified in NUREG-1801. Although VYNPS has not experienced all of the aging effects listed in NUREG-1801, the VYNPS program will manage all of the aging effects identified in the operating experience section of NUREG-1801. The program is based on the program description in NUREG-1801, which in turn is based on relevant industry operating experience. As such, this program will provide assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB for the period of extended operation. As additional operating experience is obtained, lessons learned can be used to adjust the program, as needed.

The staff finds the applicant's response acceptable because the applicant reviewed the plant-specific operating experience against the industry experience identified in the GALL Report. As additional operating experience is obtained, lessons learned can be used to adjust the program elements. In a letter dated July 14, 2006, the applicant revised LRA Section B.1.17 in accordance with operating experience as described above.

The applicant also stated that operating experience at VYNPS is controlled by its operating experience program procedure. VYNPS plant-specific operating experience was reviewed in the applicable program basis document, as documented in the Audit and Review Report, and the results showed that VYNPS has had operating experience that is consistent with industry experience or with the GALL Report aging mechanisms. No new aging mechanism or operating experience was found that is not consistent with industry experience and the GALL Report.

The operating experience program procedure includes the following components:

> Operating experience - Information received from various industry sources that describes events, issues, equipment failures, that may represent opportunities to apply lessons learned to avoid negative consequences or to recreate positive experience as applicable.
>
> Internal operating experience - Operating experience that originates as a condition report or request from plant personnel which warrants consideration for possible Entergy-wide distribution. Internal operating experience can originate from any Entergy plant or headquarters.
>
> Impact Evaluation - Analysis of an operating experience event or problem that requires additional information and research to determine impact or potential impact, as it relates to plant condition and/or configuration. Impact evaluations are typically documented with a condition report. Condition report action items and corrective actions are used to confirm program effectiveness and to modify the program as needed.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. In addition, the staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.19, the applicant provided the UFSAR supplement for the Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.4 Non-Environmental Qualification Instrumentation Circuits Test Review Program

Summary of Technical Information in the Application. LRA Section B.1.18 describes the new Non-Environmental Qualification Instrumentation Circuits Test Review Program as consistent with GALL AMP XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

The Non-Environmental Qualification Instrumentation Circuits Test Review Program will assure maintenance of the intended functions of instrument cables exposed to adverse environments of heat, radiation, and moisture consistent with the CLB through the period of extended operation. An adverse environment is significantly more severe than the service environment specified for the cable. This program will consider the technical information and guidance of NUREG/CR-5643, Institute of Electrical and Electronics Engineers Std. P1205, SAND96-0344, and EPRI TR-109619. The program will start prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's evaluation of this AMP.

The staff noted that GALL AMP XI.E2 recommends that in cases where the calibration or surveillance program does not include a cabling system in the testing circuit (cables disconnected during instrument calibration), the cable testing frequency shall be determined by the applicant based on an engineering evaluation, but the test frequency shall be at least one every ten years. LRA Section A.2.1.20 stated that for cable disconnected during instrument calibration, testing is performed at least once every 10 years. As documented in the Audit and Review Report, the staff asked the applicant to explain how an engineering evaluation is considered in the test frequency; in order to be consistent with the GALL Report's recommendation. In its response, the applicant stated that it would revise LRA Section B.1.18 as follows:

> The first test of neutron monitoring system cables that are disconnected during instrument calibration shall be completed before the period of extended operation and subsequent tests will occur at least every 10 years. In accordance with the CAP, an engineering evaluation will be performed when test acceptance criteria are not met and corrective actions, including modified inspection frequency, will be implemented to ensure that the intended functions of the cables can be maintained consistent with the CLB for the period of extended operation.

The staff finds the applicant’s response acceptable because an engineering evaluation will be considered in the test frequency to ensure that the intended function of in-scope cables is maintained. This is consistent with GALL AMP XI.E2. In a letter dated July 14, 2006, the applicant revised LRA Section B.1.18 as described above.

The staff also noted that GALL AMP XI.E2, in accordance with the corrective actions program element, recommends that an evaluation is to consider the significance of the test results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes for not meeting the test acceptance criteria, the corrective actions required, and likelihood of recurrence, in addition to 10 CFR Part 50, Appendix B requirements.

The applicable program basis document, in accordance with the same program element, only referred to requirements of 10 CFR Part 50 Appendix B to address the corrective actions. The staff asked the applicant to revise the “corrective actions” program element to be consistent with the GALL Report or provide a justification of why such specific actions were not necessary. The applicant responded that VYNPS AMP B.1.18, in accordance with the CAP element, stated that “an engineering evaluation will be performed when the test acceptance criteria are not met in order to ensure that the intended functions of the electrical cables can be maintained consistent with current license basis.” This evaluation is performed in accordance with the Entergy corrective action process procedure. This procedure provides the stated elements to consider including the extent of the concern, the potential root causes for not meeting the test acceptance criteria, the corrective action required, and likelihood of recurrence. The staff finds the applicant's response acceptable because corrective actions per the corrective action process procedure will require specific actions consistent with to the GALL AMP XI.E2 corrective actions.

In addition, GALL AMP XI.E2, in accordance with the scope of program element, stated that this program applies to electrical cables and connections used in circuits with sensitive, high-voltage, low-level signal (*i.e.*, radiation monitoring), and nuclear instrumentation that are subject to an AMR. As documented in the Audit and Review Report, the applicable program basis document, in accordance with the same program element, did not include the high-range radiation monitoring cables. The staff asked the applicant to clarify why high-range radiation monitor cables were not included within the scope of its Non-EQ Instrumentation Circuits Test Review Program. The applicant responded, as documented in the Audit and Review Report, that cables and connections in the high-range reactor building area monitoring system, support a license renewal intended function. However, the entire length of these cables are Environmental qualification and do not require aging management since they are subject to replacement based on a qualified life. The staff reviewed the applicant’s response and finds the applicant’s response acceptable because the entire length of high-range radiation monitoring cables are environmentally qualified, subject to 10 CFR 50.49 requirements, and do not require an AMR.

Furthermore, GALL AMP XI.E2, in accordance with the parameters monitored/inspected program element, stated that the parameters monitored are determined from the specific calibration, surveillance, or testing performed and are based on the specific instrumentation in accordance with surveillance or being calibrated as documented in plant procedures. As documented in the Audit and Review Report, the applicable program basis document, in accordance with the same attribute, stated that the results from calibration or surveillance of components within the scope of license renewal will be reviewed. The parameters reviewed will be based on the specific instrumentation circuit in accordance with surveillance or being calibrated, as documented in the plant calibration or surveillance procedures. The staff asked the applicant to explain why the review of calibration results belong to the parameters monitored/inspected attribute and why the parameter for cable testing was not mentioned. The staff also asked the applicant to confirm that cable testing will be performed on in-scope cables disconnected during instrument calibration. In its response, the applicant stated that its Non-EQ Instrumentation Circuits Test Review Program basis document will be revised in accordance with the parameters monitored/inspected program element to state that the parameters monitored are determined from the specific calibration, surveillance or testing performed and are based on the specific instrumentation circuit in accordance with surveillance or being calibrated, as documented in plant procedures. Cable testing is performed by plant procedures on cables within the scope of GALL AMP XI.E2 that are disconnected during instrument calibration. The staff verified, as documented in the Audit and Review Report, that the applicant incorporated this change in the program basis document. The staff finds the applicant's response acceptable because the revised parameters monitored/inspected program element is consistent with GALL AMP XI.E2.

The staff reviewed those portions of the applicant's Non-Environmental Qualification Instrumentation Circuits Test Review Program for which the applicant claimed consistency with GALL AMP XI.E2 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant's Non-Environmental Qualification Instrumentation Circuits Test Review Program provided assurance of aging management of conductor insulation due to heat, radiation, or moisture for electrical cables used in instrumentation circuits. The staff finds the applicant's Non-Environmental Qualification Instrumentation Circuits Test Review Program acceptable because it conformed to the recommended GALL AMP XI.E2.

<u>Operating Experience</u>. LRA Section B.1.18 states that there is no operating experience for the new Non-Environmental Qualification Instrumentation Circuits Tests Review Program. Industry and plant-specific operating experience will be considered in the development of this program, and future operating experience will be incorporated into the program appropriately.

During the audit and review, the staff noted that GALL AMP XI.E2, in accordance with the operating experience, stated that operating experience has identified a case where a change in temperature across a high range radiation monitor cable in containment resulted in a substantial change in the reading of the monitor. Changes in instrument calibration can be caused by degradation of the circuit cable and are a possible indication of electrical cable degradation. The vast majority of site specific and industry wide operating experience regarding neutron flux instrumentation circuits is related to cable/connector issues inside containment near the reactor vessel. The staff asked the applicant to address industrial and plant-specific operating experience and confirm that plant-specific operating experience did not reveal any degradation not bound by industry experience. In its response, the applicant stated that operating experience discussion in LRA Section B.1.18 would be replaced with the following:

> This program is a new AMP. Industry experience that forms the basis for the program is described in the operating experience element of NUREG-1801's program description. VYNPS plant-specific operating has been reviewed against the industry operating experience identified in NUREG-1801. Although VYNPS has not experienced all of the aging effects listed in NUREG-1801, the VYNPS program will manage all of the aging effects identified in the Operating Experience section of NUREG-1801. The program is based on the program description in NUREG-1801, which in turn is based on relevant industry operating experience. As such, this program will provide assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB for the period of extended operation. As additional operating experience is obtained, lessons learned can be used to adjust the program, as needed.

The staff finds the applicant's response acceptable because the applicant reviewed the plant-specific operating experience against the industry experience identified in the GALL Report. As additional operating experience is obtained, lessons learned can be used to adjust the program elements. In a letter dated July 14, 2006, the applicant revised LRA Section B.1.18 in accordance with operating experience as described above.

The applicant also stated that operating experience at VYNPS is controlled by its operating experience program procedure. The staff reviewed the plant-specific operating experience in the applicable program basis document and the results showed that VYNPS has had operating experience that is consistent with industry experience or with the GALL Report aging mechanisms. No new aging mechanism or operating experience was found that is not consistent with industry experience and the GALL Report.

The operating experience program procedure includes the following components:

> Operating experience - Information received from various industry sources that describes events, issues, equipment failures, that may represent opportunities to apply lessons learned to avoid negative consequences or to recreate positive experience as applicable.

Internal operating experience - Operating experience that originates as a condition report or request from plant personnel which warrants consideration for possible Entergy-wide distribution. Internal operating experience can originate from any Entergy plant or headquarters.

Impact Evaluation - Analysis of an operating experience event or problem that requires additional information and research to determine impact or potential impact, as it relates to plant condition and/or configuration. Impact evaluation are typically documented with a condition report. Condition report action items and corrective actions are used to confirm program effectiveness and to modify the program as needed.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.20, the applicant provided the UFSAR supplement for the Non-Environmental Qualification Instrumentation Circuits Test Review Program.

The applicant committed (Commitment #14) to implement its Non-Environmental Qualification Instrumentation Circuits Test Review Program by March 21, 2012.

The staff reviewed LRA Section A.2.1.20 and determined that, upon the implementation of Commitment #14, the information in the UFSAR supplement is an adequate summary of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Non-Environmental Qualification Instrumentation Circuits Test Review Program, the staff finds all program elements consistent with the GALL Report with the addition of Commitment #14. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.5 Non-Environmental Qualification Insulated Cables and Connections Program

Summary of Technical Information in the Application. LRA Section B.1.19 describes the new Non-Environmental Qualification Insulated Cables and Connections Program as consistent with GALL AMP XI.E1, “Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

The Non-Environmental Qualification Insulated Cables and Connections Program will assure maintenance of the intended functions of insulated cables and connections exposed to adverse environments of heat, radiation, and moisture consistent with the CLB through the period of extended operation. An adverse environment is significantly more severe than the service environment specified for the insulated cable or connection. A representative sample of accessible insulated cables and connections within the scope of license renewal will be inspected visually for such cable and connection jacket surface anomalies as embrittlement, discoloration, cracking, or surface contamination. The technical basis for sampling will be determined according to EPRI TR-109619, “Guideline for the Management of Adverse Localized Equipment Environments.” The program will start prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's evaluation of this AMP.

The staff noted that, in accordance with the program description, GALL AMP XI.E1, stated that the program described herein is written specifically to address cables and connections at plants whose configuration is such that most (if not all) cables and connections installed in adverse localized environments are accessible. This program, as described, can be thought of as a sampling program. Selected cables and connections from accessible areas (the inspection sample) are inspected and represent, with assurance, all cables and connections in the adverse localized environments. If an unacceptable condition or situation is identified for a cable or connection in the inspection sample, a determination is made as to whether the same condition or situation is applicable to other accessible or inaccessible cables or connections. In the Non-EQ Insulated Cables and Connections Program in accordance with the same element, the applicant stated that a representative sample of accessible insulated cables and connections, within the scope of license renewal, will be visually inspected for cable and connection jacket surface anomalies such as embrittlement, discoloration, cracking or surface contamination. The technical basis for sampling will be determined using an EPRI technical report document. The staff asked the applicant to explain the technical basis for cable sampling to be consistent with the GALL Report's program description. In its response, the applicant stated that to clarify the technical basis for sampling, the sampling discussion in LRA Section B.1.19 for the Non-Environmental Qualification Insulated Cables and Connections Program would be revised to read as follows:

> This program addresses cables and connections at plants whose configuration is such that most cables and connections installed in adverse localized environments are accessible. This program can be thought of as a sampling program. Selected cables and connections from accessible areas will be inspected and represent, with assurance, all cables and connections in the adverse localized environments. If an unacceptable condition or situation is identified for a cable or connection in the inspecting sample, a determination will be made as to whether the same condition or situation is applicable to other accessible cables or connections. The sample size will be increased on an evaluation per the plant Corrective Action Process procedure.

The staff finds the applicant's response acceptable because it provided the technical basis for cable sampling; these basis are consistent with the GALL Report's program description. In a letter dated July 14, 2006, the applicant revised LRA Section B.1.19 as described above.

In addition, GALL AMP XI.E1, in accordance with the scope of program element, stated that the inspection program applies to accessible electrical cables and connections within the scope of license renewal that are installed in adverse localized environment caused by heat or radiation in the presence of oxygen. The Non-EQ Insulated Cables and Connections Program program basis document, in accordance with the same element, stated that this program will include accessible insulated cables and connections installed in structures within the scope of license renewal and prone to adverse localized environments. It was not clear to the staff if the scope of the program only included insulated cables and connections installed in-scope structures located in adverse localized environment or insulated cables and connections within the scope of license renewal that are installed in adverse localized environments. The staff asked the applicant to clarify the scope of the program, as appropriate. In its response, the applicant stated that “in a structure” meant inside the plant, not outside. It would revise LRA Section B.1.19 Program Description to include the following:

> The program applies to accessible electrical cables and connections within the scope of license renewal that are installed in adverse localized environments caused by heat or radiation in the presence of oxygen.

The staff finds the applicant's response acceptable because the scope of VYNPS AMP B.1.19 will be consistent with the scope of GALL AMP XI.E1 and it will remove the confusion as described above. In a letter dated July 14, 2006, the applicant revised the program description in LRA Section B.1.19 as described above.

The staff reviewed those portions of the applicant's Non-Environmental Qualification Insulated Cables and Connections Program for which the applicant claimed consistency with GALL AMP XI.E1 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant's Non-Environmental Qualification Insulated Cables and Connections Program provided assurance of aging management of cables and connectors within the scope of license renewal exposed to adverse localized temperature, moisture, or radiation environments with the presence of oxygen. The staff finds the applicant's Non-Environmental Qualification Insulated Cables and Connections Program acceptable because it conformed to the recommended GALL AMP XI.E1.

Operating Experience. LRA Section B.1.19 states that there is no operating experience for the new Non-Environmental Qualification Insulated Cables and Connections Program.

During the audit and review, the staff noted that GALL AMP XI.E1 stated that operating experience has shown that adverse localized environments caused by heat or radiation for electrical cables and connections may exist next to or above (within 3 feet of) steam generators, pressurizers or hot process pipes, such as feedwater (FW) lines. These adverse localized environments have been found to cause degradation of the insulating materials on electrical cables and connections that are visually observable, such as color changes or surface cracking.

These visual indications can be used as indicators of degradation. The staff asked the applicant to provide industrial and plant operating experience for this program and confirm that the review of plant operating experience did not reveal any degradation not bound by industry experience. In its response, the applicant stated that it would replace the operating experience discussion in LRA Section B.1.19 with the following:

> This program is a new aging management program. Industry experience that forms the basis for the program is described in the operating experience element of NUREG-1801 program description. VYNPS plant-specific operating experience has been reviewed against the industry operating experience identified in NUREG-1801. Although VYNPS has not experienced all of the aging effects listed in NUREG-1801, the VYNPS program will manage all of the aging effects identified in the Operating Experience section of NUREG-1801.
>
> The program is based on the program description in NUREG-1801, which in turn is based on relevant industry operating experience. As such, this program will provide assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB for the period of extended operation. As additional operating experience is obtained, lessons learned can be used to adjust the program, as needed.

The staff finds the applicant's response acceptable because the applicant reviewed the plant-specific operating experience against the industry experience identified in the GALL Report. As additional operating experience is obtained, lessons learned will be used to adjust the program elements as needed. In a letter dated July 14, 2006, the applicant revised LRA Section B.1.19 in accordance with operating experience as described above.

The applicant also stated that operating experience at VYNPS is controlled by its operating experience program procedure. VYNPS plant-specific operating experience was reviewed in the applicable program basis document, as documented in the Audit and Review Report, and the results showed that VYNPS has had operating experience that is consistent with industry experience or with the GALL Report aging mechanisms. No new aging mechanism or operating experience was found that is not consistent with industry experience and the GALL Report.

Operating experience at VYNPS is controlled by an operating experience program procedure. The program includes the following components:

> Operating experience - Information received from various industry sources that describes events, issues, equipment failures, that may represent opportunities to apply lessons learned to avoid negative consequences or to recreate positive experience as applicable.
>
> Internal operating experience - Operating experience that originates as a condition report or request from plant personnel which warrants consideration for possible Entergy-wide distribution. Internal operating experience can originate from any Entergy plant or headquarters.

Impact Evaluation - Analysis of an operating experience event or problem that requires additional information and research to determine impact or potential impact, as it relates to plant condition and/or configuration. Impact evaluation are typically documented with a condition report. Condition report action items and corrective actions are used to confirm program effectiveness and to modify the program as needed.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. In addition, the staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.21, the applicant provided the UFSAR supplement for the Non-Environmental Qualification Insulated Cables and Connections Program.

The applicant committed (Commitment #15) to implement its Non-EQ Insulated Cables and Connections Program by March 21, 2012.

The staff reviewed LRA Section A.2.1.201 and determined that, upon the implementation of Commitment #15, the information in the UFSAR supplement is an adequate summary of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Non-Environmental Qualification Insulated Cables and Connections Program, the staff finds all program elements consistent with the GALL Report with the addition of Commitment #15. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.6 One-Time Inspection Program

Summary of Technical Information in the Application. LRA Section B.1.21 describes the new One-Time Inspection Program as consistent with GALL AMPs XI.M32, "One-Time Inspection," and XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping."

The One-Time Inspection Program will be implemented prior to the period of extended operation. The one-time inspection activity for small-bore piping in the reactor coolant system and associated systems that form the reactor coolant pressure boundary (RCPB) will be comparable to GALL AMP XI.M35. The program will verify AMP effectiveness and confirm the absence of aging effects for the following:

- water chemistry control programs
- internal carbon steel surfaces exposed to indoor air in the standby gas treatment system
- internal surfaces of carbon steel and copper alloy components in the potable water and radwaste systems containing untreated water
- carbon steel retired in place system components in the area around containment penetration X-21
- small bore piping in the reactor coolant system and associated systems that form the reactor coolant pressure boundary
- reactor vessel flange leakoff lines
- main steam flow restrictors (cast austenitic stainless steel)

The elements of the program include (a) determination of the sample size 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 aging effect; (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) evaluation of the need for followup examinations to monitor the progression of any aging degradation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's evaluation of this AMP.

The staff asked the applicant to clarify how VYNPS does volumetric examinations of small bore piping socket welds. In a letter dated July 6, 2006, the applicant committed (Commitment # 16) to include the following addition to its One-Time Inspection Program. Specifically, the applicant committed to a destructive or non-destructive examination of one (1) socket welded connection using techniques proven by past industry experience to be effective for the identification of cracking in small bore socket welds. Furthermore, the applicant committed that should an inspection opportunity not occur (e.g., socket weld failure or socket weld replacement), a susceptible small-bore socket weld will be examined either destructively or non-destructively prior to entering the period of extended operation. Since small-bore piping socket weld connection will be either destructively or non-destructively examined at least once, the staff found the applicant's response acceptable.

Upon further discussions, the staff concluded that the destructive or non-destructive examination of one or more socket welds would not contribute significant additional information on the condition of the socket welds. Socket welds fail by vibrational fatigue with cracks initiating from their inside surfaces. The time required for fatigue crack initiation is very long compared to the time to propagate through a wall. Therefore, a surface examination or destructive examination of a socket weld is unlikely to detect problems. In addition, there is no history of significant socket weld failures.

In its letter, dated March 12, the applicant revised Commitment #16 to remove references to socket welds.

In addition, as discussed further in SER Sections 3.2.2.1.3 and 3.3.2.1.9, the applicant provided an amendment to its LRA in a letter dated July 14, 2007, to state that its One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program, and the Diesel Fuel Monitoring Program by confirming the absence of loss of material, cracking and fouling, where applicable.

The applicant also stated in the LRA that when evidence of an aging effect is revealed by a one-time inspection, routine evaluation of the inspection results will identify appropriate corrective actions. The inspection will be performed within the 10 years prior to the period of extended operation.

The staff reviewed those portions of the applicant's One-Time Inspection Program for which the applicant claimed consistency with GALL AMP XI.M32 and GALL AMP XI.M35 and found that they are consistent with these GALL AMPs. On the basis of its review, the staff concludes that the applicant's One-Time Inspection Program provided assurance that either the aging effect is indeed not occurring, or the aging effect is occurring very slowly as not to affect the intended function of the component or structure. The staff finds the applicant's One-Time Inspection Program acceptable because it conforms to the recommended GALL AMP XI.M32, "One-Time Inspection" and GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping."

<u>Operating Experience</u>. LRA Section B.1.21 states that there is no operating experience for the new One-Time Inspection Program. Industry and plant-specific operating experience will be considered in the development of this program, as appropriate.

The staff confirmed that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.23, the applicant provided the UFSAR supplement for the One-Time Inspection Program.

In addition, the applicant stated that, in a letter dated January 4, 2007, that a one-time inspection activity is used to verify the effectiveness of the water chemistry control programs by confirming that unacceptable cracking, loss of material, and fouling is not occurring on components within systems covered by water chemistry control programs [LRA Sections A.2.1.34, A.2.1.35, and A.2.1.36].

The applicant committed (Commitment #16) to implement its One-Time Inspection Program by March 21, 2012.

The staff reviewed LRA Section A.2.1.23 and determined that, upon the implementation of Commitment #16, the information in the UFSAR supplement is an adequate summary of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's One-Time Inspection Program, the staff finds all program elements consistent with the GALL Report with the addition of Commitment #16. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 Selective Leaching Program

Summary of Technical Information in the Application. LRA Section B.1.25 describes the new Selective Leaching Program as consistent with GALL AMP XI.M33, "Selective Leaching of Materials."

The Selective Leaching Program will ensure the integrity of components made of cast iron, bronze, brass, and other alloys exposed to raw water, treated water, or groundwater that may cause selective leaching. The program will include a one-time visual inspection and hardness measurement of selected components that may be susceptible to determine whether loss of material due to selective leaching occurs and whether the loss will affect the ability of the components to perform their intended function for the period of extended operation. The program will start prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report documents the details of the staff's evaluation of this AMP.

The staff reviewed those portions of the applicant's Selective Leaching Program for which the applicant claimed consistency with GALL AMP XI.M33 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant's Selective Leaching Program provided assurance that this aging effect will be adequately managed during the period of extended operation. The staff finds the applicant's Selective Leaching Program acceptable because it conforms to the recommended GALL AMP XI.M33, "Selective Leaching of Materials."

Operating Experience. LRA Section B.1.25 states that there is no operating experience for the new Selective Leaching Program.

The staff audited VYNPS maintenance data for evidence of this aging mechanism and reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. In addition, the staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirms that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.27, the applicant provided the UFSAR supplement for the Selective Leaching Program.

The applicant committed (Commitment #19) to implement its Selective Leaching Program by March 21, 2012.

The staff reviewed LRA Section A.2.1.27 and determined that, upon the implementation of Commitment #19, the information in the UFSAR supplement is an adequate summary of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Selective Leaching Program, the staff finds all program elements consistent with the GALL Report with the addition of Commitment #19. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 Masonry Wall Program

Summary of Technical Information in the Application. LRA Section B.1.27.1 describes the existing Masonry Wall Program as consistent with GALL AMP XI.S5, "Masonry Wall Program."

The objective of the Masonry Wall Program is to manage aging effects so that the evaluation basis established for each masonry wall within the scope of license renewal remains valid through the period of extended operation. The program includes all masonry walls performing intended functions in accordance with 10 CFR 54.4. Included components are masonry walls required by 10 CFR 50.48, radiation-shielding masonry walls, masonry walls with the potential to affect safety-related components, and the torus compartment water trough. Masonry walls are visually examined at a frequency ensuring no loss of intended function between inspections.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's evaluation of this AMP.

During the audit and review, the staff noted that GALL AMP XI.S5, Masonry Wall Program, in accordance with the detection of aging effects program element, has the following statement:

> The frequency of inspection is selected to ensure there is no loss of intended function between inspections. The inspection frequency may vary from wall to wall, depending on the significance of cracking in the evaluation basis. Unreinforced masonry walls, which have not been contained by bracing warrant the most frequent inspection, because the development of cracks may invalidate the existing evaluation basis.

The staff asked the applicant to explain if the inspection frequency varies from wall to wall.

The applicant stated that the inspection of masonry walls which are within the scope of license renewal, are performed each refueling outage. Upon the completion of six successive surveillance intervals during a ten -year period, the sequence of the inspections revert back to the initial sequence interval. In addition, the applicant stated that due to the lack of aging effects (new cracking) for the masonry walls through the current life of the program, no individual masonry walls receive more frequent inspections over others. However, if significant new cracking was discovered on a particular masonry wall, part of the corrective action would entail more frequent inspections.

The staff finds the applicant's response acceptable. A review of the applicant's operating experience did not reveal a history of masonry wall aging effects. For VYNPS, due to a history of no masonry wall aging effects, the CAP is an adequate method to determine if more frequent inspections should be performed on individual masonry walls beyond the program's current 10-year cycle.

The staff reviewed those portions of the applicant's Structures Monitoring-Masonry Wall Program for which the applicant claimed consistency with GALL AMP XI.S5 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant’s Structures Monitoring-Masonry Wall Program demonstrated that the effects of aging of masonry block walls will be properly managed for the period of extended operation. The staff finds the applicant’s Structures Monitoring-Masonry Wall Program acceptable because it conformed to the recommended GALL AMP XI.S5, “Masonry Wall Program.”

Operating Experience. LRA Section B.1.27.1 states that recent inspections (2002 and 2004) revealed no cracking of masonry walls within the scope of license renewal potentially affecting wall qualification, proving that the program is effective in managing cracking for masonry and block walls. QA surveillance and self-assessment in 2002 and 2004 revealed no issues or findings that could impact program effectiveness. The listed operating experience in which inspections revealed no cracking which could potentially affect wall qualification demonstrated that the VYNPS Masonry Wall Program is effective in ensuring that age related deterioration of masonry walls within the scope of license renewal is adequately managed to ensure that these masonry walls maintain their ability to perform their intended function.

The staff reviewed a sampling of drawings for masonry walls within the scope of license renewal and finds the drawings to be of high quality. Components attached to the walls were well documented with respect to component identification, overall dimensions and relative wall location. Any identified cracks were also well mapped out on the drawings as far as relative location and width. The high quality of the masonry drawings will ensure that any aging effects (new cracks) will be identified during the inspections performed in accordance with the program.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. In addition, the staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.29, the applicant provided the UFSAR supplement for the Masonry Wall Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Masonry Wall Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.9 System Walkdown Program

Summary of Technical Information in the Application. LRA Section B.1.28 describes the existing System Walkdown Program as consistent with GALL AMP XI.M36, "External Surfaces Monitoring."

This program entails inspections of external surfaces of components subject to an AMR. The program is also credited with managing loss of material from internal surfaces where internal and external material-environment combinations are the same and external surface conditions represent internal surface conditions.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's evaluation of this AMP.

The staff noted that, the applicant's System Walkdown procedure, one of the specific purposes of which was to observe and report system conditions, did not adequately address material degradation and leakage. Specifically, the procedure did not address the loss of material due to corrosion or material wastage, or surface or coating deterioration/degradation. Also, the procedure did not adequately address leakage or evidence of leakage from or onto surfaces. The applicant agreed that the procedure should be enhanced to include periodic system engineer inspections which are aging management oriented. The applicant added that an additional enhancement would be provided to examiners who perform the system walkdowns using the recent guidance provided in the EPRI "Aging Management Field Guide" document. The staff reviewed the guide and noted that it provided photos and detailed descriptions of the AERMs on the materials and in the environments that are found at nuclear power plants, and agreed that it would be a useful tool to the examiners.

As discussed in SER Section 3.0.3.2.11, the applicant also committed to revise the System Walkdown Program to specify CO_2 system inspections every six months.

The staff reviewed those portions of the applicant's System Walkdown Program for which the applicant claimed consistency with GALL AMP XI.M36 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant's System Walkdown Program provided assurance that the program will manage aging effects, e.g., the loss of material and leakage, of the external surfaces of components. The staff finds the applicant's System Walkdown Program acceptable because it conformed to the recommended GALL AMP XI.M36, "External Surfaces Monitoring."

Operating Experience. LRA Section B.1.28 states that in 1999 a self-assessment determined that corrective actions for deficient conditions detected during system walkdowns had been effective and had received timely closeouts, assuring that the program will manage component loss of material. Peer assessment found that system engineering management had not used metrics sufficient for monitoring core functions of the department. In accordance with new oversight standards supervisors perform walkdowns with system engineers to satisfy quality expectations. Program oversight was increased during 2003, providing assurance that the program will manage component loss of material. Recent system walkdowns (2003 and 2004) of the circulating water (CW), standby liquid control (SLC), and reactor building heating, ventilation, and air-conditioning (HVAC) systems have detected leakage or degradation prior to loss of intended function, proving that the program is effective for managing component loss of material.

The applicant stated, during the audit and review, that VYNPS has a comprehensive operating experience program that monitors industry events and issues, and assesses them for applicability to its own operations. In addition, VYNPS has a CAP that is used to track, trend, and evaluate significant plant issues and events. Those issues and events, whether from the industry or plant-specific, that are potentially significant to the System Walkdown Program are evaluated. The System Walkdown Program is augmented, as appropriate, when these evaluations show that changes to this program will enhance its effectiveness.

The staff reviewed a representative sample of system walkdowns. These system walkdowns indicated a higher than average number of reports dealing with the condenser and the SLC system. The applicant agreed that these were areas of concern. The staff noted that this program included thermography of plant instrumentation and the electrical components in the switchyard.

The staff also reviewed the operating experience provided to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the applicant reviewed all applicable operating experience and used this experience to modify the System Walkdown Program appropriately. This should help ensure that the System Walkdown Program will manage the effects of aging in the systems and components for which the program is credited.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.32, the applicant provided the UFSAR supplement for the System Walkdown Program.

The applicant committed (Commitment #24) to have the System Walkdown guidance document enhanced to perform periodic system engineer inspections of systems in-scope and subject to an AMR for license renewal in accordance with 10 CFR 54.4(a)(1) and (a)(3). Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject system will include SSCs that are in-scope and subjected to an AMR for license renewal in accordance with 10 CFR 54.4 (a)(2).

The applicant also committed (Commitment #35) to provide within the System Walkdown Training Program a process to document biennial refresher training of Engineers to demonstrate inclusion of the methodology for aging management of plant equipment as described in the EPRI “Aging Assessment Field Guide” or comparable instructional guide, by March 21, 2012.

The applicant also committed (Commitment #30) to revise the System Walkdown Program to specify CO_2 system inspections every six months; by March 21, 2012.

The staff reviewed LRA Section A.2.1.32 and determined that, upon the implementation of (Commitments #24, #30 and #35), the information in the UFSAR supplement is an adequate summary of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's System Walkdown Program, the staff finds all program elements consistent with the GALL Report with the addition of Commitments #24, #30, and #35. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.10 Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program

Summary of Technical Information in the Application. LRA Section B.1.29 describes the new Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program as consistent with GALL AMP XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)."

The purpose of the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program is to make sure that reduction of fracture toughness due to thermal aging and radiation embrittlement will not result in loss of intended function. This program will evaluate CASS components in the reactor vessel internals and require nondestructive examinations (NDEs) as appropriate. EPRI, the BWR Owners Group, and other industry groups focus on reactor vessel internals to better understand aging effects. Future Boiling Water Reactor Vessel Internals Project (BWRVIP) reports, EPRI reports, and other industry operating experience will be additional bases for evaluations and inspections in accordance with this program. This program will supplement reactor vessel internals inspections required by the BWR Vessel Internals Program for assurance that aging effects do not result in loss of the intended functions of reactor vessel internals during the period of extended operation. The program will start prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's evaluation of this AMP.

The staff reviewed those portions of the applicant's Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program for which the applicant claims consistency with GALL AMP XI.M13 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant's Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program will adequately maintain the integrity of CASS components during period of extended operation. The staff finds the applicant's Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program conforms to the recommended GALL AMP XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)."

Operating Experience. LRA Section B.1.29 states that there is no operating experience for the new Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program.

The staff reviewed the operating experience provided in the program basis document, and interviewed the applicant's technical personnel to conclude that no industry operating experience with thermal aging and embrittlement of CASS has emerged.

The staff finds the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.33, the applicant provided the UFSAR supplement for the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program.

The applicant committed (Commitment #25) to implement its Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program by March 21, 2012.

The staff reviewed LRA Section A.2.1.33 and determined that, upon the implementation of Commitment #25, the information in the UFSAR supplement is an adequate summary of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program, the staff finds all program elements consistent with the GALL Report with the addition of Commitment #25. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.11 Water Chemistry Control - BWR Program

Summary of Technical Information in the Application. LRA Section B.1.30.2 describes the existing Water Chemistry Control - BWR Program as consistent with GALL AMP XI.M2, “Water Chemistry.”

The objective of this program is to manage aging effects caused by corrosion and cracking mechanisms. The program monitors and controls water chemistry according to EPRI Report 1008192 (BWRVIP-130), which has three sets of guidelines for primary water, for condensate and FW, and for control rod drive (CRD) mechanism cooling water. EPRI guidelines in BWRVIP-130 also include recommendations for controlling water chemistry in the torus, condensate storage tanks, demineralized water storage tanks, and spent fuel pool. The Water

Chemistry Control - BWR Program optimizes the primary water chemistry to minimize the potential for loss of material and cracking by limiting the levels of contaminants in the reactor coolant system levels of contaminants that could cause loss of material and cracking. Additionally, the applicant has instituted hydrogen water chemistry for the reduction of dissolved oxygen in the treated water to limit the potential for intergranular stress corrosion cracking (IGSCC) through the reduction of dissolved oxygen in the treated water.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's evaluation of this AMP.

The staff reviewed those portions of the applicant’s Water Chemistry Control-BWR Program for which the applicant claimed consistency with GALL AMP XI.M2 and found that they are consistent with this GALL AMP. On the basis of its review, the staff concludes that the applicant’s Water Chemistry Control-BWR Program provided assurance that this program will help mitigate degradation caused by corrosion and stress corrosion cracking (SCC) in components exposed to reactor or treated water. The staff finds the applicant’s Water Chemistry Control-BWR Program acceptable because it conformed to the recommended GALL AMP XI.M2, “Water Chemistry.”

Operating Experience. LRA Section B.1.30.2 states that for the first 158 operating days of Cycle 24 (May - November 2004), sulfate and chloride levels in the reactor water, while within EPRI guideline acceptance criteria, were significantly higher than they had been during Cycle 23. An engineering and chemistry evaluation determined the most probable sources of chloride and sulfate ingress and the causes contributing to the extended time required to reduce reactor water chemistry to normal low levels. Corrective actions included enhanced control of chemical ingress, increased condensate and FW cleaning, and enhanced demineralizer filter replacement procedures. Resolution of higher than normal reactor water sulfate and chloride levels before they exceed EPRI guideline acceptance criteria is assurance that the program will ensure adequate water quality to preclude component loss of material, cracking, and fouling. A QA audit in 2003 revealed no issues or findings that could impact program effectiveness.

The staff reviewed a chemistry audit report for April 2005 from an independent external organization and verified that it identified areas of improvement for the FW and condensate system to maintain the performance quality of the Water Chemistry Control - BWR Program.

The staff also reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.35, the applicant provided the UFSAR supplement for the Water Chemistry Control - BWR Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

In addition, in a letter dated January 4, 2007, the applicant provided an revision to its LRA to explicitly state the One-Time Inspection Program activities will conform the effectiveness of the Water Chemistry Control – BWR Program.

Conclusion. On the basis of its audit and review of the applicant's Water Chemistry Control - BWR Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2 AMPs Consistent with the GALL Report with Exceptions and/or Enhancements

In LRA Appendix B, the applicant stated the following AMPs that are, or will be, consistent with the GALL Report, with exceptions or enhancements:

- Buried Piping Inspection Program
- BWR Control Rod Drive Return Line Nozzle Program
- BWR Feedwater Nozzle Program
- BWR Penetrations Program
- BWR Stress Corrosion Cracking Program
- BWR Vessel Inside Diameter Attachment Welds Program
- BWR Vessel Internals Program
- Containment Leak Rate Program
- Diesel Fuel Monitoring Program
- Fatigue Monitoring Program
- Fire Protection Program
- Fire Water System Program
- Oil Analysis Program
- Reactor Head Closure Studs Program
- Reactor Vessel Surveillance Program
- Service Water Integrity Program
- Structures Monitoring Program
- Water Chemistry Control - Closed Cooling Water Program
- Bolting Integrity Program Metal
- Metal Enclosed Bus Inspection Program

For AMPs that the applicant claimed are consistent with the GALL Report, with exception(s) and/or enhancement(s), the staff performed an audit and review to confirm that program attributes or features for which the applicant claimed consistency were indeed consistent. The staff also reviewed the exception(s) and/or enhancement(s) to the GALL Report to determine whether they were acceptable and adequate. The results of the staff's audits and reviews are documented in the following sections.

3.0.3.2.1 Buried Piping Inspection Program

Summary of Technical Information in the Application. LRA Section B.1.1 describes the existing Buried Piping Inspection Program as consistent, with exceptions and enhancement, with GALL AMP XI.M34, "Buried Piping and Tanks Inspection."

This program includes: (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, stainless steel, and titanium components. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. Buried components are inspected when excavated during maintenance. Prior to the period of extended operation, plant operating experience will be reviewed to verify that there had been an inspection within the previous ten years. There will be a focused inspection within the first 10 years of the period of extended operation unless an opportunistic inspection (or an inspection of pipe condition without excavation) occurs within this ten-year period.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions and enhancement to determine whether the AMP, with the exceptions and enhancement, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Buried Piping Inspection Program for which the applicant claimed consistency with GALL AMP XI.M34 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's Buried Piping Inspection Program provided assurance that the program will manage aging effects on the external surfaces of buried steel piping. The staff finds the applicant's Buried Piping Inspection Program acceptable because it conformed to the recommended GALL AMP XI.M34, "Buried Piping and Tanks Inspection," with exceptions and an enhancement.

Exception 1. In LRA Section B.1.1, the applicant stated an exception to the GALL Report program element "scope of program." Specifically, the exception states that:

> The GALL Report refers to buried steel piping and tanks. The VYNPS program does not inspect tanks. There are no buried steel tanks subject to an AMR.

In addition, the applicant stated in the LRA, that preventive measures are taken at VYNPS that are in accordance with standard industry practices.

The staff asked the applicant to describe the tanks at VYNPS. The applicant responded that the only below-grade tank at VYNPS that is below grade is the diesel fire pump tank, which is in a vault, so it is not exposed to a soil environment. The only buried tank at VYNPS is the John

Deere Diesel tank, which is fiberglass. The GALL Report does not identify fiberglass as a material that is subject to an AERM. These tanks are monitored by the Diesel Fuel Monitoring Program.

The staff reviewed the applicant's response. The applicant clarified that the only buried tank at VYNPS is fiberglass, which is not subject to the aging mechanisms identified in the GALL Report. On the basis that fiberglass is a material not subject to a loss of material and the tanks are monitored by the applicant's Diesel Fuel Monitoring Program, the staff found this exception acceptable.

Exception 2. In LRA Section B.1.1, the applicant stated an exception to the GALL Report program element "detection of aging effects." Specifically, the exception states:

> Inspections via methods that allow assessment of pipe condition without excavation may be substituted for inspections requiring excavation solely for the purpose of inspection. Methods such as phased array ultrasonic testing (UT) technology provide indication of wall thickness for buried piping without excavation. Use of such methods to identify the effects of aging is preferable to excavation for visual inspection, which could result in damage to coatings or wrappings.

The LRA also states that, as an alternative to examination methods that require excavation to examine buried piping, examination methods that do not require excavation may be substituted. The LRA identifies phased array UT to determine wall thickness as one such alternative.

The staff asked the applicant to provide technical justification of the phased array UT examination technique and other examination methods that VYNPS planned to perform as an exception. The applicant explained that robotic crawlers that can perform phased array UT examinations are available. These UT examinations can perform piping wall thickness measurements, which provide an indication of the condition of the exterior surface of the piping being examined. While these alternative examination methods are planned to be performed to obviate the need for excavation, in the event that they detect wall thinning sufficient to indicate that the exterior piping surface is corroded or damaged, excavation will be performed in order to better evaluate the exterior surface condition, and to repair or to replace the piping, as needed. When the staff asked the applicant how buried piping would be examined when it cannot be examined by UT, due to size or material, the applicant responded that excavation and examination would be performed, as normal. On the basis that either UT or excavation will be performed to determine wall thickness of buried piping, the staff finds this exception acceptable.

Enhancement. In LRA Section B.1.1, the applicant stated the following enhancement in meeting the GALL Report program element "parameters monitored/inspected." Specifically, the enhancement stated:

> Guidance for performing examinations of buried piping will be enhanced to specify that coating degradation and corrosion are attributes to be evaluated.

The applicant further stated, in the LRA, that this program included examinations to detect and manage the effects of corrosion on the pressure-retaining capability of buried piping.

The staff noted that a VYNPS program procedure required “a general visual examination for obvious signs of settlement, joint separation, cracks (concrete pipe), obvious misalignment, etc.” of buried piping. Also, the staff noted that the program procedure was very general rather than focused on coating or wrapping integrity. The staff determines that this procedure did not adequately address the GALL Report recommendation in that the average examiner would not be able to read the procedure requirements and find evidence of age-related damage to piping surfaces or coverings. The applicant made a commitment (Commitment #1) to enhance this plant procedure to provide additional guidelines for the examination of buried piping, which include an improved definition of the scope of buried piping examinations; a requirement to define the condition of the coatings to be examined, including adhesion and discontinuities; a requirement to inspect piping underneath failed coatings; additional acceptance criteria, including rust and wall thickness; and instructions to notify engineering to perform an opportunistic examination of any buried structure uncovered during the excavation of piping. The staff finds this commitment to be acceptable, since the enhanced procedure will address the recommendations of the GALL Report.

On this basis, the staff finds this enhancement acceptable since when the enhancement is implemented the Buried Piping Inspection Program will be consistent with GALL AMP XI.M34 and will provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. LRA Section B.1.1, states that steel piping was excavated and inspected on several occasions during the past seven years. These inspections revealed no loss of material due to external surface corrosion. Therefore, this operating experience proves that the program manages loss of material caused by corrosion of the external surfaces of buried components.

The applicant stated, during the audit and review, that VYNPS has a comprehensive operating experience program that monitors industry events and issues, and assesses them for applicability to its own operations. In addition, VYNPS has a CAP that is used to track, trend, and evaluate significant plant issues and events. Those issues and events, whether from the industry or plant-specific, that are potentially significant to the Buried Piping Inspection Program are evaluated. The Buried Piping Inspection Program is augmented, as appropriate, when these evaluations show that changes to this program will enhance its effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. In addition, the staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.1, the applicant provided the UFSAR supplement for the Buried Piping Inspection Program.

In LRA Section A.2.1.1, the applicant stated that its Buried Piping Inspection Program included preventive measures to mitigate corrosion and inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, stainless steel, and gray cast iron components. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. Buried components are inspected when excavated during maintenance. If trending within the CAP identified susceptible locations, the areas with a history of corrosion problems are evaluated for the need for additional inspection, alternate coating, or replacement.

A focused inspection will be performed within the first 10 years of the period of extended operation, unless an opportunistic inspection (or an inspection via a method that allows an assessment of pipe condition without excavation) occurs within this ten-year period.

During the audit and review, the staff asked the applicant to clarify its buried piping examination plans during the ten-year periods before and during the period of extended operation. The applicant responded to say that buried piping was last examined in 2003, which is within the final ten-year period before the period of extended operation. Therefore, even if no other buried piping is examined until the end of the current operating license, VYNPS has followed staff guidance regarding the examination of buried piping through the end of the current operating license. Regarding the period of extended operation, the applicant stated, in the LRA and the UFSAR, that a focused examination of buried piping will be performed within the first ten years of the period of extended operation, unless an opportunistic examination or an examination by an examination method that allows an assessment of the buried piping surface condition without excavation, occurs within that ten-year period.

The applicant committed (Commitment #1) to enhance guidance for performing examinations of buried piping to specify that coating degradation and corrosion are attributes to be evaluated for its Buried Piping Program by March 21, 2012.

The staff reviewed LRA Section A.2.1.1, and determined that, upon the implementation of Commitment #1, the information in the UFSAR supplement is an adequate summary of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Buried Piping Inspection Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the GALL Report with the addition of Commitment #1. In addition, the staff reviewed the exceptions and their justifications and determined that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 BWR CRD Return Line Nozzle Program

Summary of Technical Information in the Application. LRA Section B.1.2 describes the existing BWR CRD Return Line Nozzle Program as consistent, with exception, with GALL AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle."

In accordance with this program, the applicant has rerouted the CRD return flow to the reactor water cleanup (RWCU) system with the rerouted line flow valved open and capped the CRD return line vessel nozzle to mitigate cracking. Inservice Inspection (ISI) examinations monitor the effects of crack initiation and growth on the intended function of the CRD return line nozzle and cap.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the BWR CRD Return Line Nozzle Program for which the applicant claimed consistency with GALL AMP XI.M6 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's BWR CRD Return Line Nozzle Program provides assurance that aging effects within the scope of license renewal are adequately managed. The staff finds the applicant's BWR CRD Return Line Nozzle Program acceptable because it conforms to the recommended GALL AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle," with exceptions.

Exception. In LRA Section B.1.2, the applicant stated exception to the GALL Report program elements "parameters monitored/inspected," "detection of aging effects," and "monitoring and trending." Specifically, the exception states:

> VYNPS does not inspect the welded connection between the CRD return line and the RWCU system piping during each refueling outage.

The applicant stated that in its SE of BWR FW and CRD return line modifications at VYNPS, NRC accepted VYNPS' commitment to inspect the CRD return line to RWCU joint, by UT methods, for three consecutive refuel outages, then to reassess the inspection frequency based upon the inspection results. Inspection of the three CRD return line to RWCU welds confirmed there were no indications; and the VYNPS assessment concluded that further inspections are not required. The staff reviewed this assessment and determines that it was acceptable.

In the LRA, the applicant asserted that is reasonable to maintain this exception for the period of extended operation since the CRD return line now ties into the RWCU system in a section of piping that is non-safety-related (no license renewal function) and is not subject to an AMR. The applicant further stated that the BWR CRD Return Line Nozzle Program monitors the effects of cracking on the intended function of the CRD return line nozzle by performing ultrasonic inspection of the nozzle inner radius, nozzle to vessel weld, and nozzle to cap weld in accordance with the American Society of Mechanical Engineers (ASME) Code, Section XI, Subsection IWB.

The staff noted that the inspections identified in NUREG-0619, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10,” for the rerouted return line are not addressed by the BWR CRD Return Line Program, and this had been appropriately identified as an exception to the referenced GALL Report program. Considering that the return line welds had been subject to enhanced inspection, that the results had been reviewed by the staff, and that the welds are in a system that is not subject to an AMR, the staff finds this exception to be acceptable.

<u>Operating Experience</u>. LRA Section B.1.2 states that the CRD return line nozzle ultrasonic examination in October 2002 found no indications of cracking.

The staff reviewed plant records of the examinations identified in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience revealed no degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u>. In LRA Section A.2.1.2, the applicant provided the UFSAR supplement for the BWR CRD Return Line Nozzle Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

<u>Conclusion</u>. On the basis of its audit and review of the applicant's BWR CRD Return Line Nozzle Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and their justifications and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 BWR Feedwater Nozzle Program

<u>Summary of Technical Information in the Application</u>. LRA Section B.1.3 describes the existing BWR Feedwater Nozzle Program as consistent, with exception, with GALL AMP XI.M5, “BWR Feedwater Nozzle.”

In accordance with this program, the applicant has replaced the original low flow control valve with a drag-type valve with improved flow characteristics, replaced the FW spargers with interference-fit thermal sleeve spargers, and installed a thermal sleeve bypass leak detection system to mitigate cracking. This program continues enhanced ISI of the FW nozzles in accordance with the requirements of ASME Code, Section XI, Subsection IWB and the recommendation of General Electric (GE) NE-523-A71-0594 to monitor the effects of cracking on the intended function of the FW nozzles.

<u>Staff Evaluation</u>. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the BWR Feedwater Nozzle Program for which the applicant claimed consistency with GALL AMP XI.M5 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant’s BWR Feedwater Nozzle Program provides assurance that aging of the FW nozzles will be adequately managed. The staff finds the applicant’s BWR Feedwater Nozzle Program acceptable because it conforms to the recommended GALL AMP XI.M5, “BWR Feedwater Nozzle,” with an exception.

<u>Exception</u>. In LRA Section B.1.3, the applicant stated an exception to the GALL Report program element “preventive actions.” Specifically, the exception states:

> Stainless steel cladding was not removed, a low-flow controller was not installed and the RWCU system was not rerouted.

LRA further states that it performs the enhanced ISI recommended by a GE guidance document to monitor the effects of cracking on the intended function of the FW nozzles and have performed system modifications to mitigate cracking.

The staff reviewed the applicable portions of the program procedures for VYNPS inservice inspection and a VYNPS calculation on crack growth for the FW nozzles. In addition, the staff reviewed NVY 84-144, in which the staff provided its SE of BWR FW modifications at VYNPS and determines that the intent of the requirements of NUREG-0619 and NEDE-21821-A had been satisfied by the modifications performed.

The staff finds that FW nozzle cracking continues to be adequately managed by the existing program. On this basis, the staff finds this exception to be acceptable.

<u>Operating Experience</u>. Section B.1.3, states that inspections following FW system modifications show no new cracking of the FW nozzle, indicating that plant modifications to reduce thermal stresses have been effective in resolving the FW nozzle cracking issue. Ultrasonic testing of the FW nozzle in October 2002 resulted in no recordable indications. Absence of recordable indications proves that the program is effective for managing FW nozzle cracking. QA assessments in 2002 and 2004 revealed no issues or findings that could impact program effectiveness. Data from the bypass leakage detection system continues to be used appropriately to ensure adequate conservatism in modeling the aging of the interference-fit thermal sleeve.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.3, the applicant provided the UFSAR supplement for the BWR Feedwater Nozzle Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's BWR Feedwater Nozzle Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and their justifications and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 BWR Penetrations Program

Summary of Technical Information in the Application. LRA Section B.1.4 describes the existing BWR Penetrations Program as consistent, with exceptions, with GALL AMP XI.M8, “BWR Penetrations.”

The program includes: (a) inspection and flaw evaluation conforming to the guidelines of staff-approved documents BWRVIP-27 and BWRVIP-49 and (b) monitoring and control of reactor coolant water chemistry in accordance with guidelines to ensure the long-term integrity of vessel penetrations and nozzles.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions to determine whether the AMP, with the exceptions, remained adequate to manage the aging effects for which it is credited.

The GALL Report, in the preventive actions program element for GALL AMP XI.M8, stated that maintaining high water purity reduces susceptibility to SCC or intergranular stress-corrosion cracking (IGSCC) and reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in BWRVIP-29. The applicant stated, in the LRA, that the applicant's reactor water chemistry is monitored and maintained in accordance with the guidelines of BWRVIP-130 to ensure the long-term integrity of vessel penetrations and nozzles.

The staff reviewed the Water Chemistry Control-BWR Program and concludes that it is acceptable. The acceptance of the applicant's Water Chemistry Control-BWR Program is addressed in SER Section 3.0.3.1.11.

The staff reviewed those portions of the BWR Penetrations Program for which the applicant claimed consistency with GALL AMP XI.M8 and finds that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's BWR Penetrations Program provided assurance that the applicant's BWR Penetrations Program will adequately manage the aging effects. The staff finds the applicant's BWR Penetrations Program acceptable because it conformed to the recommended GALL AMP XI.M8, "BWR Penetrations," with exceptions.

Exception 1. In LRA Section B.1.4, the applicant stated exception to the GALL Report program elements "parameters monitored/inspected" and "detection of aging effects." Specifically, the exception states:

> Table IWB-2500-1 from the 1998 Edition with 2000 Addenda of ASME Code, Section XI is used to specify SLC nozzle inspections, while the GALL Report specifies the 2001 Edition with 2002 and 2003 Addenda.

The applicant further stated, in the LRA, that "Since ASME Code, Section XI through the 2003 Addenda has been accepted by reference in 10 CFR 50.55a, paragraph (b)(2), without modification or limitation on use of Table IWB-2500-1 from the 1998 Edition with 2000 Addenda for BWR components, use of this version is appropriate to assure that components crediting this program can perform their intended function consistent with the CLB during the period of extended operation."

The staff reviewed inspection requirements and finds that there is no change for the penetration inspection requirements in IWB-2500 for the ASME Code Edition/Addendum identified in this exception. On this basis, the staff finds this acceptable.

Exception 2. In LRA Section B.1.4, the applicant stated exception to the GALL Report program element "detection of aging effects." Specifically, the exception states:

> VYNPS examines ½ inch of the volume next to the widest part of the N10 nozzle to vessel weld, rather than half of the vessel wall thickness.

The applicant stated, in the LRA, that "Extending the examination volume into the base metal as required by ASME Code, Section XI, 1998 Edition, 2000 Addenda, Figure IWB-2500-7(b) prolongs the examination time significantly and results in no net increase in safety. The extra volume is base metal region which is not prone to inservice cracking and has been extensively examined before the vessel was put into service and during the first, second and third interval examinations."

The staff asked the applicant to provide additional justification instead of referencing examination results from previous intervals. The applicant stated the inspection of the vessel penetrations to ½ inch versus ½ vessel wall thickness was consistent with ASME Code Case

N-613-1 which has been endorsed by the NRC as documented in Regulatory Guide 1.147, Revision 14. As the applicant's inspections are consistent with the NRC-approved ASME Code Case N-613-1, the staff finds this exception acceptable.

Operating Experience. LRA Section B.1.4 states that enhanced leakage inspection (with insulation removed) of the SLC nozzle in October 2002 resulted in no recordable indications. Absence of recordable indications proves that the program is effective for managing SLC nozzle cracking. Liquid penetrant examination of instrument penetration nozzles in May 2001 resulted in no recordable indications. Absence of recordable indications proves that the program is effective for managing instrument penetration nozzle cracking. The applicant, as a participant in the BWRVIP, is committed to incorporate lessons learned from operating experience of the entire BWR fleet. The applicant evaluates BWRVIP inspection criteria and industry operating experience are evaluated to determine whether the existing program should be modified.

The staff reviewed the operating experience provided in the LRA and industry operating experience documented in related BWRVIP reports, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation the criterion defined in the GALL Report and in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.4, the applicant provided the UFSAR supplement for the BWR Penetrations Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's BWR Penetrations Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 BWR Stress Corrosion Cracking Program

Summary of Technical Information in the Application. LRA Section B.1.5 describes the existing BWR Stress Corrosion Cracking Program as consistent, with exception, with GALL AMP XI.M7, "BWR Stress Corrosion Cracking."

The program includes: (a) preventive measures to mitigate IGSCC and (b) inspection and flaw evaluation to monitor IGSCC and its effects on RCPB components made of stainless steel, CASS, or nickel alloy.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remained adequate to manage the aging effects for which it is credited.

The GALL Report, in the preventive actions program element for GALL AMP XI.M7, stated that maintaining high water purity reduces susceptibility to SCC or IGSCC and reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in BWRVIP-29. The applicant's reactor water chemistry is monitored and maintained in accordance with the guidelines of BWRVIP-130.

The staff reviewed the Water Chemistry Control-BWR Program, and concludes that it is acceptable. The acceptance of the Water Chemistry Control-BWR Program is addressed in SER Section 3.0.3.1.11.

The applicant stated, that extensive piping replacement and mitigating treatments were applied throughout the austenitic piping system during the decade from 1977 to 1986 and the result of these actions is that nearly all piping, nozzles, and welds in the austenitic system are composed of resistant materials. The staff finds this meets the GALL Report’s recommendation.

The staff reviewed those portions of the BWR Stress Corrosion Cracking Program for which the applicant claimed consistency with GALL AMP XI.M7 and finds that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant’s BWR Stress Corrosion Cracking Program provides assurance that IGSCC will be adequately managed and the intended function of the pressure boundary piping made of susceptible material will be maintained consistent with the CLB for the period of extended operation. The staff finds the applicant’s BWR Stress Corrosion Cracking Program acceptable because it conforms to the recommended GALL AMP XI.M7, “BWR Stress Corrosion Cracking,” with an exception.

Exception. In LRA Section B.1.5, the applicant stated an exception to the GALL Report program element “acceptance criteria.” Specifically, the exception states:

> The 1998 Edition with 2000 Addenda of ASME Code, Section XI, Subsection IWB-3600 is used for flaw evaluation, while the GALL Report specifies the 1986 Edition of ASME Code, Section XI, Subsection IWB-3600 for flaw evaluation.

The applicant stated, in the LRA, that “Since ASME Section XI through the 2003 Addenda has been accepted by the NRC in 10 CFR 50.55a, paragraph (b)(2), without modification or limitation on use of Subsection IWB-3600 from the 1998 Edition with 2000 Addenda, use of this version for flaw evaluation is appropriate to assure that components crediting this program can perform their intended function consistent with the CLB during the period of extended operation.”

The staff reviewed the Inservice Inspection Program, and concludes that it is acceptable. The acceptance of the applicant's Inservice Inspection Program is addressed in SER Section 3.0.3.3.3. ASME Code, Section XI, Subsection IWB-3600 is part of the Inservice Inspection Program. On this basis, the staff finds this exception acceptable.

Operating Experience. LRA Section B.1.5 states that liquid penetrant and ultrasonic examinations of Generic Letter (GL) 88-01 nozzle safe end welds in May 2001 and October 2002 resulted in no recordable indications. Absence of recordable indications on the nozzle safe end welds proves that the program is effective for managing cracking of austenitic stainless steel piping and components. Preventive measures to mitigate cracking, including replacement and modification of austenitic piping and components, have been approved by the staff as part of an effective SCC mitigation strategy. QA assessment in 2001 revealed no issues or findings that could impact program effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience revealed no degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.5, the applicant provided the UFSAR supplement for the BWR Stress Corrosion Cracking Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's BWR Stress Corrosion Cracking Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and their justifications and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 BWR Vessel ID Attachment Welds Program

Summary of Technical Information in the Application. LRA Section B.1.6 describes the existing BWR Vessel ID Attachment Welds Program as consistent, with exception, with GALL AMP XI.M4, “BWR Vessel ID Attachment Welds.”

The program includes: (a) inspection and flaw evaluation in accordance with the guidelines of staff-approved BWRVIP-48 and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-130 (EPRI Report 1008192) to ensure the long-term integrity and safe operation of reactor vessel inside diameter (ID) attachment welds and support pads.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remained adequate to manage the aging effects for which it is credited.

The GALL Report, in the preventive actions program element for GALL AMP XI.M4, stated that maintaining high water purity reduces susceptibility to SCC or IGSCC and reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in BWRVIP-29. The applicant stated, in the LRA, that the applicant's reactor water chemistry is monitored and maintained in accordance with the guidelines of BWRVIP-130.

The staff reviewed the Water Chemistry Control-BWR Program and concluded that it is acceptable. The acceptance of the applicant’s Water Chemistry Control-BWR Program is addressed in Section 3.0.3.1.11 of this SER.

BWRVIP-48 requires that steam dry support and feedwater sparger bracket attachment welds which use furnace-sensitized stainless steel (E 308/309 or 308L/309L) or Alloy 600 material be examined by modified VT-1 inspection. The staff asked the applicant to clarify the inspection requirements for those attachments. The applicant responded that the program procedure states clearly that these brackets are examined as if they are furnace-sensitized. The staff reviewed the applicable program procedures and determined this position is consistent with the GALL Report’s recommendation.

The staff reviewed those portions of the BWR Vessel ID Attachment Welds Program for which the applicant claimed consistency with GALL AMP XI.M4 and finds that they are consistent with the GALL Report AMP. Furthermore, the staff concludes that the applicant’s BWR Vessel ID Attachment Welds Program provides assurance that cracking will be adequately managed and the intended function of the vessel ID attachments will be maintained consistent with the current licensing basis for the period of extended operation. The staff found the applicant’s BWR Vessel ID Attachment Welds Program acceptable because it conforms to the recommended GALL AMP XI.M4, “BWR Vessel ID Attachment Welds,” with an exception.

Exception. In LRA Section B.1.6, the applicant stated an exception to the GALL Report program element "parameters monitored/inspected." Specifically, the exception states:

> Table IWB-2500-1 from the 1998 Edition with 2000 Addenda of ASME Section XI is used, while the GALL Report specifies the 2001 Edition with 2002 and 2003 Addenda.

The applicant further stated, in the LRA, that "Since ASME Section XI through the 2003 Addenda has been accepted by reference in 10 CFR 50.55a paragraph (b)(2) without modification or limitation on use of Table IWB-2500-1 from the 1998 Edition with 2000 Addenda for BWR components, use of this version is appropriate to assure that components crediting this program can perform their intended function consistent with the current licensing basis during the period of extended operation."

The staff reviewed the Inservice Inspection Program and concluded that it is acceptable. The acceptance of the applicant's Inservice Inspection Program is addressed in Section 3.0.3.3.3 of this SER. On this basis, the staff found this exception acceptable.

Operating Experience. LRA Section B.1.6 states that visual inspections of vessel ID attachment welds in October 2002 recorded no indications. Absence of recordable indications proves that the program is effective for managing cracking of vessel attachment welds. Staff inspections in 2002 and 2004 and a self-assessment in 2002 revealed no issues or findings that could impact program effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience revealed no degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.6, the applicant provided the UFSAR supplement for the BWR Vessel ID Attachment Welds Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's BWR Vessel ID Attachment Welds Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and their justifications and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 BWR Vessel Internals Program

Summary of Technical Information in the Application. LRA Section B.1.7 describes the existing BWR Vessel Internals Program as consistent, with exceptions and enhancement, with GALL AMP XI.M9, “BWR Vessel Internals.”

The program includes (a) inspection, flaw evaluation, and repair in conformance with applicable, staff-approved, BWRVIP documents and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-130 to ensure the long-term integrity of vessel internal components.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions and enhancement to determine whether the AMP, with the exceptions and enhancement, remained adequate to manage the aging effects for which it is credited.

The staff noted that the BWR Vessel Internals Program was credited to manage the steam dryer in LRA Section 3.1. The staff noted that the BWR Vessel Internals Program does not address steam dryer in the AMP and asked the applicant to address this item. In a letter dated August 22, 2006, the applicant committed (Commitment #37) to continue inspections in accordance with the VYNPS Steam Dryer Monitoring Program, Revision 3, which incorporates the guidelines of GE-SIL-644, Revision 1. The applicant also committed to evaluate BWRVIP-139 upon approval by the staff and either include its recommendations in the BWR Vessel Internals Program or inform the staff of exceptions to that document.

The GALL Report, in the preventive actions program element for GALL AMP XI.M7, stated that maintaining high water purity reduces susceptibility to SCC or IGSCC and reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in BWRVIP-29 (EPRI TR-103515). The applicant's reactor water chemistry is monitored and maintained in accordance with the guidelines of BWRVIP-130.

The staff reviewed the Water Chemistry Control-BWR Program, and concludes that it is acceptable. The acceptance of the applicant’s Water Chemistry Control Program is addressed in SER Section 3.0.3.1.11. On this basis, the staff finds this difference acceptable.

The staff reviewed those portions of the BWR Vessel Internals Program for which the applicant claimed consistency with GALL AMP XI.M9 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant’s BWR Vessel Internals Program provided assurance that aging effects for vessel internals will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the CLB through the period of extended operation. The staff finds the applicant's BWR Vessel Internals Program acceptable because it conformed to the recommended GALL AMP XI.M9, "BWR Vessel Internals," with the exceptions and enhancement.

Exception 1. In LRA Section B.1.7, the applicant stated an exception to the GALL Report program elements "scope of program" and "detection of aging effects." Specifically, the exception states:

> Core Shroud - For shroud horizontal welds H1, H2 and H3, VYNPS inspects 18 inches in length in each of the four quadrants from the outside diameter using EVT-1 methods. If cracks are found in a quadrant, the length is expanded in that quadrant to detect 18 inches of unflawed weld. Thus, VYNPS does not meet the BWRVIP-76 requirement to inspect both the outside and inside diameter of the welds and does not meet the requirement to inspect 100 percent of the length of the welds.
>
> Exception Note: The applicant stated, in the LRA, that "The CS spargers cover H1 and H2, and grating covers the periphery of the top guide. Therefore, access to the shroud inside diameter would be through vacated fuel cells, which would result in the camera being too distant from the inspection surfaces to perform an adequate EVT-1 of H1, H2, or H3. Although no BWRVIP guidance is given for one-sided visual examinations of horizontal welds, they are inspected on a six-year frequency following the BWRVIP guidance for a one-sided EVT-1 of vertical welds. The excellent results obtained in the 1995 ultrasonic examination of welds H1, H2, and H3 (very limited indications) and the 1996 ultrasonic examination of the vertical and ring segment welds (no indications) provide additional assurance that a one sided EVT-1 is acceptable."

The staff noted that the proposed outside diameter inspection cannot detect cracks initiated from the inside diameter and industry operating experience indicated that cracks have been initiated from the inside diameter. The applicant responded that one-sided EVT-1 will not be used and will follow BWRVIP-76's recommendation.

In a letter dated January 4, 2007, the applicant provided an amendment to its LRA to delete the exception related to the core shroud. Specifically, the applicant revised the BWR Vessel Internals Program as follows:

> 1. Delete the exception to the BWR Vessel Internal Program related to the core shroud (page B-27)
>
> 2. Delete exception Note #1 on page B-29.

On the basis that this exception is deleted and the applicant will follow BWRVIP-76's recommendation, consistent with the GALL Report recommendation, the staff finds this acceptable.

Exception 2. In LRA Section B.1.57, the applicant stated exception to the GALL Report program elements “scope of program” and “detection of aging effects.” Specifically, the exception states that:

> Core Plate - VYNPS performs VT-3 inspection of 50 percent (15) of the top of the core plate rim hold-down bolts every other refueling outage. If access to the lower plenum becomes available, VYNPS plans to perform a VT-3 inspection of accessible rim hold-down bolt bottom locking engagement and accessible aligner pin assemblies. Thus, VYNPS does not meet the BWRVIP-25 requirement to perform enhanced VT-1 from below the core plate of 50 percent of the hold-down bolts.

The applicant also stated that “A baseline VT-3 examination of the tops of all 30 bolted connections was performed in 1996. Followup VT-3 examinations of tops of 50 percent of the bolted connections were performed in 1999, 2000 and 2001. None of the exams found evidence of cracking or bolting disassembly. Since the lower bolted connections are similar to the top, and there are no failed connections in the sample that is inspected, it is unlikely that a significant number of failed connections could exist in the remainder of the population. Therefore, the VYNPS inspection plan is adequate for ensuring the structural integrity of the core plate configuration to resist sliding against shear loads.”

The staff noted that VT-3 cannot detect cracking and asked the applicant for further justification. The staff also asked the applicant to provide the plant-specific TLAA analysis as identified in the applicant’s action item of BWRVIP-25. The applicant responded that there is no TLAA to support an inspection sample of 50 percent of the bolts with none cracked to assure the integrity of a critical number of bolts.

In a letter dated July 6, 2006, the applicant provided Commitment #2 and Commitment #29 to address this exception. In this letter, the applicant stated that VYNPS will either install core plate wedge or complete a plant-specific analysis to determine acceptance criteria for continued inspection for core plate hold down bolting in accordance with BWRVIP-25.

Since the applicant committed to either install a core plate wedge or complete a plant-specific analysis to determine acceptance criteria for continued inspection for core plate hold down bolting in accordance with BWRVIP-25, the staff finds this exception acceptable.

Exception 3. In LRA Section B.1.57, the applicant stated an exception to the GALL Report program elements “scope of program” and “detection of aging effects.” Specifically, the exception states that:

> Core Spray - VYNPS defers inspection of the three inaccessible welds inside each of the two CS nozzles, and the P9 welds inside the CS shroud collars, until a delivery system for ultrasonic testing of the hidden welds is developed. Thus, VYNPS does not meet the BWRVIP-18 requirement to perform an ultrasonic inspection of a full target weld set every other refueling outage.

The applicant stated, in the LRA, that "The three CS thermal sleeve welds in each of the two CS nozzles are full penetration butt welds, which decreases the likelihood of cracking. Inspections of similar CS piping welds, such as junction box-to-pipe and upper elbow welds, showed no indication of cracking. Integrity of the P9 welds must be considered because indications have been recorded during ultrasonic examination of collar-to-shroud welds at VYNPS. The P9 welds are creviced. All other creviced CS welds at VYNPS - the junction box cover plate welds, P1 welds and downcomer sleeve welds - show no indications of cracking. Therefore, deferral of inspection of the inaccessible welds is justified."
The staff noted that BWRVIP-18 states that inspection technique development needed for the inaccessible (thermal sleeve) welds is being addressed by the BWRVIP inspection committee as a high priority item (since 1996). The staff asked the applicant to provide justification to address this exception.

In a letter dated July 6, 2006, the applicant provided Commitment #36 to address this item. In this letter, the applicant stated that "If technology to inspect the hidden jet pump thermal sleeve and CS thermal sleeve welds has not been developed and approved by the NRC at least two years prior to the period of extended operation, VYNPS will initiate a plant-specific action to resolve this issue. That plant-specific action may be justification that the welds do not require inspection." The staff finds this commitment to be acceptable, since the enhanced procedure will address the recommendations of the GALL Report. On the basis of this commitment, the staff finds this exception acceptable.

Exception 4. In the LRA Section B.1.57, the applicant stated an exception to the GALL Report program elements "scope of program" and "detection of aging effects." Specifically, the exception states that:

> Jet Pump Assembly - VYNPS uses EVT-1 inspection of six jet pump welds with UT indications. Thus, VYNPS does not meet guidance implied in BWRVIP-41 that when flaws are identified, subsequent examinations should use the same technique that originally found the flaw.
>
> VYNPS defers inspection of jet pump inaccessible welds, until a delivery system for ultrasonic testing of the hidden welds is developed. Thus, VYNPS does not meet the BWRVIP-41 requirement to perform a modified VT-1 of 100 percent of these welds over two 6-year inspection cycles and 25 percent per inspection cycle thereafter.

The applicant noted that:

> "The hidden jet pump welds are far enough into the nozzle that failure at these welds would not result in the thermal sleeve disengaging from the nozzle before the riser contacted the shroud. If the jet pump thermal sleeve or riser piping severed, it would be detected through jet pump monitoring, which alarms if the riser pipe moves more than 10 percent while at or above a core flow of 42 Mlb/hr. Therefore, deferral of inspection of the inaccessible welds is justified.

For jet pump welds, BWRVIP-41 finds EVT-1 or UT to be acceptable examination techniques. In 1996, VYNPS performed UT examinations and recorded indications in six jet pump welds. All six welds were reinspected by UT after two cycles of operation and there were no new indications or growth of existing indications. Since the reinspection demonstrated that there is no active cracking in these welds, and EVT-1 inspection will reveal cracking prior to encroachment on the weld structural integrity limit, performing subsequent inspections using the EVT-1 technique is acceptable. VYNPS will perform the EVT-1 inspections every two cycles until three successive inspections confirm no new indications or growth of existing indications, at which time VYNPS will revert to the six-year inspection interval specified in BWRVIP-41.

The staff noted that the SER for BWRVIP-41 states that an AMR of the nozzle thermal sleeve (jet pump inaccessible welds) will be provided by individual applicants and asked the applicant to provide plant-specific justification/commitment to demonstrate that the weld will be adequately managed during the period of extend operation.

In a letter dated July 6, 2006, the applicant provided Commitment #36 to address this item. In this letter, the applicant stated that “If technology to inspect the hidden jet pump thermal sleeve and CS thermal sleeve welds has not been developed and approved by the NRC at least two years prior to the period of extended operation, VYNPS will initiate plant-specific action to resolve this issue. That plant-specific action may be justification that the welds do not require inspection.” The staff finds this commitment to be acceptable, since the enhanced procedure will address the recommendations of the GALL Report. On the basis of this commitment, the staff finds this exception acceptable.

The staff also noted that EVT-1 inspection cannot detect the depth of the flaw and there is no way to identify the flaw propagation with EVT-1. The staff asked the applicant to provide further justification for using EVT-1 technique.

The applicant gave three reasons why there was no change in the size of the indications. The first was that the indications are not relevant and are caused by either geometry, transducer lift off or are related to metallurgical interfaces, which it states is unlikely. The second possibility is that the indications are fabrication flaws. The applicant thinks that the fabrication flaws would not have been identified since all that is required during fabrication was a PT exam. The third possibility is that the cracks are IGSCC but, the cracks are not growing.

The applicant stated that the BWRVIP has stated that EVT-1 and UT are equivalent. The staff has accepted this position. The applicant also stated that before integrity of the welds was compromised, the EVT-1 examinations would be able to identify the flaws because they would be long, through-wall circumferential flaws. Furthermore, the applicant stated that flaw propagation can be confirmed through three successive examinations which is consistent with the rules in ASME Code Section XI. Finally, the applicant stated that, in addition to the above reasons, VYNPS Technical Specifications (TSs) require that jet pump integrity and operability be checked daily. The staff finds that reverting to the six -year inspection frequency using the EVT-1 technique is acceptable. On this basis, the staff finds this exception acceptable.

Exception 5. In LRA Section B.1.57, the applicant stated an exception to the GALL Report program elements “scope of program” and “detection of aging effects.” Specifically, the exception states that:

> Control Rod Drive Housing - VYNPS performed less than 5 percent of the CRD guide tube weld exams within the first six-year interval. Thus, VYNPS does not meet the BWRVIP-47 requirement to inspect 5 percent of the CRD guide tube welds within the first six years.

The applicant stated, in the LRA, that “To meet the BWRVIP-47 requirement to inspect 5 percent of the CRD guide tube welds within the first six years, VYNPS would have to inspect five guide tubes. Four CRD guide tube assemblies were inspected during the first six-year period, for a total of 4.5 percent of the welds. The inspections began in RFO 22 (2001), when four guide tube assemblies were inspected, and were expected to be completed during RFO 23 (2002). Control blade change-out allows access to the interior of the CRD guide tube and, typically, there are between three and ten blade change-outs each outage. However, no control blades were changed during RFO 23. Inspecting one guide tube during RFO 23 to attain the five percent sample level would have required vacating an additional fuel cell (more fuel moves) and an added three hours for disassembly and reassembly (not counting inspection time). This hardship is not justified in terms of safety in order to raise the inspection sample from 4.5 percent to 5 percent. The BWRVIP-47 requirement to inspect 10 percent of the CRD guide tubes over the first twelve years will be met.”

The staff noted that the program basis document indicated VT-3 inspections were performed and asked the applicant to clarify whether EVT-1 inspection was performed to meet the baseline inspection requirements. The applicant responded that the EVT-1 inspections are conducted on control rod guide tube (CRGT)-2 and CRGT-3 in accordance with BWRVIP-47.

On the basis that the inspection meets the BWRVIP-47 guidelines of 10 percent of the CRGT over the 12 years, the staff finds this exception acceptable.

Exception 6. In LRA Section B.1.57, the applicant stated an exception to the GALL Report program element “parameters monitored/inspected.” Specifically, the exception states that:

> Table IWB-2500-1 from the 1998 Edition with 2000 Addenda of ASME Code, Section XI is used, while the GALL Report specifies the 2001 Edition with 2002 and 2003 Addenda.

The applicant stated, in the LRA, that “Since ASME Code, Section XI through the 2003 Addenda has been accepted by reference in 10 CFR 50.55a, paragraph (b)(2), without modification or limitation on use of Table IWB-2500-1 from the 1998 Edition with 2000 Addenda for BWR components, use of this version is appropriate to assure that components crediting this program can perform their intended function consistent with the CLB during the period of extended operation.”

The staff reviewed the Inservice Inspection Program and concludes that it is acceptable. The acceptance of the applicant's Inservice Inspection Program is addressed in SER Section 3.0.3.3.3. ASME Code, Section XI, Subsection IWB-2500 from the 1998 Edition with 2000 Addenda is part of the Inservice Inspection Program. On this basis, the staff finds this exception acceptable.

Enhancement. In LRA Section B.1.57, the applicant stated the following enhancement in meeting the program element "scope of program." Specifically, the enhancement states:

> The VYNPS top guide fluence is projected to exceed the threshold for irradiation-assisted stress corrosion cracking (IASCC) ($5x10^{20}$ n/cm^2) prior to the period of extended operation. Therefore, 10 percent of the top guide locations will be inspected using enhanced visual inspection technique, EVT-1, within the first 12 years of the period of extended operation, with one-half of the inspections (50 percent of locations) to be completed within the first six years of the period of extended operation. Locations selected for examination will be areas that have exceeded the neutron fluence threshold.

During the audit and review, the staff noted that the applicant's enhancement addresses the first 12 years of the period of extended operation and does not address the remaining period of extended operation. The staff asked the applicant to clarify the reinspection requirement. In a letter dated July 6, 2006, the applicant provided its LRA amendment to address this issue. In its letter, the applicant stated that an inspection requirement will be applied to the remaining period of extended operation.

On this basis, the staff finds this enhancement acceptable since when the enhancement is implemented, the BWR Vessel Internals Program will be consistent with GALL AMP XI.M9 and will provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. LRA Section B.1.7 states that cracking of jet pump riser welding (RS-1) was detected during 1998 inspections. Subsequent inspections detected no new indications or growth of existing indications. Potential CS piping weld flaws also were detected during ultrasonic examination in 2001. Indications evaluated in accordance with BWRVIP-18 evaluation criteria were found acceptable. This operating experience shows that the program is effective at managing the effects of component cracking on the intended function. Visual inspections of reactor vessel internals in 2004 detected no new age-related indications. Absence of new indications shows that the program is effective at managing component aging effects on intended function. Staff inspections, self-assessments, QA audits, and evaluations of industry operating experience from 1999 through 2004 revealed no issues or findings that could impact program effectiveness.

The staff's review of plant-specific operating experience revealed conditions discovered by BWR Vessel Internals Program examinations similar to those identified elsewhere in the BWR fleet. In each case, indications were evaluated and either found acceptable for further service or appropriately repaired. The BWR Vessel Internals Program is continually adjusted to account for industry experience and research. The staff finds this acceptable.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.7, the applicant provided the UFSAR supplement for the BWR Vessel Internals Program.

The applicant committed (Commitment #37) to continue inspections in accordance with the Steam Dryer Monitoring Program, Revision 3, in the event that the BWRVIP-139 is not approved prior to the period of extended operation; by March 21, 2012.

The applicant also committed (Commitment #29), by March 21, 2012, to perform one of the following:

1. Install core plate wedges, or,

2. Complete a plant-specific analysis to determine acceptance criteria for continued inspection of core plate holddown bolting in accordance with BWRVIP-25 and submit the inspection plan to the NRC two years prior to the period of extended operation for NRC review and approval.

The applicant made a commitment (Commitment #36) that by March 12, 2012, if technology to inspect the hidden jet pump thermal sleeve and CS thermal sleeve welds has not been developed and approved by the NRC at least two years prior to the period of extended operation, VYNPS will initiate plant-specific action to resolve this issue. That plant-specific action may be justification that the welds do not require inspection.

The applicant committed (Commitment #2), to inspect 15 percent of the top guide locations using enhanced visual inspection technique, EVT-1, within the first 18 years of the period of extended operation, with at least one-third of the inspections to be completed within the first 6 years and at least two-thirds within the first 12 years of the period of extended operation. Locations selected for the examination will be areas that have exceeded the neutron fluence threshold.

The staff reviewed LRA Section A.2.1.7 and determines that, upon the implementation of Commitments #2, #29, #36 and #37, the information in the UFSAR supplement is an adequate summary of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's BWR Vessel Internals Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the addition of Commitments #2, #29,

#36 and #37. In addition, the staff reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancement and confirmed that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.8 Containment Leak Rate Program

Summary of Technical Information in the Application. LRA Section B.1.8 describes the existing Containment Leak Rate Program as consistent, with exception, with GALL AMP XI.S4, "10 CFR 50, Appendix J."

Containment leak rate tests are required for assurance that: (a) leakage through the primary reactor containment and systems and components penetrating primary containment does not exceed allowable limits in technical specifications or associated bases and (b) periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of the primary containment and penetrating systems and components.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Containment Leak Rate Program for which the applicant claimed consistency with GALL AMP XI.S4 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's Containment Leak Rate Program provided assurance that aging management and other deterioration of the containment leakage limiting boundary is appropriately managed to ensure that postulated post-accident releases are limited to an acceptable level during the period of extended operation. The staff finds the applicant's Containment Leak Rate Program acceptable because it conformed to the recommended GALL AMP XI.S4, "10 CFR 50, Appendix J," with an exception.

Exception. In LRA Section B.1.8, the applicant stated exception to the GALL Report program element "monitoring and trending." Specifically, the exception states:

> The first Type A test after the April 1995 Type A test shall be performed no later than April 2010. This is a one-time extension of the NEI 94-01, 10-year Type A test interval to 15 years. NRC approved Amendment 227 to Facility Operating License DPR-28 for VYNPS to extend the primary containment integrated leak rate testing interval from 10 years to no longer than 15 years on a one-time basis.

The applicant also stated that the first Type A test after the April 1995 Type A test shall be performed no later than April 2010. This is a one-time extension of the NEI 94-01, 10-year Type A test interval to 15 years.

The staff reviewed Amendment 227 to Facility Operating License DPR-28 for VYNPS, which extends the primary containment integrated leak rate testing interval from 10 years to no longer than 15 years. The staff determines that this one-time extension to the current operating license does not cover all subsequent Type A tests which must be performed at ten -year intervals. On this basis, the staff finds this exception acceptable.

Operating Experience. LRA Section B.1.8 states that during the most recent integrated leakage testing of primary containment, as-found and as-left test data met all applicable acceptance criteria, indicating that the program is effective at managing the effects of loss of material and cracking on primary containment components. A QA audit in 2001 revealed latent noncompliance with station administrative and requirements of 10 CFR Part 50, Appendix J. An administrative procedure noncompliance created the potential for untimely review of industry operating experience relative to the program. These issues could impact program effectiveness. However, actions to preclude recurrence of the identified conditions were implemented in accordance with the CAP and subsequent QA audits, QA surveillances, and engineering program health assessments (2003 and 2004) revealed no issues or findings that could impact program effectiveness.

During the audit and review, the applicant stated that VYNPS has a comprehensive operating experience program that monitors industry events and issues, and assesses them for applicability to its own operations. In addition, VYNPS has a CAP that is used to track, to trend, and to evaluate significant plant issues and events. Those issues and events, whether industry or plant-specific, that are potentially significant to the Containment Leak Rate Program at VYNPS are evaluated. The Containment Leak Rate Program is augmented, as appropriate, when these evaluations show that changes to this program will enhance its effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.8, the applicant provided the UFSAR supplement for the Containment Leak Rate Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Containment Leak Rate Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and their justifications and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Diesel Fuel Monitoring Program

Summary of Technical Information in the Application. LRA Section B.1.9 describes the existing Diesel Fuel Monitoring Program as consistent, with exceptions and enhancements, with GALL AMP XI.M30, “Fuel Oil Chemistry.”

The program samples diesel fuel to maintain adequate quality to prevent corrosion of fuel systems. Exposure to such fuel oil contaminants as water and microbiological organisms is minimized by periodic draining and cleaning of tanks and by verifying the quality of new oil before its introduction into storage tanks. Sampling and analysis activities are in accordance with technical specifications on fuel oil purity and the guidelines of American Society for Testing and Materials (ASTM) Standards D4057-88 and D975-02 (or later revisions of these standards).

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions and enhancements to determine whether the AMP, with the exceptions and enhancements, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Diesel Fuel Monitoring Program for which the applicant claimed consistency with GALL AMP XI.M30 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant’s Diesel Fuel Monitoring Program provided assurance that the loss of material due to corrosion is adequately managed by monitoring and controlling conditions that would cause this aging effect and by monitoring the effectiveness of the program through surveillance and testing. The staff finds the applicant’s Diesel Fuel Monitoring Program acceptable because it conformed to the recommended GALL AMP XI.M30, “Fuel Oil Chemistry,” with exceptions and enhancements.

Exception 1. In LRA Section B.1.9, the applicant stated an exception to the GALL Report program elements “scope of program” and “acceptance criteria.” Specifically, the exception states:

> The guidelines of ASTM Standard D6217 are not used along with those of D2276 for determination of particulates.

The applicant also stated, in the LRA, that the program uses only the guidance provided in ASTM D2276 for the determination of particulates and not both ASTM D2276 and ASTM D6217. In the LRA, the applicant further stated that the use of ASTM D2276 is consistent with the guidance provided in ASTM D975 which is specified in the VYNPS technical specifications.

The staff finds that the applicant is using one of the methods (ASTM D2276) which is recommended by the GALL Report. During the audit and review, the applicant stated that the ASTM D6217 provides guidance on determining particulate contamination by sample filtration at an offsite laboratory. However, the use of ASTM D2276 provides for guidance on determining particulate contamination using a field monitor which provides for rapid assessment of changes in contamination. In addition, the applicant stated that the acceptance criteria for ASTM D2276 is more stringent than for ASTM D6217, namely 10 mg/ml versus 24 mg/ml. The staff finds the use of only ASTM D2276 to be conservative.

The staff finds this exception acceptable based on using the more stringent of the ASTM standards recommended by the GALL Report with the added advantage of the quick assessment of contamination changes.

Exception 2. In LRA Section B.1.9, the applicant stated exception to the GALL Report program element “preventive actions.” Specifically, the exception states:

> No additives are used beyond what the refiner adds during production.

The applicant also stated, in the LRA, that VYNPS does not add biocides, stabilizers, or corrosion inhibitors to the diesel fuel. Plant-specific operating experience has not indicated significant problems related to microbiologically-influenced corrosion. Since water contamination in the diesel fuel storage tanks is minimized, the potential for MIC is limited.

The applicant stated that for the past 10 years VYNPS has been buying high quality fuel oil from the same supplier. The diesel fuel is tested before delivery and then the diesel fuel in the storage tank is tested monthly. There have been no indications of diesel fuel deterioration or the presence of water or sediment. Since mold and bacteria grow in the water fuel oil interface, the applicant stated during the audit and review that based on the test results there is no need to add biocides.

The staff reviewed the operating experience and sample results, and determines that MIC and breakdown of the diesel fuel have not been issues that necessitated the use of fuel additives. Furthermore, the Diesel Fuel Monitoring Program provides for routine monitoring of the diesel fuel through monthly surveillance and trending which ensures that the presence of contamination will not go undetected. On this basis, the staff finds this exception acceptable.

Exception 3. In LRA Section B.1.9, the applicant stated exception to the GALL Report program elements “parameters monitored/inspected” and “acceptance criteria.” Specifically, the exception states:

> Only ASTM Standard D1796 is used for determination of water and sediment, rather than Standards D1796 and D2709.

The applicant also stated, in the LRA, that ASTM Standards D1796 and D2709 are used for determination of water and sediment. However, these standards describe the determination of water and sediment for oils with different viscosities. Either standard is applicable to the #2 diesel fuel oil used at VYNPS. VYNPS uses ASTM Standard D1796 for determination of water and sediment.

The GALL Report recommends both ASTM Standards D1796 and D2709 for determining the water and sediment contamination in diesel fuel. Both of these standards are applicable to the diesel fuel used at VYNPS. The ASTM Standard D1796 is the method referenced in ASTM D975 which VYNPS is using in the plant technical specifications. Since either standard would be appropriate for the VYNPS diesel fuel, the staff accepted the use of ASTM D1796 to determine the water and sediment in the diesel fuel. On this basis, the staff finds this exception acceptable.

Exception 4. In LRA Section B.1.9, the applicant stated an exception to the GALL Report program elements “parameters monitored/inspected” and “acceptance criteria.” Specifically, the exception states:

> Determination of particulates may be according to ASTM Standard D2276, rather than modified ASTM D2276 Method A.

The applicant also stated, in the LRA, that the determination of particulates is based on ASTM D2276 and not the modified Method A version of D2276. The VYNPS determination of the presence of unacceptable levels of particulates is based on using a filter with a pore size of 0.8 μm which is recommended in ASTM D2276. The modified Method A version of ASTM D2276 uses a filter pore size of 3.0 μm.

The staff determines that the use of a filter size of 0.8 μm instead of 3.0 μm when monitoring the presence of particulates in the diesel fuel is judged to be conservative. Based on the use of the conservative filter pore size, the staff finds the testing provides results that are equivalent or superior to those obtained using a 3.0 μm pore size as recommended in the GALL Report. On this basis, the staff finds this exception acceptable.

Enhancement 1. In LRA Section B.1.9, the applicant stated the following enhancement in meeting the program element “detection of aging effects.” Specifically, the enhancement states:

> Ultrasonic thickness measurement of the tank bottom surface will be performed every 10 years during tank cleaning and inspection.

The staff determines that the monthly testing of the diesel fuel quality and for the presence of water and sediment augmented by the ultrasonic thickness measurement of the diesel fuel storage tank bottom every 10 years when the tank is cleaned and inspected will ensure that significant degradation of the tank bottom surface will not go undetected.

On this basis, the staff finds this enhancement acceptable since when the enhancement is implemented, “Diesel Fuel Monitoring Program,” will be consistent with GALL AMP XI.M30 and will provide additional assurance that the effects of aging will be adequately managed.

Enhancement 2. In LRA Section B.1.9, the applicant stated the following enhancement in meeting the program element “acceptance criteria.” Specifically, the enhancement stated:

> UT measurements of TK-40-1A bottom surface will have acceptance criterion $\geq$ 60 percent Tnom.

The GALL Report does not provide a recommendation for the “acceptance criteria” program element related to the acceptable bottom surface wall thickness.

The applicant also stated, in the LRA, that for the ultrasonic measurements of the diesel fuel storage tank bottom thickness an acceptance criteria of 60 percent of the nominal thickness will be used.

The GALL Report does not provide an acceptance criterion for the bottom surface thickness of the diesel fuel storage tank. The fuel oil tank is not pressurized so the staff judged the use of 60 percent of the nominal wall thickness provides sufficient margin to be an acceptable criterion for the ultrasonic thickness measurements. The use of this acceptance criterion will provide additional assurance that the effects of aging will be detected before the loss of intended function.

On this basis, the staff finds this enhancement acceptable since when the enhancement is implemented, “Diesel Fuel Monitoring Program,” will be consistent with GALL AMP XI.M30 and will provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. LRA Section B.1.9 states that fuel oil sampling results from 2000, 2001, 2002, and 2003 reveal fuel oil quality maintained in compliance with acceptance criteria. A 1996 visual inspection of the fuel oil storage tank internals revealed no degradation. A 1996 ultrasonic thickness measurement of the tank bottom surface also revealed no significant degradation. Continuous confirmation of diesel fuel quality and absence of degradation in the fuel oil storage tank prove that the program is effective in preventing loss of material and cracking of fuel system components. QA surveillance in 1999 found an issue that could impact program effectiveness. However, corrective action was taken to update the program to the 2002 version of ASTM D975. There have been no other significant findings.

The staff reviewed a sample of the monthly diesel fuel test data from the data highlighted in the LRA. The staff confirmed that the test results were within the acceptance criteria. Also, during the audit and review, the staff confirmed that based on a review of the plant operating experience, there were no component failures related to the quality of the diesel fuel which led to the loss of intended function of any component. Finally, the staff reviewed VYNPS work orders. From this review the staff confirmed that a visual inspection was performed in 1996 of the fuel oil tank which revealed no degradation. In addition during this review the staff confirmed that the ultrasonic measurement in 1996 of the tank bottom surface revealed no degradation.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.9, the applicant provided the UFSAR supplement for the Diesel Fuel Monitoring Program.

The applicant committed in (Commitment #3) to implement the enhancement to the Diesel Fuel Monitoring Program to ensure ultrasonic thickness measurement of the tank bottom surface will be performed every 10 years during tank cleaning and inspection by March 21, 2012.
The applicant committed in (Commitment #4) to implement the enhancement to the Diesel Fuel Monitoring Program to specify UT measurements of TK-40-1A bottom surface will have acceptance criterion $\geq$60 percent Tnom by March 21, 2012.

The staff reviewed LRA Section A.2.1.9 and determined that, upon the implementation of Commitments #3 and #4, the information in the UFSAR supplement is an adequate summary of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Diesel Fuel Monitoring Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the addition of Commitments #3 and #4. In addition, the staff reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancements and confirmed that their implementation, prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.10 Fatigue Monitoring Program

Summary of Technical Information in the Application. LRA Section B.1.11 describes the existing Fatigue Monitoring Program as consistent, with exceptions and enhancements, with GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary."

The Fatigue Monitoring Program tracks the number of critical thermal and pressure transients for selected reactor coolant system components so they do not exceed design limit on fatigue usage. The program validates analyses that explicitly assume a specified number of thermal and pressure fatigue transients by assuring that the actual effective number of transients is not exceeded.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions and enhancements to determine whether the AMP, with the exceptions and enhancements, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Fatigue Monitoring Program for which the applicant claimed consistency with GALL AMP X.M1 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's Fatigue Monitoring Program provided assurance that fatigue damage will be adequately managed. The staff finds the applicant's Fatigue Monitoring Program acceptable because it conformed to the recommended GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary," with exceptions and enhancements.

Exception 1. In LRA Section B.1.11, the applicant stated an exception to the GALL Report program element "preventive actions." Specifically, the exception states that:

> The Fatigue Monitoring Program only involves tracking the number of transient cycles and does not include assessment of the impact of reactor water environment on critical components.

In the LRA, the applicant stated that the effect of the reactor water environment on fatigue [damage] is addressed as a TLAA (as described in Section 4.3.3) as opposed to being implemented within the Fatigue Monitoring Program.

The staff confirmed that LRA Section 4.3.3 provided for an acceptable method of dealing with environmental effects, consistent with NUREG/CR-6260. On this basis, the staff finds this exception acceptable.

Exception 2. In LRA Section B.1.11, the applicant stated an exception to the GALL Report program element "detection of aging effects." Specifically, the exception states that:

> The VYNPS program does not provide for periodic update of the fatigue usage calculations.

The applicant further stated that the VYNPS program provides for periodic assessment of the number of accumulated cycles, and that if a design cycle assumption is approached, corrective action is taken.

On the basis that updates of fatigue usage calculations are not necessary unless the number of accumulated fatigue cycles approaches the number of assumed design cycles and corrective actions is taken if a design cycle assumption is approached, the staff finds the applicant's program exception acceptable.

Enhancement 1. In LRA Section B.1.11, the applicant stated the following enhancement in meeting the program element "detection of aging effects." Specifically, the enhancement stated:

> The VYNPS program will be modified to either require periodic update of cumulative fatigue usage factors (CUFs), or to require update of CUFs if the number of accumulated cycles approaches the number assumed in the design calculation.

The staff finds this enhancement acceptable. If the first alternative is adopted, "Fatigue Monitoring Program," will be consistent with GALL AMP X.M1. If the second alternative is adopted, together with the commitment to implement the use of a computerized monitoring program (which entails the establishment of a new baseline and then determines CUFs directly), an acceptable method to ensure that the effects of aging will be adequately managed is provided.

Enhancement 2. In LRA Section B.1.11, the applicant stated the following enhancement in meeting the program element "monitoring and trending." Specifically, the enhancement states:

> A computerized monitoring program (e.g., FatiguePro) will be used to directly determine CUFs for locations of interest.

The staff reviewed a sample of CUF calculations and associated reports and VYNPS technical personnel confirmed that the NUREG/CR-6260 locations were among the locations of interest to be monitored.

On the basis that CUFs will be determined directly on an ongoing basis, the staff finds that this enhancement will provide an acceptable method for monitoring and trending fatigue damage. The staff finds that when the enhancement is implemented, the applicant's Fatigue Monitoring Program will be consistent with GALL AMP X.M1 and will provide additional assurance that the effects of aging will be adequately managed.

Enhancement 3. In LRA Section B.1.11, the applicant stated the following enhancement in meeting the program element "acceptance criteria." Specifically, the enhancement stated:

> The allowable number of effective transients will be established for monitored transients. This will allow quantitative projection of future margin.

The staff finds this enhancement acceptable since when the enhancement is implemented, the applicant's Fatigue Monitoring Program will be consistent with GALL AMP X.M1 and will provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. In LRA Section B.1.11, the applicant stated that the condition reporting process documented the discovery of a previously unrecognized fatigue cycle applicable to reactor vessel FW nozzles. Corrective actions included revision of the cycle tracking procedure and of FW nozzle fatigue analysis calculations. This operating experience demonstrates that the corrective action process documents program deficiencies and tracks corrective actions when necessary. For recent reactor shutdowns and startups, cycle limitations did not trend toward exceeding the allowable number of cycles. This operating experience demonstrates that the program continues to monitor plant transients and to track the accumulation of these transients.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience revealed no degradation beyond industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

UFSAR Supplement. In LRA Section A.2.1.11, the applicant provided the UFSAR supplement for the Fatigue Monitoring Program.

The applicant committed (Commitment #5) to modified the Fatigue Monitoring Program to require periodic update of cumulative fatigue usage factors (CUFs), or to require update of CUFs if the number of accumulated cycles approaches the number assumed in the design calculation by March 21, 2012.

The applicant committed (Commitment #6) to use a computerized monitoring program (e.g., FatiguePro) will be used to directly determine CUFs for locations of interest for the Fatigue Monitoring Program by March 21, 2012.

The applicant committed (Commitment #7) to established the allowable number of effective transients for monitored transients. This will allow quantitative projection of future margin for the Fatigue Monitoring Program, by March 21, 2012.

The staff reviewed LRA Section A.2.1.11 and determines that, upon implementation of Commitments #5, #6, and #7, the information in the UFSAR supplement provided an adequate summary description of the program, as required by 10 CFR 54.21(d).

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

Conclusion. On the basis of its audit and review of the applicant's Fatigue Monitoring Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the addition of Commitments #5, #6, and #7. In addition, the staff reviewed the exceptions and the associated justifications, and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancements and confirmed that the implementation of the enhancements prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.11 Fire Protection-Fire Protection Program

Summary of Technical Information in the Application. In LRA Section B.1.12.1, the applicant stated that "Fire Protection Program," is an existing plant program that is consistent with GALL AMP XI.M26, "Fire Protection," with exceptions and enhancements.

The Fire Protection Program included a fire barrier inspection and a diesel-driven fire pump inspection. The fire barrier inspection requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire-rated doors to ensure that their operability is maintained. The diesel-driven fire pump inspection requires that the pump be periodically tested to ensure that the fuel supply line can perform its intended function. Corrective actions, confirmation process, and administrative controls in accordance with the requirements of 10 CFR 50 Appendix B are applied to the Fire Protection Program.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's audit evaluation of this AMP. The staff reviewed the exceptions and enhancements and the associated justifications to determine whether the AMP, with the exceptions and enhancements, remains adequate to manage the aging effects for which it is credited.

The GALL Report recommends that inspection results are acceptable if there are no visual indications (outside those allowed by approved penetration seal configuration) of cracking, separation of seals from walls and components, separation of layers of material, or ruptures or punctures of seals; no visual indications of concrete cracking, spalling and loss of material of fire barrier walls, ceilings and floors; no visual indications of missing parts, holes, and wear; and no deficiencies in the functional tests of fire doors.

The staff reviewed the applicant's procedure acceptance criteria and noted that they allow cracks in poured concrete barriers, fire barriers, concrete block walls, drywall, plaster, silicone foam, pyrocrete, and smoke/gas seals. The staff asked the applicant to justify the plant-specific acceptance criteria's variance from that recommended by the GALL Report. The applicant responded that this acceptance criteria procedure would be revised to require that any recordable indication be identified and entered into the CAP for evaluation and subsequent action, as described below in Enhancement 1.

The GALL Report recommends that visual inspection by fire protection qualified inspectors of penetration seals in walkdowns be performed at least once every refueling cycle. The staff reviewed VYNPS procedure, examination requirements and noted that it did not address inspector qualifications. The staff asked the applicant to explain the inspector qualifications. The applicant responded that its qualification program was being developed and will include acceptance criteria, personnel training, and qualification as a "fire protection qualified individual" in accordance with the standards of ANSI 45.2.6.

The staff reviewed those portions of the Fire Protection-Fire Protection Program for which the applicant claimed consistency with GALL AMP XI.M26 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's Fire Protection-Fire Protection Program provides assurance that the aging of fire protection components through detailed fire barrier examinations of fire barrier penetration seals, fire barrier walls, ceilings and walls, and through periodic examinations and functional tests of fire-rated doors, will be adequately managed. The Fire Protection Program also manages the aging of the diesel-driven fire pump through periodic testing, and the carbon dioxide fire suppression system through periodic examinations and testing. The staff finds the applicant's Fire Protection-Fire Protection Program acceptable because it conformes to the recommended GALL AMP XI.M26, "Fire Protection," with exceptions and enhancements.

Exception 1. In LRA Section B.1.12.1, the applicant stated an exception to the GALL Report program element "scope of program." Specifically, the exception states that:

> This program is not necessary to manage aging effects for halon fire protection system components.

The applicant also noted that the Halon 1301 suppression system is not subject to an AMR. Aging effects for components in the CO_2 system are managed by the System Walkdown Program.

The staff asked the applicant to explain statement regarding the halon fire suppression system. The applicant responded that there was no halon fire suppression system within the scope of license renewal, or that was brought in-scope resulting from requirements of 10 CFR 54.4(a)(2). The applicant explained that there is a halon fire suppression system for the computer room only, but that there are no VYNPS UFSAR, TS, or 10 CFR 50, Appendix R, requirements associated with that system. The applicant further explained that VYNPS uses water spray to protect most areas that are typically protected with halon or carbon dioxide at other nuclear power plants, except that VYNPS will limit water fire protection in areas where there is potential for water to spread radioactive contamination; in those areas, the applicant stated that fires would be fought primarily with portable dry chemical or carbon dioxide fire extinguishers. Since there is no halon fire suppression system within the scope of license renewal, the Fire Protection Program does not discuss its aging management.

The staff asked the applicant to explain the statement regarding the CO_2 fire suppression system. The applicant responded that the CO_2 fire suppression system had historically been placed in the System Walkdown Program vice the Fire Protection Program. As with the halon fire suppression system, the applicant stated that there were no VYNPS UFSAR TS or 10 CFR 50, Appendix R, requirements associated with the CO_2 fire suppression system. The staff reviewed the applicant's procedure and determines that it adequately addressed AERM as identified in the GALL Report. According to this procedure, VYNPS performs visual examinations during periodic formal walkdowns on either monthly or a six-month frequency, depending on the system; and informal walkdown results can be recorded and evaluated at any time. VYNPS has committed (Commitment #30) to revise the System Walkdown Program to specify CO_2 system inspections every six months. In its letter, dated March 13, 2007, the applicant revised its LRA to include functional testing of the CO2 system in accordance with Technical Requirements Manual (TRM) 4.13.D surveillance requirements.

The staff reviewed the applicant's response and concludes that there is no halon fire suppression system within the scope of license renewal and that the applicant adequately addresses the aging management of the CO_2 fire suppression system with the System Walkdown Program and functional testing in accordance with their TRM 4.13.D surveillance requirements. On this basis, the staff finds this exception to be acceptable.

Exception 2. In LRA Section B.1.12.1, the applicant stated an exception to the GALL Report program element "detection of aging." Specifically, the exception states that:

> The GALL Report program stated that 10 percent of each type of penetration seal should be visually inspected at least once every refueling outage. The VYNPS program specifies inspection of approximately 25 percent of the seals (regardless of seal type) each operating cycle, with all accessible fire barrier penetration seals being inspected at least once every four operating cycles.

The applicant also stated that since aging effects are typically manifested over several years, this variation in inspection frequency is insignificant.

The staff asked the applicant to explain the rationale for the inspection frequency of the penetration seals. The applicant responded that the examination frequency is conservative The staff asked the applicant to explain how it addressed inaccessible penetration seals. The applicant responded that the environment to which the inaccessible penetrations seals are exposed is similar, if not identical, to that of the accessible penetrations seals, and that it considered the condition of accessible penetration seals to be representative of the inaccessible penetration seals. Thus, inaccessible seals would not necessarily be included in any inspection expansion, when recordable indications are detected during the performance of an inspection, but would be included in replacement of accessible penetration seals, as determined by engineering evaluation.

The staff evaluated the applicant's response and determined that it was unacceptable to consider the inspection of accessible seals representative of inaccessible seals. In its letter, dated March 13, 2007, the applicant revised its LRA to remove the word "accessible" from the exception. All fire barrier penetration seals are to be inspected.

The staff evaluated the applicant's response and determines that the applicant meets or exceeds the penetration seal inspection frequency recommended in the GALL Report, and adequately addressed the aging mechanisms requiring management of inaccessible seals. On this basis, the staff finds this exception acceptable.

Enhancement 1. In LRA Section B.1.12.1, the applicant stated the following enhancement in meeting the program elements “parameters monitored/inspected” and “acceptance criteria.” Specifically, the enhancement states:

> Procedures will be enhanced to specify that fire damper frames in fire barriers shall be inspected for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion.

The staff asked the applicant to explain this enhancement (Commitment #8). The applicant responded that, in the course of an evaluation conducted in preparation for license renewal, this procedure had been determined not to adequately address the concerns associated with all the AERMs, as recommended in the GALL Report. The staff reviewed the pertinent procedure and agrees that the procedure instructions and acceptance criteria did not adequately address the aging effect of corrosion. The fire dampers are in the ventilation ducts and are considered to be susceptible to corrosion. The staff also asked the applicant to clarify the stated objective of no “significant” corrosion. The applicant responded that any recordable indication would be forwarded to the CAP for evaluation and subsequent action.

The staff reviewed the applicant’s response and determines that it adequately addresses the issue of corrosion of the dampers. The staff determines that the applicant’s response is appropriate. The staff finds this enhancement acceptable because, when the enhancement is implemented, the Fire Protection-Fire Protection Program, will be consistent with GALL AMP XI.M26 in that it will address all AERMs, and will provide additional assurance that the effects of aging will be adequately managed.

Enhancement 2. In LRA Section B.1.12.1, the applicant stated the following enhancement in meeting the program elements “parameters monitored/inspected” and “acceptance criteria.” Specifically, the enhancement stated:

> Procedures will be enhanced to state that the diesel engine subsystems (including the fuel supply line) shall be observed while the pump is running. Acceptance criteria will be enhanced to verify that the diesel engine did not exhibit signs of degradation while it was running; such as fuel oil, lube oil, coolant, or exhaust gas leakage.

The staff asked the applicant to explain this enhancement. The applicant responded that, in the course of an evaluation conducted in preparation for license renewal, this procedure had been determined not to adequately address the concerns associated with all the AERMs, as recommended in the GALL Report. The staff reviewed the pertinent procedure and determined that the procedure instructions and acceptance criteria did not adequately address all the AERMs, as recommended in the GALL Report, and noted that the fuel supply line was not mentioned. When the staff asked the applicant about the absence of the fuel supply line, the applicant stated that evidence of corrosion inside the fuel supply line would appear as corrosion products in the fuel filter, which would result in a condition report and an evaluation. The applicant added that the fuel condition is monitored by the Diesel Fuel Oil Monitoring Program. The applicant agreed that the procedure enhancement would be expanded to include detection of degradation of the fuel supply line (Commitment #9).

The staff reviewed the applicant’s response and finds this enhancement acceptable. When the enhancement is implemented the “Fire Protection-Fire Protection Program,” will be consistent with GALL AMP XI.M26 and will provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. In LRA Section B.1.12.1, the applicant stated that numerous condition reports of minor degradation of penetration seals and fire barriers show that periodic inspections effectively monitor for AERM, identify aging effects, and appropriately resolve them. QA surveillances, QA audits, and staff integrated and triennial inspections since 1999 revealed no issues or findings with impact on program effectiveness.

The applicant stated that VYNPS has a comprehensive operating experience program that monitors industry events and issues, and assesses them for applicability to its own operations. In addition, VYNPS has a CAP that is used to track, trend, and evaluate significant plant issues and events. Those issues and events, whether industry or plant-specific, that are potentially significant to the Fire Protection Program are evaluated. The Fire Protection Program is augmented, as appropriate, when these evaluations show that changes to this program will enhance its effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience revealed no degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.12, the applicant provided the UFSAR supplement for the Fire Protection Program.

The applicant committed (Commitment #8) to enhance the procedures for the Fire Protection Program to specify that fire damper frames in fire barriers shall be inspected for corrosion and to enhance the acceptance criteria to verify no significant corrosion by March 21, 2012.

The applicant committed (Commitment #9) to enhance the procedures for the Fire Protection Program to state that the diesel engine subsystems (including the fuel supply line) shall be observed while the pump is running and to enhance the acceptance criteria to verify that the diesel engine did not exhibit signs of degradation while it was running; such as fuel oil, lube oil, coolant, or exhaust gas leakage, documented as Commitment #9, as described in VYNPS AMP B.1.12.1 by March 21, 2012.

The applicant committed (Commitment #30) to revise the System Walkdown Program to specify CO_2 system inspections every six months by March 21, 2012.

The staff reviewed LRA Section A.2.1.12 and determined that, upon implementation of Commitments #8, #9, and #30, the information in the UFSAR supplement provided an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Fire Protection Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the addition of Commitments #8, #9, and #30. In addition, the staff reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.12 Fire Water System Program

Summary of Technical Information in the Application. LRA Section B.1.12.2 describes the existing Fire Water System Program as consistent, with exception and enhancements, with GALL AMP XI.M27, “Fire Water System.”

This program applies to water-based fire protection systems consisting of sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, and above-ground and underground piping and components tested in accordance with applicable National Fire Protection Association (NFPA) codes and standards. Such testing assures system functionality. Many of these systems normally are maintained at required operating pressure and monitored to immediately detect leakage causing loss of system pressure and to initiate corrective actions. In addition, a sample of sprinkler heads will be inspected in accordance with the guidance of NFPA 25 (2002 Edition) Section 5.3.1.1.1, which states that, “where sprinklers have been in place for 50 years, they shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory for field service testing.” NFPA 25 also provides guidance for this sampling every 10 years after initial field service testing.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception and enhancements to determine whether the AMP, with the exception and enhancements, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Fire Water System Program for which the applicant claims consistency with GALL AMP XI.M27 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant’s Fire Water System Program provided assurance that the aging effects for the components in the scope of its Fire Water System Program are adequately managed. The staff finds the applicant’s Fire Water System Program acceptable because it conforms to the recommended GALL AMP XI.M27, “Fire Water System,” with exceptions and enhancements.

Exception 1. In LRA Section B.1.12.2, the applicant stated an exception to the GALL Report program element "detection of aging effects." Specifically, the exception states that:

> NUREG-1801 specifies annual fire hydrant hose hydrostatic tests. In accordance with the VYNPS program, hydrostatic test of outside hoses occurs once per 24 months; and hydrostatic test of inside hoses occurs once per three years.

The staff asked the applicant to provide justification for the exception. The applicant was asked whether the 24 or 36 months is part of their CLB. In response, the applicant provided its TRM of the current licensing requirements. The staff determined that the exception was inconsistent with the TRM. In its letter, dated March 12, 2007, the applicant revised the exception to specify that fire hydrant hoses will be tested, inspected, and replaced, if necessary, in accordance with NFPA standards (Commitment #49).

On the basis that this exception is revised and the applicant will perform the fire hydrant hose test, inspections, and replacement, consistent with its TRM, the staff finds this acceptable.

Exception 2. In LRA Section B.1.12.2, the applicant stated an exception to the GALL Report program element "detection of aging effects." Specifically, the exception states that:

> NUREG-1801 specifies annual gasket inspections. In accordance with the VYNPS program, visual inspection, re-racking and replacement of gaskets in couplings occurs at least once per 18 months.

The staff asked the applicant to explain this exception. The applicant responded that the aging effects of gaskets are manifest over the period of several years, and that minor differences in inspection and testing frequencies are insignificant. In addition, the applicant stated that a review of the operating experience did not reveal age-related failures of the fire water system components that led to loss of intended function. However, in a letter dated January 4, 2007, the applicant provided a revision to its LRA to delete this exception and to specify that inspections of the fire hydrant gasket will be performed annually (Commitment #31).

On the basis that this exception is deleted and the applicant will perform the fire hydrant gasket inspection annually, consistent with the GALL Report recommendation, the staff finds this acceptable.

Exception 3. In LRA Section B.1.12.2, the applicant stated an exception to the GALL Report program element "detection of aging effects." Specifically, the exception states that:

> NUREG-1801specifies annual fire hydrant flow tests. In accordance with the VYNPS program, verification of operability and of no flow blockage occurs at least once every three years.

The staff asked the applicant to justify the extension of the fire hydrant flow test from one year, as recommended by the GALL Report, to three years. The applicant responded that it had always performed the fire hydrant flow test on a three -year frequency, which was supported by VYNPS operational experience, that is, there was no justification for the extension. However, in a letter dated January 4, 2007, the applicant provided a revision to its LRA to delete this exception and specify that the fire hydrant flow tests will be performed annually (Commitment #31).

On the basis that this exception is deleted and the applicant will perform the fire hydrant flow tests annually, consistent with the GALL Report recommendation, the staff finds this acceptable.

Exception 4. In LRA Section B.1.12.2, the applicant stated an exception to the GALL Report program element “detection of aging effects.” Specifically, the exception states that:

> NUREG-1801specifies sprinkler systems inspections once every refueling outage. In accordance with the VYNPS program, visual inspection of deluge and pre-action system piping to verify their integrity occurs at least once per 24 months. Since aging effects are typically manifested over several years, differences in inspection and testing frequencies are insignificant.

The staff asked the applicant to justify the extension of the visual inspection frequency from once every refueling outage (20 months), in accordance with the recommendation of the GALL Report, to 24 months. The applicant responded that the aging effects of sprinkler heads are manifest over the period of several years, and that minor differences in inspection and testing frequencies (four months) are insignificant. The staff reviewed the applicant’s response and operating experience. The staff finds that a loss of intended function of the sprinkler heads due to age-related failures is not likely to occur over the four additional months. On this basis, the staff finds this exception acceptable.

Enhancement 1. In LRA Section B.1.12.2, the applicant stated the following enhancement in meeting the program element “detection of aging effects.” Specifically, the enhancement stated:

> A sample of sprinkler heads will be inspected using guidance of NFPA 25 (2002 Edition) Section 5.3.1.1.1. NFPA 25 also contains guidance to repeat this sampling every 10 years after initial field service testing.

The staff asked the applicant to provide an explanation as to why this enhancement will provide additional assurance that the effects of aging will be adequately managed. The applicant responded that this enhancement to the LRA is written in accordance with the NFPA guidance, rather than the GALL Report recommendation; however, the applicant added that the NFPA guidance for this enhancement is essentially identical to the GALL Report recommendation. The staff reviewed the fire water system procedures and noted that VYNPS followed NFPA guidance in all aspects of sprinkler head examination. The staff finds this enhancement acceptable since when the enhancement is implemented the Fire Protection-Fire Water System Program, will be consistent with GALL AMP XI.M27 and will provide additional assurance that the effects of aging will be adequately managed.

Enhancement 2. In LRA Section B.1.12.2, the applicant stated the following enhancement in meeting the program element "detection of aging effects." Specifically, the enhancement states:

> Wall thickness evaluations of fire protection piping will be performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections will be performed before the end of the current operating term and at intervals thereafter during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.

The staff asked the applicant to provide an explanation as to why this enhancement would provide additional assurance that the effects of aging on fire water system piping would be adequately managed. The applicant responded that fire water system piping is flow tested in accordance with NFPA guidelines every three years. The applicant further responded that the recommendation to monitor wall thinning was a recommendation of the GALL Report, and that VYNPS included this enhancement to this attribute to perform wall thickness examinations of fire water system piping using volumetric examinations to identify the loss of material due to corrosion. The applicant stated that these examinations would be performed before the end of the current operating term and at intervals during the period of extended operation on an appropriate frequency that would be determined based on the initial examination results.

The staff reviewed the applicant's response and agrees that it adequately addresses the recommendations of the GALL Report. On this basis, the staff finds this enhancement acceptable since when the enhancement is implemented, "Fire Protection-Fire Water System Program," will be consistent with GALL AMP XI.M27 and will provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. LRA Section B.1.12.2 states that in 2003 open-head deluge nozzles were verified to be free of damage and free of obstructions that could inhibit the spray pattern. Absence of loss of material from the deluge nozzles proves that the program is effective for managing loss of material for water suppression fire protection system components. QA audits and staff integrated and triennial inspections from 2001 to 2004 revealed no issues or findings that could impact program effectiveness.

The applicant stated, during the audit and review, that VYNPS has a comprehensive operating experience program that monitors industry events and issues, and assesses them for applicability to its own operations. In addition, VYNPS has a CAP that is used to track, trend, and evaluate significant plant issues and events. Those issues and events, whether industry or plant-specific, that are potentially significant to the Fire Water System Program are evaluated. The Fire Water System Program is augmented, as appropriate, when these evaluations show that changes to this program will enhance its effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience revealed no degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.13, the applicant provided the UFSAR supplement for the Fire Water System Program.

The applicant committed (Commitment #10) to implement the enhancement to the Fire Water System Program to inspect a sample of sprinkler heads using guidance of NFPA 25 (2002 Edition) Section 5.3.1.1.1 by March 21, 2012. When sprinklers have been in place for 50 years a representative sample of sprinkler heads will be submitted to a recognized testing laboratory for field service testing[1]. This sample will be repeated every 10 years, by March 21, 2012.

The applicant committed in (Commitment #11) to implement the enhancement to the Fire Protection-Fire Water System Program to specify that wall thickness evaluations of fire protection piping will be performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion by March 21, 2012. These inspections will be performed before the end of the current operating term and at intervals thereafter during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function, by March 21, 2012.

The applicant committed (Commitment #31) to revise the Fire Protection-Fire Water System Program to specify annual fire hydrant gasket inspections and flow tests by March 21, 2012.

The applicant committed (Commitment #49) to revise the Fire Water System Program to specify that fire hydrant hoses will be tested, inspected, and replaced, if necessary, in accordance with NFPA standards by March 21, 2012.

The staff reviewed this section and determined that, upon implementation of Commitments #10, #11, #31, and #49, the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

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[1]NFPA 25 requires that sprinkler heads be replaced or representative samples from one or more sample areas be submitted to a recognized testing laboratory for field services testing. In the VYNPS program a representative sample of sprinkler heads will be submitted to a recognized testing laboratory for services testing. The Staff notes that the VYNPS sprinkler heads inspection program appears to eliminate the option to just replace a sprinkler head after 50 years service unless it first undergoes laboratory testing. This implies that, if a sprinkler head is obviously corroded and requires replacement, the VYNPS may first have to send that sprinkler head to a testing laboratory before replacing it, a seemingly unnecessary burden.

Conclusion. On the basis of its audit and review of the applicant's Fire Water System Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the addition of Commitments #10, #11, #31, and #49. In addition, the staff reviewed the exception and their justifications and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.13 Oil Analysis Program

Summary of Technical Information in the Application. LRA Section B.1.20 describes the existing Oil Analysis Program as consistent, with exception, with GALL AMP XI.M39, “Lubricating Oil Analysis.”

The Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates), preserving an environment not conducive to loss of material, cracking, or fouling. Sampling frequencies are based on vendor recommendations, accessibility during plant operation, equipment importance to plant operation, and previous test results.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Oil Analysis Program for which the applicant claimed consistency with GALL AMP XI.M39 and finds that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant’s Oil Analysis Program provided assurance that oil systems are free of contaminants which preserves an environment that is not conducive to loss of material, cracking or fouling. The staff finds the applicant’s Oil Analysis Program acceptable because it conformed to the recommended GALL AMP XI.M39, “Lubricating Oil Analysis,” with an exception.

Exception. In LRA Section B.1.20, the applicant stated an exception to the GALL Report program element “parameters monitored/inspected.” Specifically, the exception states that:

> Flash point is not determined for sampled oil.

The applicant also stated, that analyses of filter residue or particle count, viscosity, total acid/base (neutralization number), water content, and metals content are performed on the sampled oil, but the flash point of the oil is not determined.

The applicant indicated that extensive testing and analyses is performed on all of the sampled oil to verify that the oil is suitable for continued use. However, determination of the oil flash point is not performed as part of the program. The applicant also stated that it performs a fuel dilution test in lieu of performing flash point testing on the emergency diesel generators (EDGs), diesel driven fire pump, and the John Deere Diesel generator. This test accomplishes the same goal as the flash point test but is more prescriptive. The fuel dilution test determines the percent by volume of both fuel and water, the analysis can determine the cause of the change in flash point without having to conduct additional tests and corrective actions, and if required, could be implemented on a timelier basis. On the basis that the fuel dilution test is more prescriptive and timely, the staff finds this exception acceptable.

Operating Experience. LRA Section B.1.20 states that a negative trend was noted in the lube oil analysis report for the P-40-1A diesel fire pump. Oil was drained, flushed, and refilled. A lube oil sample taken on the “B” EDG indicated a temporary abnormally high non-abrasive silicon level caused by gasket sealant materials used during the last EDG overhaul. Although acceptance criteria do not include an upper threshold for silicon, re-sampling confirmed that the silicon level had gone down. Corrective action following negative trends and abnormal samples proves that the program is effective at preserving an environment not conducive to loss of material, cracking, or fouling. Recent QA surveillance and self-assessment revealed no issues or findings that could impact program effectiveness.

The staff reviewed an assessment of the maintenance programs which was performed by the Quality Assurance Group and the Component Engineering assessment of the Predictive Maintenance Programs. This review confirmed that the lube Oil Analysis Program effectively had implemented the programmatic and regulatory requirements at that point in time. The review of these reports confirmed that the Oil Analysis Program was effectively monitoring the lube oil and was trending the data to allow the appropriate actions to be taken. In addition, the staff confirmed that there have been no component failures to date at VYNPS related to lube oil contamination.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.22, the applicant provided the UFSAR supplement for the Oil Analysis Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Oil Analysis Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and their justifications and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.14 Reactor Head Closure Studs Program

Summary of Technical Information in the Application. LRA Section B.1.23 describes the existing Reactor Head Closure Studs Program as consistent, with exception, with GALL AMP XI.M3, "Reactor Head Closure Studs."

This program includes ISI in conformance with the requirements of ASME Code, Section XI, Subsection IWB, and preventive measures (e.g., rust inhibitors, stable lubricants, appropriate materials) to mitigate cracking and loss of material of reactor head closure studs, nuts, washers, and bushings.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Reactor Head Closure Studs Program for which the applicant claimed consistency with GALL AMP XI.M3 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's Reactor Head Closure Studs Program provided assurance that the effects of cracking due to SCC/IGSCC and loss of material due to wear will be adequately managed so that the intended functions of components within the scope of license renewal will be maintained during the period of extended operation. The staff finds the applicant's Reactor Head Closure Studs Program acceptable because it conformed to the recommended GALL AMP XI.M3, "Reactor Head Closure Studs," with an exception.

Exception. In LRA Section B.1.23, the applicant stated an exception to the GALL Report program element "detection of aging effects." Specifically, the exception states that:

> When reactor head closure studs are removed for examination, either a surface or volumetric examination is allowed.

The applicant noted that cracking initiates on the outside surfaces of bolts and studs. Therefore, a qualified surface examination meeting the acceptance standards of IWB-3515 provides at least the sensitivity for flaw detection that an end shot ultrasonic examination provides on bolts or studs. Thus, when reactor head closure studs are removed for examination, either a surface or volumetric examination is allowed.

The applicant stated that its detection of aging effects is consistent with ASME Section XI Code Case N-652 which allows surface examination to be substituted for volumetric examination when bolting is removed for examination. Code Case N-652 has been endorsed in RG 1.147, Revision 14. The applicant is therefore following approved methods for the detection of aging effects. On this basis, the staff finds the applicant has taken an acceptable exception to the GALL Report. The staff determines that either a surface or volumetric examination can reliably reveal cracking and loss of material due to corrosion or wear.

Operating Experience. LRA Section B.1.23 states that recent (2002 and 2004) visual and ultrasonic inspections of reactor vessel studs, nuts, bushings, and washers revealed no recordable indications. Absence of recordable indications proves that the program is effective for managing loss of material and cracking for applicable components.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience revealed no degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.25, the applicant provided the UFSAR supplement for the Reactor Head Closure Studs Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Reactor Head Closure Studs Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and their justifications and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.15 Reactor Vessel Surveillance Program

Summary of Technical Information in the Application. LRA Section B.1.24 describes the existing Reactor Vessel Surveillance Program as consistent, with enhancement, with GALL AMP XI.M31, “Reactor Vessel Surveillance.”

This program manages reduction in fracture toughness of reactor vessel beltline materials to maintain the pressure boundary function of the reactor pressure vessel (RPV) for the period of extended operation. The applicant participates in the BWRVIP Integrated Surveillance Program (ISP) as approved by License Amendment 218. This program monitors changes in the fracture toughness properties of ferritic materials in the RPV beltline region. As BWRVIP-ISP capsule test reports for representative RPV materials become available the actual shift in the reference temperature for nil-ductility transition of the vessel material may be updated. In accordance with 10 CFR Part 50, Appendix H, the applicant reviews relevant test reports for compliance with fracture toughness requirements and pressure-temperature limits. BWRVIP-116, "BWR Vessel and Internals Project Integrated Surveillance Program (ISP) Implementation for License Renewal," describes the design and implementation of the ISP during the period of extended operation. BWRVIP-116 identifies additional capsules, their withdrawal schedule, and contingencies to ensure that the requirements of 10 CFR Part 50 Appendix H are met for the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, remained adequate to manage the aging effects for which it is credited.

In LRA Appendix B, Reactor Vessel Surveillance Program, the applicant described its AMP to manage irradiation embrittlement of the RPV through testing that monitors RPV beltline materials. The LRA stated that the RPV surveillance program will be enhanced by making it consistent with the BWRVIP ISP for the period of extended operation prior to the VYNPS entering its period of extended operation.

The applicant has implemented the BWRVIP ISP which is based on the BWRVIP-78 report, "BWR Integrated Surveillance Program Plan," and the BWRVIP-86-A report, "BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation." These reports are consistent with the GALL AMP XI.M31, "Reactor Vessel Surveillance," for the period of the current VYNPS license. The staff concludes that the BWRVIP ISP in the BWRVIP-78 and BWRVIP-86-A reports is acceptable for BWR applicant implementation provided that all participating applicants use one or more compatible neutron fluence methodologies acceptable to the staff for determining surveillance capsule and RPV neutron fluences. The staff's acceptance of the BWRVIP ISP for the current term at VYNPS is documented in the staff's SE dated March 29, 2004, which is addressed in VYNPS Amendment 218.
The BWRVIP developed an updated version of the ISP in the BWRVIP-116 report, "BWR Vessel And Internals Project, Integrated Surveillance Program Implementation For License Renewal," which provides guidelines for an ISP to monitor neutron irradiation embrittlement of the limiting RPV beltline materials for all U.S. BWR power plants for the period of extended operation. The applicant stated in the Reactor Vessel Surveillance Program, and in the Updated Final Safety Analysis Report (UFSAR) supplement Section A.2.1.26, "Reactor Vessel Surveillance Program," that it will implement the ISP specified in the BWRVIP-116 report. The staff reviewed the UFSAR Supplement Section A.2.1.26 to determine whether it provides an adequate description of the program.

In RAI B.1.24-1, by letter dated August 16, 2006, the staff requested that the applicant commit to the following in the Reactor Vessel Surveillance Program and in UFSAR Supplement (LRA Section A.2.1.26):

> The BWRVIP-116 report which was approved by the staff will be implemented at VYNPS with the conditions documented in Sections 3 and 4 of the staff's final SE for the BWRVIP-116 report dated March 1, 2006.

In response to RAI B.1.24-1, by letter dated September 20, 2006, the applicant stated that it would update UFSAR Supplement Section A.2.1.26 and the Reactor Vessel Surveillance Program to include the aforementioned commitment (Commitment #38) proposed by the staff. The staff finds that its concern described in RAI B.1.24-1 is resolved.

An ISP used as a basis for a facility's RPV surveillance program must be reviewed and approved by the staff as required by 10 CFR 50, Appendix H. The ISP to be used by the applicant is a program that was developed by the BWRVIP and the applicant will apply the BWRVIP ISP as the method by which the VYNPS will comply with the requirements of 10 CFR Part 50, Appendix H. The BWRVIP ISP identifies capsules that must be tested to monitor neutron radiation embrittlement for all applicants participating in the ISP and identifies capsules that need not be tested (standby capsules). Table 3-3 of the BWRVIP-116 report indicates that the remaining capsule from VYNPS is not to be tested. This untested capsule was originally part of the applicant's plant-specific surveillance program and has received significant amounts of neutron radiation.

In RAI B.1.24-2, by letter dated August 16, 2006, the staff requested that the applicant commit to include the following commitment in the UFSAR Supplement (LRA Section A.2.1.26):

> If the VYNPS standby capsule is removed from the RPV without the intent to test it, the capsule will be stored in a manner which maintains it in a condition which would permit its future use, including during the period of extended operation, if necessary.

In response to RAI B.1.24-2, by letter dated September 20, 2006, the applicant stated that it would incorporate the staff's aforementioned commitment (Commitment #39) in UFSAR Supplement Section A.2.1.26. The staff finds that the concern described in RAI B.1.24-2 is resolved.

On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging due to loss of fracture toughness of the RPV beltline region will be adequately managed, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Operating Experience. LRA Section B.1.24 states that the applicant participates in the BWRVIP ISP as incorporated into the plant technical specifications by Amendment 218. The fact that it participates in the BWRVIP ISP means future operating experience from all participating BWRs will be factored into this program.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff concludes that this program element is acceptable.

UFSAR Supplement

The applicant described the reactor materials surveillance program as an existing program in LRA Section A.2.1.26. The program uses periodic testing of metallurgical surveillance samples to monitor the loss of fracture toughness of the RPV beltline region materials consistent with the requirements of 10 CFR Part 50, Appendix H. The applicant further stated that it will implement the staff-approved BWRVIP-116 report for the period of extended operation. The BWRVIP-116 report was approved by the staff and, as described in the staff evaluation section, the applicant made a commitment (Commitment #38) to include the following statement in the UFSAR Supplement (LRA Section A.2.1.26) by March 21, 2012:

> The BWRVIP-116 report which was approved by the staff will be implemented at VYNPS with the conditions documented in Sections 3 and 4 of the staff's final SE for the BWRVIP-116 report dated March 1, 2006.

As to the status of the remaining VYNPS standby capsule, the applicant made a commitment (Commitment #39) to incorporate the following statement in the UFSAR Supplement (LRA Section A.2.1.26) by March 21, 2012:

> If the VYNPS standby capsule is removed from the RPV without the intent to test it, the capsule will be stored in manner which would permit its future use, if necessary.

The staff reviewed the applicant's proposed revision to UFSAR Supplement Section A.2.1.26 and determines that by committing to implement the most recent staff-approved version of the BWRVIP-116 report, the applicant demonstrated its compliance with the requirements of 10 CFR Part 50, Appendix H.

The staff's review determines that the following license condition will be required to ensure that changes in the withdrawal schedule for the capsule that is specified in the BWRVIP-116 report will be submitted for staff review and approval:

> All capsules placed in storage must be maintained for future insertion. Any changes to storage requirements must be approved by the NRC, as required by 10 CFR Part 50, Appendix H.

The staff concludes that the information provided in the UFSAR Supplement for the aging management of systems and components discussed above is equivalent to the information in NUREG-1801 and therefore provides an adequate summary of program activities (pending incorporation of Commitments #38 and #39) as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Reactor Vessel Surveillance Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the addition of Commitments #38 and

#39. Also, the staff reviewed the enhancement and confirmed that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.16 Service Water Integrity Program

Summary of Technical Information in the Application. LRA Section B.1.26 describes the existing Service Water Integrity Program as consistent, with exceptions, with GALL AMP XI.M20, "Open-Cycle Cooling Water System."

This program implements the recommendations of GL 89-13 to manage aging effects on the service water systems (SWS) for the period of extended operation. The SWS include the service water (SW), residual heat removal service water (RHRSW), and alternate cooling systems. The program includes surveillance and control techniques to manage aging effects in the SWS or SCs they serve.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions to determine whether the AMP, with the exceptions, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Service Water Integrity Program for which the applicant claimed consistency with GALL AMP XI.M20 and finds that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's Service Water Integrity Program demonstrated that the aging of the SWS will be properly managed for the period of extended operation. However, due to a history of aggressive aging effects, the applicant stated that future proper management of the SWS may include major components replaced with components made of materials less susceptible to aging in raw water. The staff finds the applicant's Service Water Integrity Program acceptable because it conformed to the recommended GALL AMP XI.M20, "Open-Cycle Cooling Water System," with exceptions.

Exception 1. In LRA Section B.1.26, the applicant stated an exception to the GALL Report program element "preventive actions." Specifically, the exception states that:

> The GALL Report stated that system components are lined or coated. Components are lined or coated only where necessary to protect the underlying metal surfaces.

The applicant noted that the GALL Report stated that system components are constructed of appropriate materials and lined or coated to protect the underlying metal surfaces from being exposed to aggressive cooling water environments. Not all VYNPS system components are lined or coated. Components are lined or coated only where necessary to protect the underlying metal surfaces.

The applicant was asked to provide the original (or current if pipe has been replaced) material and lining specification for the buried piping which is part of the SWS, including the alternate cooling system. The applicant stated that no piping had been replaced and provided the original VYNPS piping specification, which showed the piping for the SW and alternate cooling water systems piping to be carbon steel material and not internally lined or coated. The applicant further stated that the only coated components in the SWS are a few valve body internals and heat exchanger heads that are currently and will continue to be inspected as part of the Service Water Integrity Program.

The staff reviewed the SWS piping specifications and determined that the system piping is not internally lined or coated. VYNPS operating experience demonstrates that the lack of internal linings or coatings has resulted in the system experiencing aggressive aging effects. The applicant stated that to address the aggressive aging effects on the system due to the lack of protective internal linings or coatings, changes have been made at VYNPS in accordance with the Service Water Integrity Program. The applicant stated during the audit and review that changes have been made to the sampling and chemical treatment process. New chemical addition pumps were installed and sampling implemented for SW components during inspections However, VYNPS is limited in accordance with environmental controls to no more than two hours a day of chemical treatment to the SWS. VYNPS has also begun chemical treatment of SW lines not normally inservice. VYNPS also inspects the system every refueling outage. The applicant stated that one method being considered to manage aging is system piping replacement with materials less susceptible to the aging effects of raw water.

The staff finds that VYNPS is taking measures with inspections and chemical treatments in accordance with the Service Water Integrity Program to compensate for the SWS components in general not having internal protective linings or coatings. On this basis, the staff finds this exception acceptable.

Exception 2. In LRA Section B.1.26, the applicant stated an exception to the GALL Report program element “monitoring and trending.” Specifically, the exception states that:

> The GALL Report stated that testing and inspections are performed annually and during refueling outages. The VYNPS program requires tests and inspections each refueling outage.

The applicant noted that the GALL Report program entails testing and inspections performed annually and during refueling outages. The VYNPS program requires tests and inspections each refueling outage, but not annually. Since aging effects are typically manifested over several years, the difference in inspection and testing frequency is insignificant.

The applicant stated, in the LRA, that its Service Water Integrity Program requires tests and inspections each refueling outage. The applicant stated in its program basis document that inspection scope, method, and testing frequencies are in accordance with VYNPS commitments in accordance with GL 89-13. Tests and inspections are done during refueling outages and other outages as necessary.

The staff finds VYNPS is in compliance with its commitment in accordance with GL 89-13 to inspect and perform testing on the SWS each refueling outage. Outages at VYNPS are generally performed on an eighteen month cycle. The staff also determines that since aging effects typically manifest over several years, the difference in inspection and testing frequency is not significant. On this basis, the staff finds this exception acceptable.

Operating Experience. LRA Section B.1.26 states that recent performance test and inspection results (2004) prove that the program is effective for managing component aging effects, For example, SW-cooled diesel generator heat exchanger performance testing revealed no significant performance degradation, RHR heat exchanger inspection revealed no loss of material, cracking or fouling, a SW check valve internal visual inspection revealed no loss of material, and internal visual inspection of a SW pipe by fiber optics revealed no loss of material. Ultrasonic wall thickness measurements taken in October 2003 and January 2004 in the vicinity of known wall-thinning in a SW pipe revealed that the pipe wall thickness had not changed and that the structural integrity of the piping would be maintained until the pipe section could be replaced in September 2004. Accelerated monitoring in the vicinity of an indication is assurance that the program is effective for managing component loss of material. A staff inspection of the SWS in 2002 determines that mitigation of MIC buildup had not been effective as evidenced by more than 20 SWS leaks. A self-assessment, including independent evaluation by industry experts, was completed on December 20, 2002. Protocols for use of biocides to mitigate MIC were revised and the processes for analysis, trending, and interpretation of results were enhanced. Resolution of this issue is assurance that the program will manage component aging effects.

The staff finds the listed operating experience up through 2002 indicates that VYNPS had performed inadequately in managing the aging effects of raw water on the SWS. The staff determines that mitigation of MIC buildup had not been effective as indicated by the more than 20 SWS leaks. During the audit and review discussions/interviews, the applicant stated that no biocides to mitigate MIC had been used in the SWS for many years after initial plant operation. The lack of aging management for the system manifested itself in 2002 with 20 leaks. The applicant performed a self-assessment of the aging management of the system, including the use of independent industry experts. This resulted in the criteria for the use of biocides to mitigate MIC being revised and the processes for analysis, trending, and interpretation of results being enhanced.

The applicant further stated that the improved performance by VYNPS in managing the aging effects on the SWS after 2002 is demonstrated by the more recent operating experience. Recent SWS performance test and inspection results from 2004 demonstrated that the program has become more effective in managing aging effects for applicable components. The staff reviewed a sampling of inspection reports and performance testing results for the SWS components and found the documentation to be very detailed and thorough. Since 2002 VYNPS has taken a much more aggressive and pro-active approach to managing the aging effects of the SWS components as indicated by the most recent operating experience where no severe aging was found. The staff finds by VYNPS demonstrating a more pro-active approach to managing aging on the SWS, the type of aggressive aging effects discovered in 2002 will be better managed going forward.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u>. In LRA Section A.2.1.28, the applicant provided the UFSAR supplement for the Service Water Integrity Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

<u>Conclusion</u>. On the basis of its audit and review of the applicant's Service Water Integrity Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and their justifications and determined that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 Structures Monitoring Program

<u>Summary of Technical Information in the Application</u>. LRA Section B.1.27.2 describes the existing Structures Monitoring Program as consistent, with enhancements, with GALL AMP XI.S6, "Structures Monitoring Program."

Structures monitoring in accordance with 10 CFR 50.65 (Maintenance Rule) is addressed in RG 1.160 and NUMARC 93-01. These two documents provide guidance for development of applicant-specific programs to monitor the condition of structures and structural components within the scope of the Maintenance Rule so there is no loss of structure or structural component intended function. Since protective coatings do not manage aging effects for structures included in the Structures Monitoring Program, the program does not address protective coating monitoring and maintenance.

<u>Staff Evaluation</u>. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancements to determine whether the AMP, with the enhancements, remained adequate to manage the aging effects for which it is credited.

The staff asked the applicant to explain why the inspection of crane rails and girders is not included under a program that is consistent with GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems. The applicant stated that its Periodic Surveillance and Preventive Maintenance Program and the Structures Monitoring Program adequately manage aging effects for cranes and girders. Therefore, a separate program (i.e., inspection of overhead heavy load and light load handling system) is not necessary. The staff finds the applicant's response acceptable.

The staff asked the applicant to explain if VYNPS has any porous concrete subfoundations and a site dewatering system. In addition, the applicant was asked to explain if the Structures Monitoring Program required periodic sampling and testing of groundwater to determine and confirm that the below grade water chemistry/soil is non-aggressive to concrete structures below grade.

The applicant stated that VYNPS does not have porous concrete subfoundations or a site dewatering system. The results of the two most recent reported groundwater samples as submitted to the State of Vermont were made available to the staff. These samples are currently obtained twice yearly, primarily around the plant septic systems with some of the sampling wells near plant structures. The results of these samples are provided to the State of Vermont in accordance with the Indirect Discharge Permit. The Structures Monitoring Program will be enhanced to ensure an engineering evaluation is made on a periodic basis of groundwater samples to assess for evidence of groundwater being aggressive to concrete. Historically, VYNPS groundwater samples have shown some level of seasonality in that the wells adjacent to roadways have slightly higher levels of chlorides due to salt treatment of roadways in the winter.

In a letter dated July 14, 2006, the applicant stated by amendment to the application that LRA Section B.1.27.2 for the Structures Monitoring Program is revised to include an enhancement to perform, at least once every five years, an engineering evaluation of groundwater samples to assess for groundwater being aggressive to concrete.

The staff reviewed the applicant's response and finds the applicant's response acceptable. The applicant has committed (Commitment #33) to enhancing the VYNPS Structures Monitoring Program to ensure an engineering evaluation is made on a periodic basis of groundwater samples. A five -year periodicity for performing an engineering evaluation of groundwater samples to assess for groundwater being aggressive to concrete has previously been accepted by the staff in other applicant LRAs and therefore on this basis the staff finds the maximum five -year periodicity acceptable.

The staff also asked the applicant to explain if VYNPS will take advantage of inspection opportunities for structures required for license renewal and identified as inaccessible.

The applicant stated that VYNPS will take advantage of inspection opportunities for underground structures that become accessible by excavation. This inspection is already part of the Structures Monitoring Program. The staff finds the applicant's response acceptable. The applicant will take advantage of inspection opportunities for structures required for license renewal and identified as inaccessible.

The staff asked the applicant to explain if the inspection acceptance criteria for its Structures Monitoring Program was based on American Concrete Institute (ACI) standard, ACI 349.3R-96, and if not, to provide the industry codes, standards and guidelines that the acceptance criteria is based on. In addition, the applicant was asked to explain the basis of the acceptance criteria for crane rail/girder inspections.

The applicant stated that the VYNPS Structures Monitoring Program is controlled by plant procedure, as documented in the Audit and Review Report. The standards used to develop and conduct the program are listed in the procedure. The specific standard used to develop inspection requirements for this procedure is NEI 96-03, "Nuclear Energy Institute, Industry Guideline for Monitoring the Condition of Structures at Nuclear Power Plants," Section 3.3, "Examination Guidance." Inspection requirements of commodities taken from NEI-96-03 are delineated in the program procedure. The following comparison of the relevant guidelines for concrete structural components in the program procedure, with the guidelines of ACI 349.3 Chapter 5 "Evaluation Criteria" indicates general consistency:

1) Both documents specify visual inspection methods for the examination of structures.

2) Both documents provide guidance for the inspections for the following parameters and conditions:

    - Concrete components: spalling, cracking, delamination, honey combs, water in-leakage, chemical leaching, peeling paint, or discoloration

    - Structure Settlement: excessive total or differential settlement

    - Structural/seismic gap: insufficient space for structural movement during a seismic event (i.e., exclusion of foreign objects or debris); deteriorated elastomer type filler.

3) ACI 349.3R-96 Chapter 5 provides acceptable limits beyond which further evaluation is required. PP 7030 Section 4.8 conservatively requires evaluation of identified degradation.

Based upon this comparison, the applicant concluded that the guidance for inspections provided in PP 7030 is consistent with the guidelines in ACI 349.3R-96.

The acceptance criteria for crane rail/girder inspections are contained in the preventive maintenance tasks for the crane inspection. A plant procedure provides the inspection and acceptance criteria for crane rail/girders. The procedure criteria is based on the following codes and standards of ANSI B30.2-83 "Overhead and Gantry Cranes" and NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants."

The staff reviewed the applicant's response and finds the response acceptable. The applicant has made a comparison of the VYNPS relevant guidelines for concrete inspection acceptance criteria with the guidelines of ACI 349.3R-96 Chapter 5, and found general consistency. In addition, the applicant stated that the acceptance criteria for crane rail/girder inspections are based on codes and standards of ANSI B30.2-83 and NUREG-0612.

The staff noted that the program description in the LRA for the Structures Monitoring Program makes no reference to GALL AMP XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants." GALL AMP XI.S7 stated that for plants not committed to RG 1.127, Revision 1, aging management of water-control structures may be included in the Structures Monitoring Program. However, details pertaining to water-control structures are to incorporate the attributes of GALL AMP XI.S7. During the audit and review, the staff asked the applicant to explain if VYNPS is committed to RG 1.127, Revision 1 for inspection of its water control structures (such as intake structure). If VYNPS is not committed to RG 1.127, Revision 1, explain how the 10 program elements of GALL AMP XI.S7 are incorporated into the VYNPS Structures Monitoring Program.

The applicant stated that the water-control structure at VYNPS is the intake structure. There are no earthen water control structures at VYNPS. The program elements of GALL AMP XI.S7 applicable to the intake structure are incorporated in the VYNPS Structures Monitoring Program as described below. Program elements of GALL AMP XI.S7 that are not incorporated in the Structures Monitoring Program primarily apply to earthen structures.

1) Scope – The scope of the GALL AMP XI.S7 program applicable to VYNPS is the intake structure. The intake structure is included in the scope of the Structures Monitoring Program as delineated in VYNPS LRA Table 3.5.2-3.

2) Preventive Actions – The GALL AMP XI.S7 program includes no preventive actions.

3) Parameters Monitored – The AERM for concrete structural components of the intake structure is loss of material which is consistent with the GALL Report, Volume 2 Item II.A6-7. The parameters monitored from the GALL AMP XI.S7 program applicable to loss of material are consistent with those monitored by the Structures Monitoring Program. The guidance for inspections of concrete in RG 1.127, Section C.2, is consistent with the guidance in ACI 349.3R-96 used in the Structures Monitoring Program.

4) Detection of Aging – GALL AMP XI.S7 identifies visual inspection methods as the primary method used to detect aging. The Structures Monitoring similarly uses visual inspection methods as the primary method used to detect aging in concrete structural components. GALL AMP XI.S7 identifies inspection intervals of five years. The Structures Monitoring Program identifies similar inspection intervals of three years for accessible areas, ten years for inaccessible areas and opportunistic inspections for buried components.

5) Monitoring and Trending – Monitoring is by periodic inspection for both the GALL AMP XI.S7 and Structures Monitoring Programs.

6) Acceptance Criteria – Acceptance criteria is not identified in RG 1.127, however appropriate guidance is provided in the Structures Monitoring Program to ensure corrective measures are identified prior to loss of intended function.

7-9) The corrective actions, confirmation process and administrative control attributes of the Structures Monitoring Program and the GALL AMP XI.S7 program are consistent.

10) Operating Experience – The operating experience relevant to the effectiveness of the Structures Monitoring Program is presented in Appendix B of the application and is consistent with the operating experience described in GALL AMP XI.S7.

The staff reviewed the applicant's response and finds the applicant's response acceptable. The staff determines that the applicant has verified that the program elements of GALL AMP XI.S7 pertaining to VYNPS water control structures have been incorporated within the Structures Monitoring Program.

The staff reviewed those portions of the Structures Monitoring Program for which the applicant claimed consistency with GALL AMP XI.S6 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's Structures Monitoring Program provides assurance that the aging of materials of construction, which include structural steel, concrete, roof materials, wood, polyvinyl chloride (PVC), and sealing materials, for structures within the scope of license renewal will be properly managed for the period of extended operation. The staff finds the applicant's Structures Monitoring Program acceptable because it conformed to the recommended GALL AMP XI.S6, "Structures Monitoring Program," with enhancements.

Enhancement 1. In LRA Section B.1.27.2, the applicant stated the following enhancement in meeting the program element “scope of program.” Specifically, the enhancement states:

> The Structures Monitoring Program will be enhanced to specify that process facility crane rails and girders, condensate storage tank (CST) enclosure, CO_2 tank enclosure, N_2 tank enclosure and restraining wall, CST pipe trench, diesel generator cable trench, fuel oil pump house, SW pipe trench, drywell floor liner seal, manway seals and gaskets, and hatch seals and gaskets are included in the program.

By letter dated July 14, 2006, as discussed in SER Section 3.0.3.2.17.2, the applicant removed the drywell floor liner seal from scope of its Structures Monitoring Program since drywell floor liner seal (moisture barrier) is examined in accordance with the its Containment Inservice Inspection-IWE Program.

The staff finds that with the addition of the above SCs, the applicant’s Structures Monitoring Program will meet the recommendation of the program described in GALL AMP XI.S6. The applicant identified commitments to the NRC associated with this enhancement relative to GALL AMP XI.S6.

On this basis, the staff finds this enhancement (Commitments #20) acceptable since when the enhancement is implemented, the Structures Monitoring Program will be consistent with GALL AMP XI.S6 and will provide additional assurance that the effects of aging will be adequately managed.

Enhancement 2. In LRA Section B.1.27.2, the applicant stated the following enhancement in meeting the program element “detection of aging effects.” Specifically, the enhancement states:

> Guidance for performing structural examinations of wood to identify loss of material, cracking, and change in material properties will be added to the Structures Monitoring Program.

On this basis, the staff finds this enhancement (Commitments #21) acceptable since when the enhancement is implemented, the Structures Monitoring Program will be consistent with GALL AMP XI.S6 and will provide additional assurance that the effects of aging will be adequately managed.

Enhancement 3. In LRA Section B.1.27.2, the applicant stated the following enhancement in meeting the program element “detection of aging effects.” Specifically, the enhancement states:

> Guidance for performing structural examinations of elastomers (Drywell floor liner seal, seals, and gaskets) to identify cracking and change in material properties (cracking when manually flexed) will be enhanced in the Structures Monitoring Program procedure.

On this basis, the staff finds this enhancement (Commitment #22) acceptable since when the enhancement is implemented, the Structures Monitoring Program will be consistent with GALL AMP XI.S6 and will provide additional assurance that the effects of aging will be adequately managed. The drywell floor liner seal is to be removed by the applicant as discussed in SER Section 3.0.3.2.17.2.

Enhancement 4. In LRA Section B.1.27.2, the applicant stated the following enhancement in meeting the program element "detection of aging effects." Specifically, the enhancement states:

> Guidance for performing structural examinations of PVC cooling tower fill to identify cracking and change in material properties will be added to the Structures Monitoring Program procedure.

On this basis, the staff finds this enhancement (Commitments #23) acceptable since when the enhancement is implemented, Structures Monitoring Program," will be consistent with GALL AMP XI.S6 and will provide additional assurance that the effects of aging will be adequately managed.

The staff determines that these three enhancements, described above, will provide the inspection methods for SCs that are in-scope of license renewal, to ensure that aging degradation will be detected and quantified before there is loss of intended functions. The staff finds that with the addition of the above guidance for performing structural examinations of wood, elastomers, and PVC cooling tower fill to the Structures Monitoring Program, all the inspection methods for each structure/aging effect combination within the scope of license renewal in accordance with this AMP is provided. The additional guidance provided sufficient detail to ensure that aging degradation will be detected and quantified before there is loss of intended functions.

Operating Experience. LRA Section B.1.27.2 states that the concrete pad above John Deere diesel generator day tank was sinking and cracking. The pad was repaired with steel bollards installed to prevent future sinking and cracking. Cooling tower inspections detected degradation of a structural column, cracking of a wooden structural member. The degraded column and associated splice connection were replaced. Resolution of these issues proves that the program is effective for managing cracking of structural components. Recent performance test and inspection results (2002 and 2003) show that the program is effective for managing component aging effects. For example, inspection of the turbine building crane and of the reactor building overhead crane in 2002 revealed no findings; and inspection of the reactor building airlock door seal revealed no cracking, dry rot, bulging, or separation of the seal. The most recent structures monitoring inspection found the overall condition of structures very good. Inspections were conducted in 2004 in the reactor building, turbine building, diesel generator rooms, fuel oil day tank room, control building, plant stack, switch yard, discharge structure, intake structure, and John Deere diesel building. Absence of significant findings during these inspections proves that the program is effective for managing loss of material, cracking, and change in material properties for structural components.

The staff reviewed the summary of specific operating experience for the Structures Monitoring Program. The staff also reviewed the operating experience for a concrete pad sinking and cracking and degradation of a structural wooden column and found that the applicant's existing Structures Monitoring Program was effective in identifying deterioration of plant SCs within its scope. The deficiencies were placed in the CAP for VYNPS and dispositioned for repair. The listed operating experience demonstrated that the VYNPS Structures Monitoring Program is effective in ensuring that age related deterioration of plant SCs within the scope of license renewal is adequately managed to ensure that these SCs maintain their ability to perform their intended function. On the basis of its review, the staff finds that the applicant's Structures Monitoring Program is effective in identifying age-related degradation, implementing repairs, and maintaining the structural integrity of the structures and associated components within the scope of license renewal.

The staff also reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.30, the applicant provided the UFSAR supplement for the Structures Monitoring Program.

The applicant committed (Commitment #20) to enhance the Structures Monitoring Program to specify that process facility crane rails and girders, CST enclosure, CO_2 tank enclosure, N_2 tank enclosure and restraining wall, CST pipe trench, diesel generator cable trench, fuel oil pump house, SW pipe trench, manway seals and gaskets, and hatch seals and gaskets are included in the program by March 21, 2012.

The applicant committed (Commitment #21) to enhance the Structures Monitoring Program to add guidance for performing structural examinations of wood to identify loss of material, cracking, and change in material, by March 21, 2012.

The applicant committed (Commitment #22) in to enhance the Structures Monitoring Program to add guidance for performing structural examinations of elastomers, seals, and gaskets) to identify cracking and change in material properties (cracking when manually flexed) by March 21, 2012.

The applicant committed (Commitment #23) to enhance the Structures Monitoring Program to add guidance for performing structural examinations of PVC cooling tower fill to identify cracking and change in material properties by March 21, 2012.

The applicant committed (Commitment #33) to include in the Structures Monitoring Program provisions that will ensure an engineering evaluation is made on a periodic basis (at least once every five years) of groundwater samples to assess aggressiveness of groundwater to concrete. Samples will be monitored for sulfates, pH and chlorides, by March 21, 2012.

The staff reviewed this section and determined that, upon the implementation of Commitments #20, #21, #22, #23, and #33, the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Structures Monitoring Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the addition of Commitments #20, #21, #22, #23, and #33. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.18 Water Chemistry Control - Closed Cooling Water Program

Summary of Technical Information in the Application. LRA Section B.1.30.3 describes the existing Water Chemistry Control - Closed Cooling Water Program as consistent, with exception, with GALL AMP XI.M21, “Closed-Cycle Cooling Water System.”

This program includes preventive measures that manage loss of material, cracking, and fouling for closed cooling water systems (CCWS) (reactor building closed cooling water (CCW), turbine building CCW, augmented off-gas (AOG) CCW, EDG CCW, AOG refrigerant skid water, and chilled water). These chemistry activities monitor and control CCW chemistry using plant-specific procedures and processes based on EPRI guidance for CCW chemistry.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remained adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Water Chemistry Control-Closed Cooling Water Program for which the applicant claimed consistency with GALL AMP XI.M21 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant’s Water Chemistry Control-Closed Cooling Water Program provided assurance that this program will manage loss of material, cracking, and fouling for the following CCWSs:

- Reactor Building Closed Cooling Water
- Augmented Off-Gas Closed Cooling Water

- Augmented Off-Gas Refrigerant Skid Water and Chilled Water
- Emergency Diesel Generator Closed Cooling Water
- Turbine Building Closed Cooling Water

The staff finds the applicant's Water Chemistry Control-Closed Cooling Water Program acceptable because it conformed to the recommended GALL AMP XI.M21, "Closed-Cycle Cooling Water System," with an exception.

Exception 1. In LRA Section B.1.30.3, the applicant stated an exception to the GALL Report program element "detection of aging effects." Specifically, the exception states that:

> The VYNPS Water Chemistry Control-Closed Cooling Water Program does not include performance and functional testing.
>
> *Exception Note.* While GALL AMP XI.M21, Closed-Cycle Cooling Water System endorses EPRI Report TR-107396 for performance and functional testing guidance, EPRI Report TR-107396 does not recommend that equipment performance and functional testing be part of a Water Chemistry Control Program. This appears appropriate since monitoring pump performance parameters is of little value in managing effects of aging on long-lived, passive CCWS components. Rather, EPRI Report TR-107396 stated in Section 5.7 (Section 8.4 in EPRI Report 1007820) that performance monitoring is typically part of an engineering program, which would not be part of water chemistry. In most cases, functional and performance testing verifies that component active functions can be accomplished and as such would be included as part of Maintenance Rule (10 CFR 50.65). Passive intended functions of pumps, heat exchangers and other components will be adequately managed by the Closed Cooling Water Chemistry Program through monitoring and control of water chemistry parameters.

The staff discussed technical issues related to this exception with the applicant. The applicant stated that aging of CCWS components relies on monitoring and control of CCWS chemistry. The applicant stated that the effectiveness of the Closed Cooling Water Chemistry Program will be verified by a one-time inspection of the CCWS. The applicant was asked to confirm that the one-time inspection would consider representative sampling of low-flow and stagnant water areas of the listed CCWSs. In its response, the applicant stated that sampling of the entire system, including the piping and fittings, thermowells, and valve bodies in the various systems, would be selected.

The staff determines that the applicant would select representative samples from the low-flow and stagnant flow areas of the listed CCWSs in the One-Time Inspection Program, which will provide assurance that the aging effects for this system will be adequately managed. On this basis, the staff finds this exception acceptable.

Operating Experience. LRA Section B.1.30.3 states that monthly sample results from January 2003 through January 2005 showed CCWS chemistry parameters are maintained within EPRI acceptance criteria. Self-assessments in 2000 and 2002 found the program effective at maintaining low levels of contaminants in the water. One reactor building CCW reading for molybdate corrosion inhibitor was within the EPRI action Level 1 range; the reading was slightly low, molybdate was added, and the reading returned to normal at the next sample. First and second quarter 2004 reports stated that, “the chemistry of the major CCWSs remains very good and within specification.” Sample results within acceptance criteria indicate that the program is effective for managing component loss of material, cracking, and fouling.

In addition, self-assessment in 2000 revealed that low triazole concentrations during 1999 were resolved by the addition of pure 10 percent triazole to CCWSs when molybdate corrosion inhibitor was high and triazole was low. Timely correction of low triazole concentrations provides assurance that the program will ensure adequate water quality to preclude loss of material, cracking, and fouling of applicable components. Self-assessment in 2000 revealed three instances of CCW chemistry outside administrative limits without corrective action taken or planned. Procedural changes and trending process revisions resolved the issue and provide assurance that the program will ensure adequate water quality to preclude component loss of material, cracking, and fouling. A QA audit of program implementation in 2003 found it effective. QA auditors also confirmed implementation of improvements recommended during previous program audits. A self-assessment in 2002 and a QA audit in 2003 revealed no issues or findings that could impact program effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.36, the applicant provided the UFSAR supplement for the Water Chemistry Control - Closed Cooling Water Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

In addition, in a letter dated January 14, 2007, the applicant provided an amendment to its LRA to explicitly state that the One-Time Inspection Program activities will confirm the effectiveness of the Water Chemistry Control – Closed Cooling Water Program.

Conclusion. On the basis of its audit and review of the applicant's Water Chemistry Control-Closed Cooling Water Program, the staff determines that those program elements, for which the applicant claimed consistency with the GALL Report, are consistent with the GALL Report. In addition, the staff reviewed the exception and the associated justifications, and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.19 Bolting Integrity Program

Summary of Technical Information in the Application. In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Appendix B, Section B.1.31, "Bolting Integrity Program," and stated its Bolting Integrity Program is a new plant program that is consistent with GALL AMP XI.M18, "Bolting Integrity," with an enhancement. By letter dated January 4, 2007, the applicant provided additional clarification stated:

> The Bolting Integrity Program applies to bolting and torquing practices of safety-related and non-safety-related bolting for pressure retaining components, nuclear steam supply system (NSSS) support components, and structural joints. The program addresses all bolting regardless of size (except the reactor vessel closure studs which are addressed by the Reactor Vessel Closures Stud Program).

The applicant stated that this program relies on recommendations for a comprehensive bolting integrity program as delineated in NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," and industry recommendations as delineated in the EPRI NP-5769, with the exceptions noted in NUREG-1339 for safety-related bolting. The program relies on industry recommendations for comprehensive bolting maintenance as delineated in EPRI TR-104213 for pressure-retaining bolting and structural bolting.

The applicant stated that this program covers bolting within the scope of license renewal, including: (1) safety-related bolting, (2) bolting for NSSS component supports, (3) bolting for other pressure-retaining components including nonsafety-related bolting, and (4) structural bolting (actual measured yield strength is less than or equal to 150 ksi). The aging management of reactor head closure studs is addressed by GALL AMP XI.M3 and is not included in this program. The staff's recommendations and guidelines for comprehensive bolting integrity programs that encompass all safety-related bolting are delineated in NUREG-1339, which includes the criteria established in the 1995 Edition through the 1996 Addenda of ASME Code, Section XI. The industry's technical basis for the program for safety-related bolting and guidelines for material selection and testing, bolting preload control, ISI, plant operation and maintenance, and evaluation of the structural integrity of bolted joints is outlined in EPRI NP-5769, with the exceptions noted in NUREG-1339. For other bolting, this information is set forth in EPRI TR-104213.

The applicant also stated that its Bolting Integrity Program applies to bolting and torquing practices of safety-related and nonsafety-related bolting for pressure-retaining components, NSSS component supports, and structural joints. The program addresses all bolting regardless of size. Guidance for the program is contained in NUREG-1339, which refers to EPRI NP-5769 and EPRI NP-5067 for technical bases. For other (structural) bolting, the guidelines of EPRI TR-104213 are followed.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The Audit and Review Report details the staff's audit evaluation of this AMP. The staff reviewed the exception and the associated justifications to determine whether the AMP, with the exception, remains adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the Bolting Integrity Program for which the applicant claims consistency with GALL AMP XI.M18 and found that they are consistent with the GALL AMP. On the basis of its review, the staff concludes that the applicant's Bolting Integrity Program will adequately manage the aging effects associated with the bolting. The staff finds the applicant's Bolting Integrity Program conforms to the recommended GALL AMP XI.E4, "Bolting Integrity," with the enhancement as described below.

Enhancement. The applicant stated the following enhancement in meeting the program element "preventive actions." Specifically, the enhancement states:

> Enhance procedures to clarify that actual yield strength is used in selecting materials for low susceptibility to SCC.

The staff finds that this enhancement ensures that the recommendations in the referenced documents are properly implemented. On this basis, the staff finds this enhancement acceptable since when the enhancement is implemented, the Bolting Integrity Program will be consistent with GALL AMP XI.M18, and will provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. The applicant stated that operating experience reviews did not identify cracking or loss of preload as AERMs for pressure boundary bolting. Although cracking and loss of preload are not AERMs for the plant equipment operator, plant procedures implement the recommendations of NUREG-1339, "Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," for pressure boundary bolting in the scope of license renewal. Plant procedures address material and lubricant selection, design standards, and good bolting maintenance practices in accordance with EPRI 5067, "Good Bolting Practices."

The staff reviewed the operating experience provided in the LRA supplement and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience revealed no degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement for the Bolting Integrity Program.

The applicant committed (Commitment #34) to implement the Bolting Integrity Program by March 21, 2012.

The staff reviewed the UFSAR Supplement section and determines that, upon implementation of Commitment #34, the information in the UFSAR supplement provided an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Bolting Integrity Program, the staff determines that those program elements, for which the applicant claimed consistency with the GALL Report, are consistent with the addition of Commitment # 34. Also, the staff reviewed the enhancement and confirmed that the implementation of the enhancements prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.20 Metal-Enclosed Bus Inspection Program

Summary of Technical Information in the Application. In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Appendix B, Section B.1.32, and stated that the Metal-Enclosed Bus Inspection Program is a new program that will be comparable to GALL AMP XI.E4, "Metal-Enclosed Bus," with exceptions.

The applicant stated that in accordance with Metal-Enclosed Bus Inspection Program, internal portions of the isophase bus which runs between the main transformer and the unit auxiliary transformer are inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. Internal bus supports are inspected for structural integrity and signs of cracks. Enclosure assemblies are visually inspected for evidence of loss of material and, where applicable, enclosure assembly elastomers are inspected to manage cracking and change in material properties.

Staff Evaluation. The staff confirmed the applicant’s claim of consistency with the GALL Report. The Audit and Review Report details the staff's audit evaluation of this AMP. The staff reviewed the enhancements and the associated justifications to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

The staff reviewed those portions of the applicant’s Metal-Enclosed Bus Inspection Program for which the applicant claims comparable with GALL AMP XI.E4 and found that they are consistent with the GALL Report AMP. On the basis of its review, the staff concludes that the applicant’s Metal-Enclosed Bus Inspection Program will adequately manage the aging effects associated with the metal-enclosed bus (MEB). The staff finds the applicant’s Metal-Enclosed Bus Inspection Program conforms to the recommended GALL AMP XI.E4, "Metal-Enclosed Bus,” with the exceptions.

Exception 1. In the revised LRA Section B.1.32, the applicant stated an exception to the GALL Report program elements “parameters monitored/inspected” and “detection of aging effects.” Specifically, the exception states that:

> MEB enclosure assemblies will be inspected in addition to internal surfaces.

The applicant stated that MEB enclosure assemblies will be inspected in addition to internal surfaces. The applicant also stated that, in accordance with Exception Note 1, that inspection of MEB enclosure assemblies in accordance with its Metal Enclosure Bus Inspection Program assures that effects of aging will be identified prior to loss of intended functions.

The staff reviewed the applicant’s Metal Enclosure Bus Program and found that the inspection proposed by the applicant is consistent with the inspection portion of GALL AMP XI.S6. The applicant will inspect the external surfaces of MEB enclosure assemblies, including enclosure assembly elastomers, for cracking and change in material properties. On this basis, the staff finds this exception acceptable.

Exception 2. In revised LRA Section B.1.32, the applicant stated an exception to the GALL Report program elements “parameters monitored/inspected” and “detection of aging effects.” Specifically, the exception states that:

> Bus insulation will not be inspected or monitored since the isophase bus which runs between the main transformer and the unit auxiliary transformer does not have bus insulation.

The staff reviewed the applicant’s Metal-Enclosed Bus Inspection Program. The staff finds that since the design of VYNPS isophase bus is different from non-segregated phase bus in that it does not have insulation material on the isophase bus, there is no need for inspecting or monitoring bus insulation. On this basis, the staff finds this exception acceptable.

Operating Experience. In the revised LRA, the applicant stated that its Metal-Enclosed Bus Inspection Program is a new program. The program is based on the program described in NUREG-1801 which in turn is based on industry operating experience. Industry operating experience and plant operating experience will be considered during program implementation.

The staff reviewed the operating experience at VYNPS and finds that operating experience at VYNPS is controlled by procedure. The program includes the following components: (1) Operating Experience - Information received from various industry sources that describes events, issues, equipment failures, that may represent opportunities to apply lessons learned to avoid negative consequences or to recreate positive experience as applicable; (2) Internal

Operating Experience - Operating experience (OE) that originates as a condition report or request from plant personnel which warrants consideration for possible Entergy-wide distribution. Internal operating experience can originate from any Entergy plant or headquarters; and (3) Impact Evaluation - Analysis of an operating experience event or problem that requires additional information and research to determine impact or potential impact, as it relates to plant condition and/or configuration. An impact evaluation is typically documented with a condition report. Condition report action items and corrective actions are used to confirm program effectiveness and to modify the program as needed.

The staff reviewed the operating experience provided in the revised LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

UFSAR Supplement. In revised LRA Section A.2.1.38, the applicant provided the UFSAR supplement for the Meta-Enclosed Bus Inspection Program.

The applicant committed (Commitment #32) to implement the Metal-Enclosed Bus Program by March 21, 2012.

The staff reviewed LRA Section A.2.1.38 and determines that, upon implementation Commitment #32, the information in the UFSAR supplement provided an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Metal-Enclosed Bus Inspection Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the addition of Commitment # 32. In addition, the staff reviewed the exceptions and the associated justifications, and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3 AMPs Not Consistent with or Not Addressed in the GALL Report

In LRA Appendix B, the applicant identified the following AMPs as plant-specific:

- Heat Exchanger Monitoring Program
- Containment Inservice Inspection Program
- Inservice Inspection Program
- Instrument Air Quality Program
- Periodic Surveillance and Preventive Maintenance Program
- Vernon Dam Federal Energy Regulatory Commission Inspection
- Water Chemistry Control - Auxiliary Systems Program

For AMPs not consistent with or not addressed in the GALL Report, the staff performed a complete review to determine their adequacy to monitor or manage aging. The staff's review of these plant-specific AMPs is documented in the following sections.

3.0.3.3.1 Heat Exchanger Monitoring Program

Summary of Technical Information in the Application. LRA Section B.1.14 describes the Heat Exchanger Monitoring Program as a new, plant-specific program.

The Heat Exchanger Monitoring Program will inspect heat exchangers for degradation and, if found, evaluate its effects on the heat exchanger's design functions, including ability to withstand a seismic event. Representative tubes within the sample population of heat exchangers will be eddy current-tested at a frequency determined by plant-specific and industry operating experience to identify aging effects prior to loss of intended function. With each eddy current test, visual inspections on accessible heat exchanger heads, covers and tube sheets will monitor surface conditions for indications of loss of material. The sample population of heat exchangers includes the high-pressure coolant injection (HPCI) gland seal condenser (GSC), HPCI lube oil cooler, reactor core isolation coolant lube oil cooler, condensate storage and transfer steam reheat coil, drywell atmospheric cooling units (RRU-1, 2, 3, and 4), reactor recirculation pump (RRP) seal water coolers, RRP motor upper and lower bearing oil coolers, and RRP motor air coolers. The program will be implemented prior to the period of extended operation.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.1.14 on the applicant's demonstration of the Heat Exchanger Monitoring Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff reviewed the Heat Exchanger Monitoring Program against the AMP elements found in the GALL Report, in SRP-LR Appendix A.1.2.3, and in SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 elements (i.e., “scope of the program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” “corrective actions,” “confirmation process,” “administrative controls,” and “operating experience”).

The applicant indicated that the “corrective actions,” “confirmation process,” and “administrative controls” program elements are parts of the site-controlled QA program. The staff's evaluation of the QA program is in SER Section 3.0.4. Evaluation of the remaining seven elements follows:

(1) Scope of Program - LRA Section B.1.14 states that this program will manage aging effects on selected heat exchangers in various systems as identified in AMRs. In the program description for this program in the LRA, the applicant listed the specific components that are managed by this program.

The staff confirmed that the specific components for which the program manages aging effects are identified by the applicant, which satisfies the criterion as defined in SRP-LR Appendix A.1.2.3.1. On this basis, the staff finds that the applicant's proposed program scope acceptable.

The staff confirmed that the "scope of the program" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions - LRA Section B.1.14 states that this program is an inspection program and no actions are taken as part of this program to prevent degradation.

The staff confirmed that the preventive actions program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.2. The staff finds it acceptable because this is an inspection program and there is no need for preventive actions. On this basis, the staff finds that the applicant's preventive actions acceptable.

The staff confirmed that the "preventive actions" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B.1.14 states that this program where practical, eddy current inspections of shell-and-tube heat exchanger tubes may be performed to determine tube wall thickness. Visual inspections will be performed on heat exchanger heads, covers and tube sheets where accessible to monitor surface condition for indications of loss of material.

The staff confirmed that the preventive actions program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.3. In the LRA, the applicant stated that this AMP is credited to manage the aging effect of loss of material on the pressure boundary intended function for the components for which this AMP is credited. Visual inspection of the heat exchanger heads, covers and tube sheets is capable of detecting indications of loss of material. The use of eddy current testing of the shell-and-tube heat exchanger tubes to determine changes in tube wall thickness will detect the loss of material on the tubes. On this basis, the staff finds that the applicant's description of the parameters monitored/inspected is acceptable.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B.1.14 states that loss of material is the aging effect managed by this program. Representative tubes within the sample population of heat exchangers will be eddy current tested at a frequency determined by internal and external operating experience to ensure that effects of aging are identified prior to loss of intended function. Visual inspections of accessible heat exchangers will be performed on the same frequency as eddy current inspections.

In addition, as stated in the LRA, an appropriate sample population of heat exchangers will be determined based on operating experience prior to inspections. Inspection can reveal loss of material that could result in degradation of the heat exchangers. Fouling is not addressed by this program. As documented in the Audit and Review Report, the applicant clarified that all heat exchangers in the program are inspected. The population of tubes for eddy-current testing is sampled using a standard industry methodology. The applicant also indicated that the heat transfer intended function is managed in accordance with another program for those heat exchangers for which this function is required.

The staff confirmed that the detection of aging effects program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.4. The inspection for the aging effect of loss of material is directly related to the pressure boundary intended function. All of the heat exchangers in the program are to be inspected and any sampling of the tubes to be selected for eddy-current testing is based on an industry standard methodology. The sample population of tubes will be eddy-current tested at a frequency based on internal and external operating experience. On this basis, the staff finds that the applicant's description of the detection of aging effects is acceptable.

The staff confirmed that the “detection of aging effects” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B.1.14 states that results of this program will be evaluated against established acceptance criteria and an assessment will be made regarding the applicable degradation mechanism, degradation rate and allowable degradation level. This information will be used to develop future inspection scope and to modify inspection frequency, if appropriate. Wall thickness will be trended and projected to the next inspection. Corrective actions will be taken if projections indicate that the acceptance criteria may not be met at the next inspection.

The staff confirmed that the monitoring and trending program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.5. The program described above provides for monitoring and trending the eddy-current thickness data. In addition, the applicant stated that the condition of the surfaces based on visual inspections of the heat exchanger heads, covers and tube sheets will be trended. This information will allow the applicant to take the appropriate corrective actions before the loss of intended function. On this basis, the staff finds that the applicant's description of monitoring and trending is acceptable.

The staff confirmed that the “monitoring and trending” program element satisfies recommendation defined in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B.1.14 states that the minimum acceptable tube wall thickness for each heat exchanger to be eddy current inspected will be established based upon a component-specific engineering evaluation. Wall thickness will be acceptable if greater than the minimum wall thickness for the component.

In addition, as stated in the LRA, the acceptance criterion for visual inspections of heat exchanger heads, covers and tubesheets will be no evidence of degradation that could lead to loss of intended function. If degradation that could lead to loss of intended function is detected, a condition report will be written and the issue resolved in accordance with the site CAP.

The staff confirmed that the acceptance criteria program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.6. The staff finds the use of specific criteria for the minimum wall thickness for each component based on a component-specific engineering evaluation to be acceptable for the eddy-current testing. On this basis, the staff finds that the applicant's description of the acceptance criteria is acceptable.

The staff confirmed that the “acceptance criteria” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - LRA Section B.1.14 states that there is no operating experience for the new Heat Exchanger Monitoring Program.

The staff recognized that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation defined in the GALL Report and in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u>. In LRA Section A.2.1.15, the applicant provided the UFSAR supplement for the Heat Exchanger Monitoring Program.

The applicant committed to implement the Heat Exchanger Monitoring Program, documented as Commitment #12, as described in VYNPS AMP B.1.14, by March 21, 2012.

The staff reviewed this section and determined that, upon the implementation of Commitment #12, the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

<u>Conclusion</u>. On the basis of its technical review of the applicant's Heat Exchanger Monitoring Program with the addition of Commitment #12, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.2 Containment Inservice Inspection Program

Summary of Technical Information in the Application. LRA Section B.1.15.1 describes the Containment Inservice Inspection Program, as an existing, plant-specific program.

Section 50.55a of 10 CFR imposes ASME Code, Section XI, ISI requirements for Classes 1, 2, and 3 pressure-retaining components and their attachments in light-water cooled power plants. Additionally, 10 CFR 50.55a imposes ASME Code, Section XI, ISI requirements for Class MC and Class CC containment structures. Subsection IWE provides inspection requirements for Class MC metal containments and Class CC concrete containments. The scope of Subsection IWE includes steel liners for concrete containment and their attachments, containment hatches and airlocks, moisture barriers, and pressure-retaining bolting. The program uses NDE techniques to detect and characterize flaws. Three different types of examinations are volumetric, surface, and visual. Volumetric examinations are the most extensive, using methods such as radiographic, ultrasonic or eddy current examinations to locate surface and subsurface flaws. Surface examinations, such as magnetic particle or dye penetrant testing, are used to locate surface flaws. Three levels of visual examinations are specified: VT-1, VT-2, and VT-3.

The Containment Inservice Inspection Program encompasses the requirements for the inspection of Class MC pressure-retaining components (primary containment) and their integral attachments in accordance with the requirements of 10 CFR 50.55a(b)(2) and the 1998 Edition of ASME Code, Section XI with 2000 Addenda, Inspection Program B.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.1.15.1 on the applicant's demonstration of the Containment Inservice Inspection Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff reviewed the Containment Inservice Inspection Program against the AMP elements finds in the GALL Report, in SRP-LR Appendix A.1.2.3, and in SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 elements (i.e., “scope of the program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” “corrective actions,” “confirmation process,” “administrative controls,” and “operating experience”).

During the audit and review, the staff asked the applicant to explain why its Containment Inservice Inspection Program was a plant-specific program instead of an existing plant program that is consistent with GALL AMP XI.S1, “ASME Code, Section XI, Subsection IWE,” with exceptions. The applicant stated that VYNPS chose to describe its Containment Inservice Inspection Program as plant-specific rather than comparing it to the corresponding GALL Report program because the GALL Report program contains many ASME Code, Section XI tables and section numbers which change with different versions of the code. Because of this, comparison with the GALL Report program would have generated many exceptions and explanations which would have detracted from the objective of the comparison. Therefore, the

Inservice Inspection – Containment Inservice Inspection Program was presented as a plant-specific program so that it could be evaluated on its own merit without numerous explanations of code revision. The staff finds VYNPS's classification of its Containment Inservice Inspection Program as plant-specific an acceptable alternative to characterizing it as consistent with GALL AMP XI.S1, with exceptions.

The staff's evaluation of the 10 program element are provided below. The staff's evaluation of the applicant's QA program is discussed in SER Section 3.0.4.

(1) Scope of Program - LRA Section B.1.15.1 states that this program, in accordance with ASME Code, Section XI Subsection IWE, manages loss of material and cracking for the primary containment and its integral attachments. The primary containment is a GE Mark I pressure suppression containment system. The system consists of a drywell (housing the reactor vessel and reactor coolant recirculation loops), a pressure suppression chamber (housing a water pool), and the connecting vent system between the drywell and the water pool, isolation valves, and containment cooling systems. The code of construction for the containment structure is the ASME Code, Section III,1965, with winter addenda.

    The staff confirmed that the specific components for which the program manages aging effects are identified by the applicant, which satisfied the criterion as defined in SRP-LR Appendix A.1.2.3.1. On this basis, the staff finds that the applicant's proposed program scope acceptable.

    The staff confirmed that the "scope of the program" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions - LRA Section B.1.15.1 states that this program is a monitoring program that does not include preventive actions.

    The staff confirmed that the preventive actions program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.2. The staff finds that the applicant's Containment Inservice Inspection Program is only an inspection program and the inspections performed in accordance with this program will only monitor the condition of the primary containment and its integral attachments and will not perform any preventive or mitigating action for aging effects/mechanisms. On this basis, the staff finds the applicant's preventive actions acceptable.

    The staff confirmed that the "preventive actions" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B.1.15.1 states that the primary containment and its attachments are inspected for evidence of cracks, wear, and corrosion.

The staff asked the applicant to explain why VYNPS did not have a Service Level I Protective Coating Monitoring and Maintenance Program to prevent coating failure that could adversely affect the operation of post-accident fluid systems emergency core cooling systems (ECCS) and thereby impair safe shutdown. The applicant had already stated in the LRA that coatings are not relied on for managing aging effects for license renewal which the staff finds acceptable. The applicant stated in detail during the audit and review its response to GL 98-04, “Potential for Degradation of the Emergency Core Cooling System and Containment Spray System After a Loss of Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment,” dated July 14, 1998, that the impact of debris loading on the ECCS strainers at VYNPS is discussed. As discussed in the GL response, in response to NRC Bulletin 96-03, new large passive ECCS strainers have been installed at VYNPS. The applicant stated that the new VYNPS torus stainers were designed to accept 100 percent of the coatings within the LOCA pipe break steam/water jet zone of influence. The approach velocity of materials entrained in the torus water is extremely low due to the sizing of the ECCS strainers and also any coating debris would quickly settle to the bottom of the suppression pool after the initial turbulence subsided.

The NRC has previously accepted VYNPS’s response to GL 98-04 which indicated that the coatings of the containment will not affect the operation of the ECCS strainers during a LOCA. Since coatings are not relied upon to manage aging effects and not an ECCS strainer blockage concern, the staff finds the applicant’s response acceptable for not requiring a Service Level I Protective Coating Monitoring and Maintenance Program in accordance with license renewal.

The staff confirmed that the parameters monitored/inspected program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.3. The staff finds that the applicant has identified the parameters of the primary containment and its attachments which need to be inspected by general visual examination to determine if aging effects/mechanisms have occurred and to the extent that detailed visual examinations need to be performed. In accordance with IWE requirements, if detailed IWE visual examinations are required of certain areas, the areas shall be examined for evidence of cracking, discoloration, wear, pitting, excessive corrosion, gouges, surface discontinuities, dents, and other signs of surface irregularities. On this basis, the staff finds that the applicant's description of the parameters monitored or inspected acceptable.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B.1.15.1 states that this program manages loss of material for the primary containment and its integral attachments. In addition, as stated in the LRA, the primary inspection method for the primary containment and its integral attachments is visual examination. Visual examinations are performed either directly or remotely with sufficient illumination and resolution suitable for the local environment to assess general conditions that may affect either the containment structural integrity or leak tightness of the pressure retaining component. The program includes augmented ultrasonic exams to measure wall thickness of the containment structure.

The staff confirmed that this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.4. Although not stated in accordance with this element, the staff finds that the applicant has identified the frequency of inspections in accordance with the program description. In accordance with the program description, it is stated that VYNPS uses Inspection Program B of ASME Code, Section XI Subsection IWE. This inspection program consists of sequential 10-year inspection intervals with three partial inspection periods within the interval. All accessible areas of the primary containment and its integral attachments will be inspected every 10 years. An initial visual examination is an adequate method to gather data on the condition of the primary containment and its integral attachments. Should flaws or areas of degradation be found which exceed the acceptance standards, ultrasonic examinations are also an adequate method to determine remaining component thickness. On this basis, the staff finds that the applicant's description of the detection of aging effects acceptable.

The staff confirmed that the “detection of aging effects” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B.1.15.1 states that program results are compared, as appropriate, to baseline data and other previous test results. If indications are accepted for continued use by analytical evaluation, the areas containing such flaws are monitored during successive inspection periods.

The staff confirmed that for visual inspection, this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.5. The staff finds that the applicant will retain all inspection results and records in accordance with its Inservice Inspection – Containment Inservice Inspection Program. As appropriate, reviews of previous inspection results and records will be done for areas containing flaws so that long-term degradation can be trended. The applicant will continue to monitor areas containing flaws during successive inspection periods even if the flaws are accepted for continued use by analytical evaluation. On this basis, the staff finds that the applicant's description of the monitoring and trending acceptable.

The staff confirmed that the “monitoring and trending” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B.1.15.1 states that program results are compared, as appropriate, to baseline data, other previous test results, and acceptance criteria of the ASME Code, Section XI, Subsection IWE for evaluation of any evidence of degradation.

The staff confirmed that the acceptance criteria program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.6. The staff finds that the applicant compared all primary containment and its integral attachments inspection findings, as appropriate, to baseline data, other previous test results, and acceptance criteria of the ASME Code, Section XI, Subsection IWE. On this basis, the staff finds that the applicant's description of the acceptance criteria acceptable.

The staff confirmed that the “acceptance criteria” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.6. The staff finds this program element acceptable.

(7) Corrective Actions - The adequacy of the applicant's 10 CFR 50, Appendix B Program associated with this program element is reviewed by the staff and addressed in SER Section 3.0.4.

The staff reviewed other aspects of this program element to determine whether or not it satisfied the criteria defined in SRP-LR Appendix A.1.2.3.7. The staff finds that the applicant will take corrective action when conditions adverse to the quality of the primary containment and its integral attachments exist, by performing evaluations and/or repair and replacements. On this basis, the staff finds that the applicant's description of the corrective actions acceptable.

(8) Confirmation Process - The adequacy of the applicant's 10 CFR 50, Appendix B Program associated with this program element was reviewed by the staff and is addressed in SER Section 3.0.4.

The staff reviewed other aspects of this program element to determine whether or not it satisfied the criteria defined in SRP-LR Appendix A.1.2.3.8. The staff finds that the applicant’s confirmation process is part of the CAP and included reviews to assure that proposed actions are adequate, tracking and reporting of open corrective actions, and review of corrective action effectiveness. Any followup inspection required by the confirmation process is documented in accordance with the CAP. The CAP constitutes the confirmation process for the VYNPS AMPs and activities. The ASME Code, Section XI, Subsection IWE, also requires that when the primary containment and its integral attachments examination results require evaluation of flaws or areas of degradation, and the component is acceptable for continued service, the areas containing such flaws or areas of degradation shall be reexamined during the next inspection period in accordance with augmented inspections. In accordance with Subsection IWE, when the reexaminations reveal that the flaws or areas of degradation remain essentially unchanged for the next inspection period, these areas no longer require augmented examination. On this basis, the staff finds that the applicant's description of the confirmation process acceptable.

(9) Administrative Controls - The adequacy of the applicant's 10 CFR 50, Appendix B Program associated with this program element was reviewed by the staff and is addressed in SER Section 3.0.4.

The staff reviewed other aspects of this program element to determine whether or not it satisfied the criteria defined in SRP-LR Appendix A.1.2.3.9. The staff finds that the applicant’s Containment Inservice Inspection Program has regulatory and administrative controls which provide a formal review and approval process of the program. On this basis, the staff finds that the applicant's description of the administrative controls acceptable.

(10) Operating Experience - LRA Section B.1.15.1 states that RFO 21 inspections finds only two areas of potential age-related degradation; the drywell floor to metal containment moisture barrier had missing paint, cracked paint, and areas of corrosion on the base metal in the seal area; and corrosion was found in the area of the X-5G penetration. Engineering evaluation was performed and no significant wall loss was identified. Base metal was prepared, primed and painted to protect it from further corrosion, and the moisture barrier was replaced. RFO 22 inspections found two more areas of potential age-related degradation; surface pitting of primary containment vent headers and vent pipe bowls; and corrosion on torus penetrations X-207A-H. Evaluation determined that the components have significant margin to code minimum wall thickness and that the rate of corrosion is low due to the inerted containment environment during operation. Augmented inspections were not necessary since none of the identified corrosion was significant. RFO 24 inspections revealed flaking coating and rust staining on the bay 3 inner torus wall. Subsequent ultrasonic examination revealed no material loss. Also, visual inspection of drywell head exterior surface revealed areas of localized missing coating and primer with light corrosion, but no material loss. Resolution of these issues prior to loss of component intended function proves that the program is effective at managing aging effects for primary containment and its integral attachments. RFO 24 visual inspections of drywell interior surfaces, stabilizer assembly interior surfaces, torus penetrations, and drywell penetrations revealed areas of localized missing coating where the primer is intact, but no corrosion or material loss. Visual inspection of new drywell moisture barrier resulted in no recordable indications. Absence of aging effects on these components proves that the program is effective at managing aging effects for primary containment and its integral attachments.

Further, QA surveillance during RFO 24 revealed a problem with program administrative controls. The issue was addressed and closed. The program was revised to require that engineering evaluations of indications that do not meet acceptance criteria be completed before the containment is declared operable. QA surveillance revealed an issue that could impact effectiveness of the program. Resolution of this issue provides evidence that the program remains effective at managing aging effects for primary containment and its integral attachments. A recent engineering system health report revealed no issues or findings that could impact program effectiveness.

The staff reviewed the summary of specific operating experience provided in the applicant's applicable program basis document, as documented in the Audit and Review Report, for the Containment Inservice Inspection Program. The review indicated that the applicant's Inservice Inspection – Containment Inservice Inspection Program is effective in identifying age-related degradation, implementing repairs, and maintaining the integrity of the containment pressure boundaries and the moisture barrier seal.

The staff noted that there has been only one noteworthy component CR written as a result of the Inservice Inspection – Containment Inservice Inspection Program since the inception of the program. During the RFO 21 inspections, two areas of potential age-related degradation were discovered. The drywell floor to metal containment moisture barrier had missing paint, cracked paint, and areas of corrosion on the base metal in the seal area; and corrosion was found in the area of the X-5G penetration. The applicant performed an engineering evaluation and no significant wall thickness loss was identified. The applicant prepared, primed and painted the containment base metal to protect it from further corrosion, and the moisture barrier was replaced. Historically, the other deficiencies were limited to such things as flaking or missing coatings on the drywell liner, minor rust staining and corrosion of the drywell liner, and minor corrosion of drywell penetrations, torus penetrations, vent headers, vent pipe bowls, drywell head and torus bays. None of these deficiencies resulted in loss of intended function due to age-related degradation. This provides assurance that containment pressure boundary degradation has not been occurring since the inception of the program.

The staff also noted that there was one noteworthy CR written by the applicant's QA on a deficiency in the process for declaring the containment operable after a RFO. QA surveillance during RFO 24 revealed a problem with the Inservice Inspection – Containment Inservice Inspection Program administrative controls that could have impacted the effectiveness of the program. The applicant states in the LRA that the program was revised to require that engineering evaluations of indications that do not meet acceptance criteria be completed before the containment is declared operable. The staff finds that the applicant's resolution of this issue ensures that the containment pressure boundary will not operate in a condition with findings that have not been evaluated.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.16, the applicant provided the UFSAR supplement for the Containment Inservice Inspection Program. The staff reviewed LRA Section A.2.1.16 and finds the UFSAR supplement information an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Containment Inservice Inspection Program, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.3 Inservice Inspection Program

Summary of Technical Information in the Application. LRA Section B.1.15.2 describes the Inservice Inspection Program, as an existing, plant-specific program.

Section 50.55a of 10 CFR imposes inservice inspection requirements of ASME Code Section XI for Classes 1, 2, and 3 pressure-retaining components and their attachments in light-water cooled power plants. Additionally, 10 CFR 50.55a imposes inservice inspection requirements of ASME Code Section XI for Class MC and Class CC containment structures. Subsection IWE contains inspection requirements for Class MC metal containments and Class CC concrete containments. The scope of IWE includes steel liners for concrete containment and their attachments; containment hatches and airlocks; moisture barriers; and pressure-retaining bolting. The program uses NDE techniques to detect and characterize flaws. Three different types of examinations are volumetric, surface, and visual. Volumetric examinations are the most extensive, with such methods as radiographic, ultrasonic, or eddy current examinations to locate surface and subsurface flaws. Surface examinations like magnetic particle or dye penetrant testing locate surface flaws. Three levels of visual examinations specified are VT-1, VT-2, and VT-3.

The Inservice Inspection Program encompasses ASME Code, Section XI, Subsection IWA, IWB, IWC, IWD and IWF requirements. The Inservice Inspection Program is based on ASME Code, Inspection Program B (IWA-2432), which has 10-year inspection intervals. Every 10 years the program is updated to the latest ASME Code edition and addendum, Section XI, approved by the staff, in accordance with 10 CFR 50.55a. On September 1, 2003, VYNPS entered the fourth ISI interval. The Code Edition and Addenda used for the fourth interval is the 1998 Edition with 2000 Addenda. The current program maintains the structural integrity of Classes 1, 2, and 3 systems and supports at the level required by 10 CFR 50.55a.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.1.15.2 on the applicant's demonstration of the Inservice Inspection Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff reviewed the Inservice Inspection Program against the AMP elements found in the GALL Report, in SRP-LR Appendix A.1.2.3, and in SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 elements (i.e., “scope of the program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” “corrective actions,” “confirmation process,” “administrative controls,” and “operating experience”).

The applicant indicated that the “corrective actions,” “confirmation process,” and “administrative controls” program elements are parts of the site-controlled QA program. The staff's evaluation of the QA program is in SER Section 3.0.4. Evaluation of the remaining seven elements follows:

(1) Scope of Program - LRA Section B.1.15.2 states that this program manages cracking, loss of material, and reduction of fracture toughness of reactor coolant system piping, components, and supports. The program implements applicable requirements of ASME Code, Section XI, Subsections IWA, IWB, IWC, IWD and IWF, and other requirements specified in 10 CFR 50.55a with approved NRC alternatives and relief requests. Every 10 years the Inservice Inspection Program is updated to the latest ASME Code Edition and Addendum, Section XI, approved by the NRC, in accordance with10 CFR 50.55a.

ASME Code, Section XI inspection requirements for reactor vessel internals, (Subsection IWB, Categories B-N-1 and B-N-2) are not in the Inservice Inspection Program, but are included in the BWR Vessel Internals Program. For more information on the BWR Vessel Internals Program, see SER Section 3.0.3.2.7.

The staff confirmed that the specific components for which the program manages aging effects are identified by the applicant, which satisfied the criterion as defined in SRP-LR Appendix A.1.2.3.1. They conform to the scope of ISI as set forth in ASME Code, Section XI, Subsections IWA, IWB, IWC, IWD and IWF and approved by the staff in accordance with 10 CFR 50.55a. On this basis, the staff finds that the applicant’s proposed program scope to be acceptable.

The staff confirmed that the “scope of the program” program element satisfies therecommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions - LRA Section B.1.15.2 states that this program is a condition monitoring program that does not include preventive actions.

The staff confirmed that the preventive actions program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.2 for a condition monitoring program. On this basis, the staff finds the absence of preventive actions to be acceptable.

The staff confirmed that the “preventive actions” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B.1.15.2 states that this program uses NDE techniques to detect and characterize flaws. Volumetric examinations such as radiographic, ultrasonic or eddy current examinations are used to locate surface and subsurface flaws. Surface examinations, such as magnetic particle or dye penetrant testing, are used to locate surface flaws.

The applicant also stated that three levels of visual examinations are specified. VT-1 visual examination is conducted to assess the condition of the surface of the part being examined, looking for cracks and symptoms of wear, corrosion, erosion or physical damage. It can be done with either direct visual observation or with remote examination using various optical and video devices. VT-2 visual examination is conducted specifically to locate evidence of leakage from pressure retaining components (period pressure tests). While the system is in accordance with pressure for a leakage test, visual examinations are conducted to detect direct or indirect indication of leakage. VT-3 visual examination is conducted to determine general mechanical and structural condition of components and supports and to detect discontinuities and imperfections.

The staff confirmed that the preventive actions program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.3. They are consistent with the requirements of applicable subsections Section XI of the ASME Code. Although the 1998 Edition (with year 2000 Addenda) is in effect for the current (fourth) interval, the program addresses the need to increase or expand examination scope as required to satisfy the requirements of 10 CFR 50.55a. In addition, the program addresses the need to revisit the specific version of the ASME Code in subsequent intervals and to re-evaluate exemptions to be requested. On this basis, the staff finds that the applicant's description of the parameters monitored/inspected is acceptable.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B.1.15.2 states that this program manages cracking and loss of material, as applicable, for carbon steel, low alloy steel and stainless steel/nickel based alloy subcomponents of the RPV using NDE techniques specified in ASME Code, Section XI, Subsection IWB examination categories.

The applicant also stated that its Inservice Inspection Program manages cracking, loss of preload, loss of material, and reduction of fracture toughness, as applicable, of reactor coolant system components using NDE techniques specified in ASME Code, Section XI, Subsections IWB, IWC and IWD examination categories. No AERMs are identified for lubrite sliding supports. However, the Inservice Inspection Program will confirm the absence of aging effects for the period of extended operation.

In addition, the applicant stated that its Inservice Inspection Program manages loss of material for ASME Code, Class 1, 2, and 3 steel piping supports and steel component supports within containment, using NDE techniques specified in ASME Code, Section XI, Subsection IWF examination categories.

The staff confirmed that this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.4 for the detection of aging effects. The applicant’s Inservice Inspection Program has been reviewed and accepted by the staff in accordance with 10 CFR 50.55a. On this basis, the staff finds that the applicant's description of the detection of aging effects is acceptable.

The staff confirmed that the “detection of aging effects” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B.1.15.2 states that program results are compared, as appropriate, to baseline data and, other previous test results. If indications are accepted for continued use by analytical evaluation, the areas containing such flaws are monitored during successive inspection periods.

The applicant also stated that ISI results are recorded every operating cycle and provided to the NRC after each refueling outage via Owner’s Activity Reports prepared by the Inservice Inspection Program Coordinator. These detailed reports include scope of inspection and significant inspection results.

The staff confirmed that the monitoring and trending program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.5. The implementing procedure and selected records of prior inspections were examined to confirm that the requirements of this program element are satisfied. On this basis, the staff finds that the applicant's description of the acceptance criteria is acceptable.

The staff confirmed that the “monitoring and trending” program element satisfies the recommendnation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B.1.15.2 states that in this program a preservice, or baseline, inspection of program components was performed prior to startup to assure freedom from defects greater than code-allowable. This baseline data also provides a basis for evaluating subsequent inspection results. Since plant startup, additional inspection criteria for Class 2 and 3 components have been required by 10 CFR 50.55a, for which baseline data has also been obtained. Results are compared, as appropriate, to baseline data, other previous test results, and acceptance criteria of the ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition, 2000 Addenda, for evaluation of any evidence of degradation.

The staff confirmed that the acceptance criteria program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.6. The implementing procedure and selected records of prior inspections were examined to confirm that the requirements of this program element are satisfied. On this basis, the staff finds that the applicant's description of the acceptance criteria is acceptable.

The staff confirmed that the “acceptance criteria” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - LRA Section B.1.15.2 states that evaluation of pressure boundary components, including bolting, is by NDEs and visual inspections. Deviations from acceptance criteria are properly resolved. Inspections since 2001 revealed erosion of valve body internals, weld indications, recirculation pump bolting corrosion, and RHR valve bolting corrosion. The scope of welding inspections was expanded when rejectable indications were revealed. Condition reports documented indications and ensured resolution of those conditions. Corrective actions included repair and replacement of components. These actions prove that the program is effective at managing component aging effects. QA audits, QA surveillances, engineering system health reports, and staff inspections from 2001 to 2004 revealed no issues or findings that could impact program effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.17, the applicant provided the UFSAR supplement for the Inservice Inspection Program. The staff reviewed this section and finds the UFSAR supplement information an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Inservice Inspection Program, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.4 Instrument Air Quality Program

Summary of Technical Information in the Application. LRA Section B.1.16 describes the Instrument Air Quality Program as an existing, plant-specific program.

The Instrument Air Quality Program maintains instrument air (IA) supplied to components free of water and significant contaminants, preserving an environment not conducive to loss of material. Dewpoint, particulate contamination, and hydrocarbon concentration are checked periodically to maintain IA quality.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.1.16 on the applicant's demonstration of the Instrument Air Quality Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff reviewed the Instrument Air Quality Program against the AMP elements found in the GALL Report, in SRP-LR Appendix A.1.2.3, and in SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 elements (i.e., "scope of the program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," "corrective actions," "confirmation process," "administrative controls," and "operating experience").

The applicant indicated that the "corrective actions," "confirmation process," and "administrative controls" program elements are parts of the site-controlled QA program. The staff's evaluation of the QA program is in SER Section 3.0.4. Evaluation of the remaining seven elements follows:

(1) Scope of Program - LRA Section B.1.16 states that this program applies to components within the scope of license renewal and subject to an AMR that are supplied with IA, for which pressure boundary integrity is required for the component to perform its intended function.

    The staff confirmed that the specific components for which the program manages aging effects are identified by the applicant, which satisfied the criterion as defined in SRP-LR Appendix A.1.2.3.1. In addition, on the basis of a review of implementing procedures and discussions with the applicant's staff, the program reflects the VYNPS response to GL 88-14 as augmented by NRC Information Notice (IN) 81-38 and its first supplement. On this basis, the staff finds that the applicant's proposed program scope is acceptable.

    The staff confirmed that the "scope of the program" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions - LRA Section B.1.16 states that system air quality is monitored and maintained within specified limits to ensure that IA supplied to components is maintained free of water and significant contaminants, thereby preventing loss of material.

The staff confirmed that the preventive actions program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.2. The activities for prevention and mitigation of aging effects on systems and components within the scope of license renewal that are supplied with IA are adequately described. On this basis, the staff finds that the applicant's preventive actions is acceptable.

The staff confirmed that the “preventive actions” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B.1.16 state that dewpoint, particulate contamination and hydrocarbon concentration are periodically checked to verify IA quality is maintained.

The staff confirmed that the preventive actions program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.3. Dewpoint, particulate contamination and hydrocarbon concentration are linked to the aging effects of concern and are appropriate parameters to be monitored. Furthermore, in a letter dated July 6, 2006, the applicant committed to maintain the quality of compressed air in accordance with Instrument Society of America (ISA) S7.3 “Quality Standard for Instrument Air.” On this basis, the staff finds that the applicant's description of the parameters monitored/inspected is acceptable.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B.1.16 states that dewpoint, particulate contamination and hydrocarbon concentration are periodically checked to verify IA quality is maintained, thereby preventing loss of material. At least once per 18 months, dew point, particulate contamination and hydrocarbon concentration are monitored at several locations in the IA system.

The staff confirmed that the detection of aging effects program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.4. The staff reviewed the implementing procedures for measuring dewpoint, particulate contamination and hydrocarbon concentration monitoring. Degradation of the piping and any components would become evident by observation of excessive corrosion or by failure of the system or any item of components to meet specified performance limits. On this basis, the staff finds that the applicant's description of the detection of aging effects is acceptable.

The staff confirmed that the “detection of aging effects” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B.1.16 states that results of sample analyses are maintained in the chemistry log. A condition report is issued if data indicates deteriorating IA quality.

The staff confirmed that for visual inspection, the monitoring and trending program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.5. Effects of corrosion and the presence of contaminants are monitored by visual inspection and periodic system and component tests. On this basis, the staff finds that the applicant's description of monitoring and trending is acceptable.

The staff confirmed that the "monitoring and trending" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B.1.16 states that:

- dew point less than 40°C
- maximum particle size is 3 micrometers
- hydrocarbon content less than 1 parts per million (ppm)

The staff confirmed that the acceptance criteria program element satisfied the criteria defined in SRP-LR Appendix A.1.2.3.6. The acceptance criteria specified in the VYNPS Instrument Air Quality Program have been found to be appropriate for managing the aging effects in the IA system. On this basis, the staff finds that the applicant's description of the acceptance criteria is acceptable.

The staff confirmed that the "acceptance criteria" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - LRA Section B.1.16 states that recent analyses revealed all parameters maintained within acceptance criteria. Absence of degradation of IA quality proves that the program is effective at maintaining IA supplied to components free of water and significant contaminants and preventing loss of material.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.18, the applicant provided the UFSAR supplement for the Instrument Air Quality Program.

The applicant committed (Commitment #28) in to revise program procedure to indicate that the Instrument Air Program will maintain IA quality in accordance with ISA S7.3 by March 21, 2012.

The staff reviewed this section and determined that, upon the implementation of Commitments #28, the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Instrument Air Quality Program with the addition of Commitment #28, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.5 Periodic Surveillance and Preventive Maintenance Program

Summary of Technical Information in the Application. LRA Section B.1.22 describes the Periodic Surveillance and Preventive Maintenance Program as an existing, plant-specific program.

The Periodic Surveillance and Preventive Maintenance Program includes periodic inspections and tests that manage aging effects not managed by other AMPs. Preventive maintenance and surveillance testing are generally implemented through repetitive tasks or routine monitoring of plant operations. The program has taken credit in the AMR of the following systems and structures: reactor building, yard structures, HPCI system, standby gas treatment system (SGTS), primary containment atmosphere control (CAC) system, SWS, EDG system, HVAC system, John Deere diesel, and nonsafety-related systems and components affecting safety-related systems.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.1.7 on the applicant's demonstration of the Periodic Surveillance and Preventive Maintenance Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff reviewed the Periodic Surveillance and Preventive Maintenance Program against the AMP elements found in the GALL Report, in SRP-LR Appendix A.1.2.3, and in SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 elements (i.e., “scope of the program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” “corrective actions,” “confirmation process,” “administrative controls,” and “operating experience”).

The applicant indicated that the “corrective actions,” “confirmation process,” and “administrative controls” program elements are parts of the site-controlled QA program. The staff's evaluation of the QA program is in SER Section 3.0.4. Evaluation of the remaining seven elements follows:

(1) Scope of Program - LRA Section B.1.22 states that this program, with regard to license renewal, includes those tasks credited with managing aging effects identified in AMRs.

The staff confirmed that the specific components for which the program manages aging effects are identified by the applicant, which satisfies the criterion as defined in SRP-LR Appendix A.1.2.3.1. On this basis, the staff finds that the applicant’s proposed program scope acceptable.

The staff confirmed that the “scope of the program” program element satisfies the recommendnation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions - LRA Section B.1.22 states that inspection and testing activities used to identify component aging effects do not prevent aging effects. However, activities are intended to prevent failures of components that might be caused by aging effects.

The staff confirmed that the preventive actions program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.2. Since inspection and testing activities do not rely on preventive actions and preventive actions need not be provided, the staff finds that the applicant's preventive actions acceptable.

The staff confirmed that the “preventive actions” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B.1.22 states that this program provides instructions for monitoring structures, systems, and components to detect degradation. Inspection and testing activities monitor various parameters including system flow, system pressure, surface condition, loss of material, presence of corrosion products, and signs of cracking.

The staff reviewed the applicant’s basis document and compared with AMRs which credit Periodic Surveillance and Preventive Maintenance Program and concurred with the applicant that inspection and testing activities monitor various parameters including system flow, system pressure, surface condition, loss of material, presence of corrosion products, and signs of cracking. The staff confirmed that the preventive actions program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.3. On this basis, the staff finds that the applicant's description of the parameters monitored or inspected is acceptable.

The staff confirmed that the “parameters monitored or inspected” program element satisfies therecommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B.1.22 states that preventive maintenance activities and periodic surveillances provide for periodic component inspections and testing to detect aging effects. Inspection intervals are established such that they provide timely detection of degradation. Inspection intervals are dependent on component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations. Each inspection or test occurs at least once every ten years. The extent and schedule of inspections and testing assure detection of component degradation prior to loss of intended functions. Established techniques such as visual inspections are used.

The staff reviewed the applicant's basis document to confirm that the program provides inspection intervals and inspection method. The staff finds that periodic surveillance intervals and requirements meet TS requirements and the inspection and testing interval for surface condition degradation is 5 years.

During the audit and review, the staff asked the applicant to justify if inspection interval of 5 years for general corrosion of carbon steel CW system components exposed to raw water environment is adequate. The applicant responded that: (1) From reviewing its Service Water Monitoring Program, MIC is significantly inhibited when exposed to chlorination. Circulating water is periodically treated with chlorine, which further reduces this potential for attack for this system and that general corrosion, even in raw water systems such as circulating water, is not fast acting; (2) PSPM inspection activities are performed on 10 CFR 54.4(a)(2) systems that have been in service for the life of the plant without required inspections per the VYNPS corrective action program. If significant changes are noted, the frequency in the PSPM can be updated; (3) The consequences of failure due to loss of material are low; and (4) With the exception of the alternate cooling tower cell, the circulating water system does not run through the reactor building or near any safety-related equipment. Based on the aging stressors described above, theapplicant concluded that the alternate cooling tower cell will not be impacted. In addition, SRP-LR Appendix A.1.2.2-3 states that risk significance may be considered in developing the details of an aging management program.

The staff reviewed the information provided by the applicant. On the basis of its review of the applicant's technical justification and operating experience, the staff found that the inspection interval of 5 years is adequate for monitoring general corrosion of carbon steel components exposed to a raw water environment in the circulating water system to assure corrective action is taken prior to loss of intended function.

The staff confirmed that this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.4. The staff finds that the applicant's program provides inspection intervals and inspection method and that periodic surveillance interval and requirements meet TS requirement and the inspection and testing interval for surface condition degradation is 5 years. On this basis, the staff finds that the applicant's description of the detection of aging effects is acceptable.

The staff confirmed that the "detection of aging effects" program element satisfies therecommendnation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B.1.22 states that preventive maintenance and surveillance testing activities provide for monitoring and trending of aging degradation. Inspection and testing intervals are established such that they provide for timely detection of component degradation. Inspection and testing intervals are dependent on component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations.

The staff reviewed applicant's program and its related operating procedures and determines the program is used to identify component degradation. Any degraded components will be handled through CAP. The staff determines that for visual inspection, this program element satisfies the criteria defined in Appendix SRP-LR A.1.2.3.5. On this basis, the staff finds that the applicant's description of the monitoring and trending is acceptable.

The staff confirmed that the "monitoring and trending" program element satisfies therecommenddation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B.1.22 states that this program's acceptance criteria are defined in specific inspection and testing procedures. The procedures confirm component integrity by verifying the absence of aging effects or by comparing applicable parameters to limits based on applicable intended functions established by plant design basis.

The staff reviewed VYNPS operating procedures for various systems (primary containment surveillance, secondary containment surveillance) and confirmed that the testing frequency is determined by the IST program criteria and the TS and is performed as scheduled by the surveillance test schedule.

The staff also reviewed the VYNPS operating procedures and confirmed that the applicant's acceptance criteria were clearly defined in its operating procedures. For example, the staff reviewed applicant's procedures, as documented in the Audit and Review Report, and confirmed the acceptance criteria established by plant design basis. On the basis of its review, the staff determines that acceptance criteria of the applicant's program satisfied the criteria defined in SRP-LR Appendix A.1.2.3.6. On this basis, the staff finds this acceptable. On this basis, the staff finds the acceptance criteria is acceptable.

The staff confirmed that the "acceptance criteria" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - LRA Section B.1.22 states that recent inspection results (2001 to 2004) show that the program is effective in managing component aging effects. For example, the material condition of cranes was consistent with inspection acceptance criteria to which the program documents referred (i.e., no significant corrosion or wear; equipment lock sliding doors had no significant wear or corrosion; HPCI turbine GSC tubes were not fouled; HPCI turbine casing had no significant corrosion or erosion;

standby gas treatment demister and loop seal components had no significant corrosion; John Deere diesel exhaust gas components had no significant corrosion or cracking; and ECCS corner room recirculation units had no significant corrosion). QA audits and surveillances, self-assessments, engineering system health reports, and staff inspections from 2001 to 2004 concluded that actions to preclude recurrence of a previous adverse trend had been effective and revealed no issues or findings that could impact program effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the “operating experience” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.24, the applicant provided the UFSAR supplement for the Periodic Surveillance and Preventive Maintenance Program.

The applicant committed (Commitment #17) to enhance the Periodic Surveillance and Preventive Maintenance Program to assure that the effects of aging will be managed by March 21, 2012.

The staff reviewed this section and determined that, upon the implementation of Commitments #17, the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Periodic Surveillance and Preventive Maintenance Program with the addition of Commitment #17, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.6 Vernon Dam FERC Inspection

Summary of Technical Information in the Application. LRA Section B.1.27.3 describes the Vernon Dam FERC Inspection as an existing, plant-specific program.

The Vernon Dam is subject to the Federal Energy Regulatory Commission (FERC) 5-year inspection program. This program consists of a visual inspection by a qualified independent consultant approved by FERC, and is in compliance with 18 CFR, "Conservation of Power and Water Resources," Part 12, "Safety of Water Power Projects and Project Works," Subpart D,"Inspection by Independent Consultant." The staff has finds that mandated FERC 5-year inspection programs are acceptable for aging management.

In a letter dated January 4, 2007, the applicant also stated that since the Vernon Dam inspections are not part of a VYNPS aging managing program but are conducted by the dam's owner, the applicant deleted its Structures Monitoring – Vernon Dam FERC Inspection Program from the LRA.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.1.27.3 on the applicant's demonstration of the Vernon Dam FERC Inspection to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff reviewed the Vernon Dam FERC Inspection against the AMP elements found in the GALL Report, in SRP-LR Appendix A.1.2.3, and in SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 elements (i.e., "scope of the program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," "corrective actions," "confirmation process," "administrative controls," and "operating experience").

The applicant stated that VYNPS AMP B.1.27.3 is an existing plant-specific program. Vernon Dam is subject to the FERC 5-year inspection program. This program consists of a visual inspection by a qualified independent consultant approved by FERC, and is in compliance with Title 18 of the Code of Federal Regulations, "Conservation of Power and Water Resources," Part 12 "Safety of Water Power Projects and Project Works," Subpart D "Inspection by Independent Consultant." The NRC has found that mandated FERC 5-year inspection programs are acceptable for aging management.

The applicant stated, in the LRA, in accordance with the operating experience, that recent inspections (1998-2002) of the Vernon Dam found minor concrete erosion on the spillway, a crack on a downstream pier, concrete surface erosion in the stanchion flashboard section, spalling at the base of a trash sluice wall, and a crack in the spillway gallery. None of these conditions are threatening structural support and, therefore, do not require immediate repair. However, the areas of degradation will continue to be monitored. Continued monitoring of minor degradation provides evidence that the program is effective for managing aging effects for the dam.

Recent FERC assessment (2002) of the Vernon Dam structures found that SCs are maintained in accordance with terms of the license, including daily visual inspections of structural integrity, and periodic underwater inspections on both the upstream and downstream sides of the dam.

In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information included in LRA Section B.1.27.3, regarding the applicant's demonstration of the Vernon Dam FERC Inspection to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff reviewed the program basis documents and reports. In addition, the staff reviewed the listed operating experience in which FERC inspections of Vernon Dam found minor concrete erosion on the spillway, a crack on a downstream pier, concrete surface erosion in the stanchion flashboard section, spalling at the base of a trash sluice wall, and a crack in the spillway gallery and found that the FERC inspections were effective in identifying aging effects on Vernon Dam. The above deficiencies were noted for continued monitoring by the Vernon Dam owner and during the continuing five-year FERC Dam inspections. None of these conditions are threatening structural support and, therefore, do not require immediate repair. However, the areas of degradation will continue to be monitored.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel and the dam’s owner to confirm that the operating experience did not reveal any degradation not bounded by industry experience.

During the audit and review, the staff found FERC letter dated August 6, 1997, which exempted the Vernon Hydroelectric Station (VHS) from the requirement of 18 CFR Part 12, Subpart D for submittal of an Independent Consultant’s Safety Inspections Report, based on its low hazard classification. The staff’s interpretation of the August 6, 1997, letter led it to assume that the dam owner still had to perform the Subpart D inspection but did not have to submit the report for FERC review and approval. For clarification, the FERC New York Regional Office was contacted. In its response to the staff on November 2, 2006, FERC stated:

> The intention of the letter issued on August 6, 1997... was to exempt the Vernon Project from all the requirements of Part 12, Subpart D of 18 CFR. This includes not only the requirement to submit a report but also the requirement of having the dam inspected by an Independent Consultant.

The staff also reviewed the applicant responses to RAI 3.6.2.2-N-08. In its letter date July 14, 2006, the applicant stated:

> Entergy, consistent with the Peach Bottom precedent, credited the [Federal Energy Regulatory Commission] FERC dam inspection program to manage the effects of aging on civil and structural elements of the VHS.

The applicant was asked in RAI 3.6.2.2-N-08-1 to describe specific reports, and describe any corrective actions that have been taken as a result of the inspection reports as they pertain to the VHS as required by 10 CFR 54.21(a)(3).

In it responses, the applicant indicated in a letter dated January 4, 2007, that it will add a plant-specific note, 505 to the applicable LRA Tables 3.5.2-1 through 3.5.2-6, which states:

> The Vernon dam is subject to the FERC inspection program. This program consists of inspections in accordance with FERC guidelines and complies with title 18 of the Code of Federal Regulations, Conservation of Power and Water Resources, Part 12 (Safety of Water Power Projects and Project Works) and Division of Dam Safety and Inspections Operating Manual. In accordance with FERC regulations, the owner has been granted an exemption from Part 12, Subpart D. As indicated in NUREG-1801 for water control structures, NRC has found that FERC / US Corp of Engineers dam inspections and maintenance programs are acceptable for aging management. In addition, Vernon dam personnel conduct a daily visual inspection of all the project facilities. An operations crew attends the plant daily. Vernon dam engineering staff performs an annual inspection of all the project structures and divers make a thorough inspection once every five years on both upstream and downstream sides.

The applicant also stated that since the Vernon Dam inspections are not part of a VYNPS aging managing program but are conducted by the dam's owner, the applicant deleted its Structures Monitoring – Vernon Dam FERC Inspection Program from the LRA.

Conclusion. The staff finds that the aging management for the Vernon Dam is performed by the owner of the VHS. In addition, inspections with reports are performed by the FERC New York Regional office. On the basis of its review of the operating experience and discussions with the applicant's technical personnel, the dam's owner, and the FERC New York Regional Office, the staff concludes that the FERC inspection program in addition to the daily visual inspections and the annual inspection conducted by Vernon Dam personnel will adequately manage the aging effects for the Vernon Dam.

The staff also finds the applicant's deletion of the Structures Monitoring – Vernon Dam FERC Inspection Program acceptable since the aging management is being performed by the dam owner.

3.0.3.3.7 Water Chemistry Control - Auxiliary Systems Program

Summary of Technical Information in the Application. LRA Section B.1.30.1 describes the Water Chemistry Control - Auxiliary Systems Program as an existing, plant-specific program.

The purpose of the Water Chemistry Control – Auxiliary Systems Program is to manage aging effects for components exposed to treated water. Program activities include sampling and analysis of stator cooling water and plant heating boiler systems and flushing of the John Deere diesel cooling water system.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.1.30.1 on the applicant's demonstration of the Water Chemistry Control - Auxiliary Systems Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff reviewed the Water Chemistry Control - Auxiliary Systems Program against the AMP elements found in the GALL Report, in SRP-LR Appendix A.1.2.3, and in SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 elements (i.e., “scope of the program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” “corrective actions,” “confirmation process,” “administrative controls,” and “operating experience”).

The applicant indicated that the “corrective actions,” “confirmation process,” and “administrative controls” program elements are parts of the site-controlled QA program. The staff's evaluation of the QA program is in SER Section 3.0.4. Evaluation of the remaining seven elements follows:

(1) Scope of Program - LRA Section B.1.30.1 states that program activities include sampling and analysis of stator cooling water and plant heating boiler systems, and flushing of the John Deere Diesel cooling water system.

The staff confirmed that the specific components for which the program manages aging effects are identified by the applicant, which satisfies the criterion as defined in SRP-LR Appendix A.1.2.3.1. On this basis, the staff finds that the applicant’s proposed program scope acceptable.

The staff confirmed that the “scope of the program” program element satisfies the recommendnation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions - LRA Section B.1.30.1 states that this program includes monitoring and control of stator cooling water and plant heating boiler FW to minimize exposure to aggressive environments and application of corrosion inhibitors to manage general, crevice, and pitting corrosion. John Deere Diesel cooling water chemistry is controlled to minimize exposure to aggressive environments by periodic flushing and replacement of the coolant and coolant conditioner.

The staff reviewed the applicant’s basis document, which stated that Cortrol OS 7700 and 50 percent Sodium Hydroxide were added as a corrosion inhibitor. Cortrol OS 7700 is added to boiler FW and contains an oxygen scavenger (hydroquinone) to reduce generalized corrosion, and a neutralized amine to minimize localized or pitting corrosion.

The staff confirmed that the existing chemistry activities and preventive actions taken by the applicant satisfies the criteria in SRP-LR Appendix A.1.2.3.2. The staff reviewed the applicant’s basis document, as documented in the Audit and Review Report, which stated that Cortrol OS 7700 and 50 percent Sodium Hydroxide were added as a corrosion inhibitor. Cortrol OS 7700 is added to boiler FW and contains an oxygen scavenger (hydroquinone) to reduce generalized corrosion, and a neutralized amine to minimize localized or pitting corrosion. On this basis, the staff finds that the applicant's preventive actions acceptable.

The staff confirmed that the “preventive actions” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B.1.30.1 states that in accordance with industry recommendations, stator cooling water and plant heating boiler FW parameters monitored include conductivity, corrosion products, and dissolved oxygen. The applicant also stated that the procedure will be enhanced (Commitment #26) to flush the John Deere Diesel generator cooling water system and replace the coolant and coolant conditioner every three (3) years.

The staff confirmed that the preventive actions program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.3. The staff reviewed the applicant’s basis documents, as documented in the Audit and Review Report, to determine that applicant’s monitoring schedule is adequate. The staff concludes that the dissolved oxygen, metals and conductivity are monitored per the surveillance schedule. On this basis, the staff finds that the applicant's description of the parameters monitored or inspected is acceptable.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B.1.30.1 states that this program manages loss of material for stator cooling water, plant heating boiler, and John Deere Diesel system components.

The applicant also stated in LRA Section B.1.30.1, that the One-Time Inspection Program describes inspections planned to verify the effectiveness of water chemistry control programs to ensure that significant degradation is not occurring and component intended function is maintained during the period of extended operation.

The staff confirmed that the detection of aging effects program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.3. The staff acknowledged that this is a mitigation program and does not provide for detection of any aging effects, such as loss of material and crack initiation and growth. The applicant’s One-time inspection program is to be undertaken to verify the effectiveness of the water chemistry program to ensure that significant degradation is not occurring. On this basis, the staff finds that the applicant's description of the detection of aging effects is acceptable.

The staff confirmed that the “detection of aging effects” program element satisfies the recommenndation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B.1.30.1 states that program values from analyses are archived for long-term trending and review.

The staff confirmed that this program element satisfies the criteria defined in SRP Section A.1.2.3.5. The staff reviewed procedure, as documented in the Audit and Review Report, to determine that applicant’s monitoring schedule is adequate. On the basis of its review, the staff concludes that the dissolved oxygen, metals and conductivity are monitored per the surveillance schedule. The staff determines the program was used to monitor chemistry content and any abnormal chemistry reported will be handled through CAP. On this basis, the staff finds the applicant’s monitoring and trending acceptable.

The staff confirmed that the “monitoring and trending” program element satisfies the recommenndation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B.1.30.1 states that acceptance criteria for chemistry parameters are in accordance with specific manufacturer’s recommendations and general guidelines provided in EPRI Report 1007820, “Revision 1 to TR-107396, Closed Cooling Water Chemistry Guidelines.”

The staff reviewed the acceptance criteria in the applicant’s program basis documents. The staff determines that the acceptance criteria for chemistry parameters are in accordance with specific manufacture’s recommendations and general guidelines provided in EPRI Report 1007820, “Revision 1 to TR-107396, Closed Cooling Water Chemistry Guidelines.” On this basis, the staff finds the applicant's acceptance criteria is acceptable.

The staff confirmed that this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.6. The staff reviewed the acceptance criteria in the applicant’s program basis documents, as documented in the Audit and Review Report. The staff determines that the acceptance criteria for chemistry parameters are in accordance with specific manufacture’s recommendations general guidelines provided in EPRI Report 1007820, “Revision 1 to TR-107396, Closed Cooling Water Chemistry Guidelines.” On this basis, the staff finds the applicant's acceptance criteria acceptable.

The staff confirmed that the “acceptance criteria” program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - LRA Section B.1.30.1 states that stator cooling water and house heating boiler sample results in 2004 and 2005 show parameters within acceptance criteria, proving that the program is effective for managing component loss of material, cracking, and fouling. A QA audit in 2003 revealed no issues or findings that could impact program effectiveness.

The staff reviewed the operating experience provided in the LRA, and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff finds that the

CAP, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the recommendation in the GALL Report and the criterion defined in SRP-LR Appendix A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.34, the applicant provided the UFSAR supplement for the Water Chemistry Control - Auxiliary Systems Program.

In addition, in a letter dated January 14, 2007, the applicant provided an amendment to its LRA to explicitly state, "One-Time Inspection Program," activities will conform the effectiveness of "Water Chemistry Control – Auxiliary Systems Program."

The applicant committed (Commitment #26) to enhance procedures to flush the John Deere Diesel Generator cooling water system and replace the coolant conditioner every three years by March 21, 2012.

The staff reviewed LRA Section A.2.1.34 and determined that, upon the implementation of Commitments #26, the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Water Chemistry Control - Auxiliary Systems Program with the addition of Commitment #26, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.8 Bolted Cable Connections Program

Summary of Technical Information in the Application. In a letter dated January 4, 2007, applicant revised its LRA. The applicant submitted its Appendix B, Section B.1.33, "Bolted Cable Connections Program." The applicant described, in the revised LRA that the Bolted Cable Connections Program is a plant-specific program. Cable connections are used to connect cable conductors to the cables or electrical devices. Connections associated with cables within the scope of license renewal are considered in this program. The most common types of connections used in the nuclear power plants are splices (butt or bolted), crimp-type ring lugs, connectors, and terminal blocks. Most connections involve insulting material and metallic parts. This AMP for electrical cable connections (metallic parts) accounts for loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. This program has been developed as an alternate to GALL AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirement." The applicant also stated that this program will be implemented prior to the period of extended operation.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information included in revised LRA Section B.1.33, regarding the applicant's demonstration of the Bolted Cable Connections Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The Audit and Review Report details the staff's audit evaluation of this AMP.

The staff reviewed the Bolted Cable Connections Program against the AMP elements finds in the GALL Report, SRP-LR Appendix A.1.2.3 and SRP-LR Table A.1-1, focusing its review on how the program manages aging effects through the effective incorporation of 10 elements (i.e., “scope of program,” “preventive actions,” “parameters monitored/inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” “corrective actions,” “confirmation process,” “administrative controls,” and “operating experience”). The staff’s evaluation of the 10 program element are provided below. The staff's evaluation of the applicant’s QA program is discussed in SER Section 3.0.4.

(1) Scope of Program - The applicant stated, in revised LRA, that this program applies to Non-Environmental qualification connections associated with cables in-scope of license renewal. This program does not include the high-voltage (>35 kV) switchyard connections. In-scope connections are evaluated for applicability of this program. The criteria for including connections in the program are that the connection is a bolted connection and is not covered in accordance with the Environmental Qualification Program or an existing preventive maintenance program.

    The staff determines that the specific commodity groups for which the program manages aging effects are identified (Non-environmental qualification bolted cable connections associated with cables in-scope of license renewal), which satisfies the criterion defined in SRP-LR Appendix A.1.2.3.1. The staff determines that the exclusion of high-voltage (>35 kV) switchyard connections, connections covered in accordance with the Environmental Qualification Program, and an existing preventive maintenance program, acceptable. Switchyard connections are addressed in SER Section 3.6.2.2. Environmental qualification cable connections are covered as required by 10 CFR 50.49. Cable connections in accordance with a preventive maintenance program are periodically inspected. On this basis, the staff finds that the applicant’s scope of program acceptable.

(2) Preventive Actions - The applicant stated, in the revised LRA, that this one-time inspection program is a condition monitoring program; therefore, no actions are taken as part of this program to prevent or mitigate aging degradation.

    The staff determines that the preventive actions program element satisfies the criteria defined in SRP-LR Appendix B.1.2.3.2. The staff finds it acceptable because this is a condition monitoring program and there is no need for preventive actions. On this basis, the staff finds the applicant’s preventive actions acceptable.

(3) Parameters Monitored/Inspected - The applicant stated, in the revised LRA, that this program will focus on the metallic parts of the cable connections. The one-time inspection verifies that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an issue that requires a periodic AMP.

The staff determines that the parameters monitored/inspected program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.3. Loosening (or high resistance) of bolted cable connections are the potential aging effects due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. The design of bolted cable connections usually account for the above stressors. The one-time inspection is to confirm that these stressors are not an issue that requires a periodic AMP. On this basis, the staff finds that the applicant's parameters monitored or inspected acceptable.

(4) Detection of Aging Effects - The applicant stated, in the revised LRA, that a representative sample of electrical connections within the scope of license renewal, are subject to an AMR and will be inspected or tested prior to the period of extended operation to verify there are no AERMs during the period of extended operation. The factors considered for sample selection will be application (medium and low voltage), circuit loading (high load), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selected is to be documented. Inspection methods may include thermography, contact resistance testing, or other appropriate methods including visual, based on plant configuration and industry guidance. The one-time inspection provides additional confirmation to support operating experience that shows electrical connections have not experienced a high degree of failures, and that existing installation and maintenance practices are effective.

The staff determines that this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.4. Thermography is used to detect aging effects of bolted cable connections due to thermal cycling, ohmic heating, electrical transients, and vibration. Contact resistance measurement is an appropriate inspection technique to detect high resistance of bolted cable connections due to chemical contamination, corrosion, and oxidation. Visual inspection is an alternative technique to thermography or measuring connection resistance of bolted connections that are covered with materials like heat shrink tape, sleeving, and insulating boots. The staff also determines that the proposed one-time inspection is acceptable because the design of these connections will account for the stresses associated with the above aging effects and one-time inspection is to confirm that these stressors/mechanisms should not be a significant aging issue. On this basis, the staff finds that the applicant's detection of aging effects acceptable.

(5) Monitoring and Trending - The applicant stated, in the revised LRA, that in this program, trending actions are not included as part of this program because this is a one-time inspection.

The staff determines that absence of trending for testing is acceptable, since the test is a one-time inspection and the ability to trend inspection results is limited by the available data. Furthermore, the staff did not see a need for such activities. On this basis, the staff finds the applicant’s monitoring and trending acceptable.

(6) Acceptance Criteria - The applicant stated, in the revised LRA, that the acceptance criteria for each inspection/surveillance are defined by the specific type of inspection or test performed for the specific type of cable connections. Acceptance criteria ensure that the intended functions of the cable connections can be maintained consistent with the CLB.

The staff determines that this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.6. The staff finds it acceptable on the basis that acceptance criteria for inspection/surveillance are defined by the specific type of inspection or test performed for the specific type of connection. The applicant will follow current industry standards which, when implemented, will ensure that the license renewal intended functions of the cable connections will be maintained consistent with the CLB.

(7) Corrective Actions - The adequacy of the applicant's 10 CFR 50, Appendix B Program associated with this program element was reviewed by the staff and is addressed in SER Section 3.0.4.

The staff reviewed other aspects of this program element to determine whether or not it satisfies the criteria defined in SRP-LR Appendix A.1.2.3.7. In the LRA, the applicant stated that corrective actions are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address corrective actions. On this basis, the staff finds that the applicant's description of the corrective actions is acceptable.

(8) Confirmation Process - The adequacy of the applicant's 10 CFR 50, Appendix B Program associated with this program element was reviewed by the staff and is addressed in SER Section 3.0.4.

The staff reviewed other aspects of this program element to determine whether or not it satisfies the criteria defined in SRP-LR Appendix A.1.2.3.8. In the LRA, the applicant stated that the confirmation process is part of the CAP. The CAP constitutes the confirmation process for AMPs and activities. On this basis, the staff finds that the applicant's description of the confirmation process is acceptable.

(9) Administrative Controls - The adequacy of the applicant's 10 CFR 50, Appendix B Program associated with this program element was reviewed by the staff and is addressed in SER Section 3.0.4.

The staff reviewed other aspects of this program element to determine whether or not it satisfies the criteria defined in SRP-LR Appendix A.1.2.3.9. In the LRA, the applicant stated that the administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The staff finds the requirements of 10 CFR Part 50, Appendix B acceptable to address administrative controls. On this basis, the staff finds that the applicant's description of the administrative controls is acceptable.

(10) Operating Experience - The applicant stated, in the revised LRA, that operating experience has shown that loosening of connections and corrosion of connections could be a problem without proper installation and maintenance activities. Industry operating experience supports performing this one-time inspection program in lieu of a periodic testing program. This one-time inspection program will verify that the installation and maintenance activities are effective.

To address NEI's concerns about the lack of operating experience to support GALL AMP XI.E6 (NEI's White Paper on GALL AMP XI.E6, dated September 5, 2006), the staff confirmed that there is little operating experience related to failed connections due to aging that have been identified and these operating experience do not support a periodic inspection as currently recommended in GALL AMP XI.E6. The staff finds that the proposed one-time inspection program will ensure that either aging of metallic cable connections is not occurring or existing preventive maintenance program is effective such that a periodic inspection program is not required.

On the basis of its review, the staff concludes that the applicant's Bolted Cable Connections Program will verify that aging of metallic cable connections is not occurring and the installation and maintenance activities are effective.

UFSAR Supplement. In revised LRA Section A.2.1.39, the applicant provided the UFSAR supplement for the Bolted Cable Connections Program. The applicant stated that its Bolted Cable Connections Program will focus on the metallic parts of the cable connections. This sampling program provides a one-time inspection to verify that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an aging issue that requires a periodic AMP. A representative sample of the electrical cable connection population subject to an AMR will be inspected or tested. Connections covered in accordance with the Environmental Qualification program, or connections inspected or tested as part of a preventive maintenance program are excluded from an AMR. The factors considered for sample selection will be application (medium and low voltage), circuit loading (high load), and location (high temperature, high humidity, vibration, etc.) The technical basis for the sample selected is to be documented. This program will be implemented prior to the period of extended operation.

The staff reviewed the UFSAR supplement, and determines that it provides a adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.4 Quality Assurance Program Attributes Integral to Aging Management Programs

Pursuant to 10 CFR 54.21(a)(3), the applicant is required to demonstrate that the effects of aging on SCs subject to an AMR will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation. SRP-LR, Branch Technical Position (BTP) RLSB-1, "Aging Management Review-Generic," describes ten elements of an acceptable AMP. Elements (7), (8), and (9) are associated with the QA activities of "corrective actions," "confirmation process," and "administrative controls." BTP RLSB-1 Table A.1-1, "Elements of an Aging Management Program for License Renewal," provides the following description of these program elements:

(7) Corrective Actions – Corrective actions, including root cause determination and prevention of recurrence, should be timely.

(8) Confirmation Process – The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.

(9) Administrative Controls – Administrative controls should provide a formal review and approval process.

Those aspects of the AMP that affect the quality of safety-related SSCs and are subject to the QA requirements of 10 CFR Part 50, Appendix B are noted in SRP-LR, BTP IQMB-1, "Quality Assurance for Aging Management Programs." Additionally, for non-safety-related SCs subject to an AMR, the existing 10 CFR Part 50 Appendix B QA program may be used by the applicant to address the elements of corrective action, confirmation process, and administrative control. BTP IQMB-1 provides the following guidance with regard to the QA attributes of AMPs:

- Safety-related SCs are subject to 10 CFR Part 50 Appendix B requirements which are adequate to address all quality-related aspects of an AMP consistent with the CLB of the facility for the period of extended operation.

- For non-safety-related SCs that are subject to an AMR, an applicant has an option to expand the scope of its 10 CFR Part 50 Appendix B program to include these SCs to address corrective action, confirmation process, and administrative control for aging management during the period of extended operation. In this case, the applicant should document such commitment in the UFSAR supplement in accordance with 10 CFR 54.21(d).

3.0.4.1 Summary of Technical Information in the Application

In LRA Sections A.2.1, “Aging Management Programs and Activities,” and B.0.3, “VYNPS Corrective Actions, Confirmation Process and Administrative Controls,” the applicant described the elements of corrective action, confirmation process, and administrative controls that are applied to the AMPs for both safety-related and nonsafety-related components. A single QA Program is used which includes the elements of corrective action, confirmation process, and administrative controls. Corrective actions, confirmation, and administrative controls are applied in accordance with the CAP regardless of the safety classification of the components. Specifically, in LRA Sections A.2.1 and B.0.3, respectively, the applicant stated that the QA Program implements the requirements of 10 CFR 50, Appendix B, and is consistent with NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants.”

LRA Section B.1, “Aging Management Review Results,” provided an AMR summary for each unique component type or commodity group determined to require aging management during the period of extended operation.

3.0.4.2 Staff Evaluation

Pursuant to 10 CFR 54.21(a)(3), an applicant is required to demonstrate that the effects of aging on SCs subject to an AMR will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation. NUREG-1800, BTP RLSB-1, “Aging Management Review - Generic,” describes ten attributes of an acceptable AMP. Three of these ten attributes are associated with the QA activities of corrective action, confirmation process, and administrative control. BTP RLSB-1, Table A.1-1, “Elements of an Aging Management Program for License Renewal,” provides the following description of these quality attributes:

> corrective actions, including root cause determination and prevention of recurrence, should be timely;
>
> the confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective; and,
>
> administrative controls should provide a formal review and approval process.

NUREG-1800, BTP IQMB-1 noted that those aspects of the AMP that affect quality of safety-related SSCs are subject to the QA requirements of Appendix B to 10 CFR Part 50. Additionally, for nonsafety-related SCs subject to an AMR, the applicant's existing Appendix B to 10 CFR Part 50 QA program may be used to address the elements of corrective action, confirmation process, and administrative control. BTP IQMB-1 provides the following guidance with regard to the QA attributes of AMPs:

> Safety-related SCs are subject to Appendix B to 10 CFR Part 50 requirements which are adequate to address all quality-related aspects of an AMP consistent with the CLB of the facility for the period of extended operation. For nonsafety-related SCs that are subject to an AMR for license renewal, an applicant has an option to expand the scope of its

> Appendix B to 10 CFR Part 50 program to include these SCs to address corrective action, confirmation process, and administrative control for aging management during the period of extended operation. In this case, the applicant should document such a commitment in the Final Safety Analysis Report (FSAR) supplement in accordance with 10 CFR 54.21(d).

The staff reviewed the applicant's AMPs described in LRA Appendix A, Section A.2.1, Appendix B, Sections B.0.3 and B.1, and in applicant's AMP evaluation reports. The purpose of this review was to ensure consistency in the use of the QA attributes for each program and that aging management activities were consistent with the staff's guidance described in NUREG-1800, BTP IQMB-1.

During the review of the LRA and AMP evaluation reports, the staff identified inconsistencies associated with corrective action, confirmation, and administrative control processes regarding the AMP for the VHS structural components. LRA Section B.1.27 and the AMP evaluation reports stated that the AMP was consistent with NUREG-1801 in that the applicants CAP was applicable to the VHS. When discussing this AMP with the applicant, the applicant stated that it did not own the VHS and that its CAP did not apply to VHS as indicated in the LRA and AMP evaluation reports. Additionally, the staff found that AMP evaluation reports did not consistently describe the application of the 10 CFR Part 50, Appendix B, QA Program for the corrective action, confirmation process, and administrative control attributes for each AMP.

In RAI 3.0-1, dated July 10, 2006, the staff requested that the applicant clarify its use of the 10 CFR Part 50, Appendix B, QA Program for corrective action, confirmation process, and administrative controls, and to supplement the LRA, as necessary, to clearly indicate the application of the QA Program, or an alternative for the corrective action, confirmation, and administrative control process attributes for each AMP.

In its responses, by letters dated July 14, 2006, August 10, 2006, October 20, 2006, and January 4, 2007, the applicant further described the application of the VYNPS 10 CFR Part 50, Appendix B, QA Program for corrective action, confirmation process, and administrative controls, and provided a revision to the UFSAR Supplement. The revision stated, in part:

> The corrective action, confirmation process, and administrative controls of the ENTERGY (10 CFR Part 50, Appendix B) Quality Assurance Program are applicable to all aging management programs that will be required during the period of extended operation, with the exception of the Vernon Dam FERC inspection.

With respect to the VHS, the applicant stated, in part, that although the VHS is not under the VYNPS QA program, any issues identified with respect to the availability of the VHS to perform its LR intended function will require invoking the VYNPS QA program. The VHS civil and structural elements will be managed through the continued use of the FERC dam inspection program, and the pertinent electrical system elements will be managed through a combination of VYNPS AMPs and the inspection and periodic maintenance processes of the owner/operator. In the event that any of these processes identify a condition which indicates the VHS is incapable of performing its LR intended function, this will require entry into the VYNPS corrective action program (in accordance with the VYNPS Technical Specifications) and therefore invokes the associated elements of the VYNPS QA program. Additionally, the applicant monitors the availability of the VHS to ensure continued ability to perform its LR intended function, through conformance with the availability specified in the NUMARC 87-00 for meeting the requirements of the SBO rule, and will invoke the VYNPS Corrective Action program if those requirements cannot be maintained.

The staff has reviewed the applicant's responses to this RAI and concluded that the applicant has adequately addressed the staff's concerns associated with implementation of the VYNPS 10 CFR Appendix B Quality Assurance Program with respect to the VYNPS AMPs and the VHS. Therefore, the staff's concern described in RAI 3.0-1 is resolved.

3.0.4.3 Conclusion

On the basis of the staff's evaluation, the descriptions and applicability of the plant-specific AMPs and their associated quality attributes provided in LRA Appendix A, Section A.2.1, and Appendix B, Sections B.0.3 and B.1, and the RAI response, are consistent with the staff's position regarding QA for aging management. The staff concludes that the QA attributes (corrective action, confirmation process, and administrative control) of the applicant's AMPs are consistent with the requirements of 10 CFR 54.21(a)(3).

3.1 Aging Management of Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant System

This section of the SER documents the staff's review of the applicant's AMR results for the reactor vessel, reactor vessel internals, and reactor coolant system components and component groups of:

- reactor vessel
- reactor vessel internals
- reactor coolant pressure boundary

3.1.1 Summary of Technical Information in the Application

LRA Section 3.1 provides AMR results for the reactor vessel, reactor vessel internals, and reactor coolant system components and component groups. LRA Table 3.1.1, "Summary of Aging Management Evaluations for the Reactor Coolant System," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the reactor vessel, reactor vessel internals, and reactor coolant system components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.1.2 Staff Evaluation

The staff reviewed LRA Section 3.1 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the reactor vessel, reactor vessel internals, and reactor coolant system components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.1.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Appendix 3.1.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.1.2.2.

The staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.1.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the reactor vessel, internals and reactor coolant system components.

Table 3.1-1 summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.1 and addressed in the GALL Report.

Table 3.1-1 Staff Evaluation for Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant System Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel pressure vessel support skirt and attachment welds (3.1.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	Fatigue is a TLAA.(See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor vessel components: flanges; nozzles; penetrations; safe ends; thermal sleeves; vessel shells, heads and welds (3.1.1-2)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	TLAA	Fatigue is a TLAA.(See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy RCPB piping, piping components, and piping elements exposed to reactor coolant (3.1.1-3)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	TLAA	Fatigue is a TLAA. (See SER Section 3.1.2.2.1)
Steel pump and valve closure bolting (3.1.1-4)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) check Code limits for allowable cycles (less than 7000 cycles) of thermal stress range	TLAA	Fatigue is a TLAA. (See SER Section 3.1.2.2.1)
Stainless steel and nickel alloy reactor vessel internals components (3.1.1-5)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	Fatigue is a TLAA. (See SER Section 3.1.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nickel alloy tubes and sleeves in a reactor coolant and secondary FW/steam environment (3.1.1-6)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	None	Not applicable to BWRs
Steel and stainless steel RCPB closure bolting, head closure studs, support skirts and attachment welds, pressurizer relief tank components, steam generator components, piping and components external surfaces and bolting (3.1.1-7)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	None	Not applicable to BWRs
Steel; stainless steel; and nickel-alloy RCPB piping, piping components, piping elements; flanges; nozzles and safe ends; pressurizer vessel shell heads and welds; heater sheaths and sleeves; penetrations; and thermal sleeves (3.1.1-8)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	None	Not applicable to BWRs
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor vessel components: flanges; nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds (3.1.1-9)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy steam generator components (flanges; penetrations; nozzles; safe ends, lower heads and welds) (3.1.1-10)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	None	Not applicable to BWRs
Steel top head enclosure (without cladding) top head nozzles (vent, top head spray or reactor core isolation cooling, and spare) exposed to reactor coolant (3.1.1-11)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21); Inservice Inspection Program (B.1.15.2)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.1.2.1.1 and 3.1.2.2.2)
Steel steam generator shell assembly exposed to secondary FW and steam (3.1.1-12)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	None	Not applicable to BWRs
Steel and stainless steel isolation condenser components exposed to reactor coolant (3.1.1-13)	Loss of material due to general (steel only), pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21); Inservice Inspection Program (B.1.15.2)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.1.2.1.2 and 3.1.2.2.2)
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 (3.1.1-14)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21); Inservice Inspection Program (B.1.15.2); BWR Vessels Internals Program (B.1.7)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.1.2.1.3. and 3.1.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy RCPB components exposed to reactor coolant (3.1.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21); Inservice Inspection Program (B.1.15.2)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.1.2.1.4 and 3.1.2.2.2)
Steel steam generator upper and lower shell and transition cone exposed to secondary FW and steam (3.1.1-16)	Loss of material due to general, pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry and, for Westinghouse Model 44 and 51 S/G, if general and pitting corrosion of the shell is known to exist, additional inspection procedures are to be developed.	None	Not applicable to BWRs
Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds (3.1.1-17)	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations.	TLAA	Loss of fracture toughness is a TLAA (See SER Section 3.1.2.1.5)
Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles (3.1.1-18)	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program (B.1.24)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.3)
Stainless steel and nickel alloy top head enclosure vessel flange leak detection line (3.1.1-19)	Cracking due to SCC and IGSCC	A plant-specific AMP is to be evaluated.	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel isolation condenser components exposed to reactor coolant (3.1.1-20)	Cracking due to SCC and IGSCC	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and plant-specific verification program	None	Not applicable (See SER Section 3.1.2.2.4)
Reactor vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process (3.1.1-21)	Crack growth due to cyclic loading	TLAA	None	Not applicable to BWRs
Stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux (3.1.1-22)	Loss of fracture toughness due to neutron irradiation embrittlement, void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	None	Not applicable to BWRs
Stainless steel reactor vessel closure head flange leak detection line and bottom-mounted instrument guide tubes (3.1.1-23)	Cracking due to SCC	A plant-specific AMP is to be evaluated.	None	Not applicable to BWRs
Class 1 CASS piping, piping components, and piping elements exposed to reactor coolant (3.1.1-24)	Cracking due to SCC	Water Chemistry and, for CASS components that do not meet the NUREG-0313 guidelines, a plant-specific AMP	None	Not applicable to BWRs
Stainless steel jet pump sensing line (3.1.1-25)	Cracking due to cyclic loading	A plant-specific AMP is to be evaluated.	None	Not applicable (See SER Section 3.1.2.2.8 and 3.1.2.3.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel and stainless steel isolation condenser components exposed to reactor coolant (3.1.1-26)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD) and plant-specific verification program	None	Not applicable (See SER Section 3.1.2.2.8)
Stainless steel and nickel alloy reactor vessel internals screws, bolts, tie rods, and hold-down springs (3.1.1-27)	Loss of preload due to stress relaxation	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	None	Not applicable to BWRs
Steel steam generator FW impingement plate and support exposed to secondary FW (3.1.1-28)	Loss of material due to erosion	A plant-specific AMP is to be evaluated.	None	Not applicable to BWRs
Stainless steel steam dryers exposed to reactor coolant (3.1.1-29)	Cracking due to flow-induced vibration	A plant-specific AMP is to be evaluated.	BWR Vessel Internals Program (B.1.7)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.1.2.1.6 and 3.1.2.2.11)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel reactor vessel internals components (e.g., upper internals assembly, rod cluster control assembly guide tube assemblies, baffle/former assembly, lower internal assembly, shroud assemblies, plenum cover and plenum cylinder, upper grid assembly, control rod guide tube assembly, core support shield assembly, core barrel assembly, lower grid assembly, flow distributor assembly, thermal shield, instrumentation support structures) (3.1.1-30)	Cracking due to SCC, irradiation-assisted SCC	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	None	Not applicable to BWRs
Nickel alloy and steel with nickel-alloy cladding piping, piping component, piping elements, penetrations, nozzles, safe ends, and welds (other than reactor vessel head); pressurizer heater sheaths, sleeves, diaphragm plate, manways and flanges; core support pads/core guide lugs (3.1.1-31)	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and FSAR supp commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins, and GLs associated with nickel alloys and (2) staff-accepted industry guidelines.	None	Not applicable to BWRs
Steel steam generator FW inlet ring and supports (3.1.1-32)	Wall thinning due to flow-accelerated corrosion	A plant-specific AMP is to be evaluated.	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and nickel alloy reactor vessel internals components (3.1.1-33)	Changes in dimensions due to void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	None	Not applicable to BWRs
Stainless steel and nickel alloy reactor CRD head penetration pressure housings (3.1.1-34)	Cracking due to SCC and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and GLs and (2) staff-accepted industry guidelines.	None	Not applicable to BWRs
Steel with stainless steel or nickel alloy cladding primary side components; steam generator upper and lower heads, tubesheets and tube-to-tube sheet welds (3.1.1-35)	Cracking due to SCC and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and GLs and (2) staff-accepted industry guidelines.	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nickel alloy, stainless steel pressurizer spray head (3.1.1-36)	Cracking due to SCC and primary water stress corrosion cracking	Water Chemistry and One-Time Inspection and, for nickel alloy welded spray heads, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and GLs and (2) staff-accepted industry guidelines.	None	Not applicable to BWRs
Stainless steel and nickel alloy reactor vessel internals components (e.g., upper internals assembly, rod cluster control assembly guide tube assemblies, lower internal assembly, CEA shroud assemblies, core shroud assembly, core support shield assembly, core barrel assembly, lower grid assembly, flow distributor assembly) (3.1.1-37)	Cracking due to SCC, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	None	Not applicable to BWRs
Steel (with or without stainless steel cladding) CRD return line nozzles exposed to reactor coolant (3.1.1-38)	Cracking due to cyclic loading	BWR CR Drive Return Line Nozzle	BWR CRD Return Line Nozzle Program (B.1.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Steel (with or without stainless steel cladding) FW nozzles exposed to reactor coolant (3.1.1-39)	Cracking due to cyclic loading	BWR Feedwater Nozzle	BWR Feedwater Nozzle Program (B.1.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and nickel alloy penetrations for CRD stub tubes instrumentation, jet pump instrumentation, standby liquid control, flux monitor, and drain line exposed to reactor coolant (3.1.1-40)	Cracking due to SCC, IGSCC, cyclic loading	BWR Penetrations and Water Chemistry	Water Chemistry Control-BWR (B.1.30.2); BWR Penetrations Program (B.1.4); BWR Vessel Internals (B.1.7); Inservice Inspection Program (B.1.15.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.7)
Stainless steel and nickel alloy piping, piping components, and piping elements greater than or equal to 4 inches NPS; nozzle safe ends and associated welds (3.1.1-41)	Cracking due to SCC and IGSCC	BWR Stress Corrosion Cracking and Water Chemistry	BWR Stress Corrosion Cracking Program (B.1.5); Water Chemistry Control-BWR Program (B.1.30.2); Inservice Inspection Program (B.1.15.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.8)
Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant (3.1.1-42)	Cracking due to SCC and IGSCC	BWR Vessel ID Attachment Welds and Water Chemistry	BWR Vessel ID Attachment Welds Program (B.1.6); Water Chemistry Control-BWR Program (B.1.30.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Stainless steel fuel supports and CRD assemblies CRD housing exposed to reactor coolant (3.1.1-43)	Cracking due to SCC and IGSCC	BWR Vessel Internals and Water Chemistry	BWR Vessel Internals Program (B.1.7); Water Chemistry Control-BWR Program (B.1.30.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Stainless steel and nickel alloy core shroud, core plate, core plate bolts, support structure, top guide, CS lines, spargers, jet pump assemblies, CRD housing, nuclear instrumentation guide tubes (3.1.1-44)	Cracking due to SCC, IGSCC, irradiation-assisted stress corrosion cracking	BWR Vessel Internals and Water Chemistry	BWR Vessel Internals Program (B.1.7); Water Chemistry Control-BWR Program (B.1.30.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.9)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to reactor coolant (3.1.1-45)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion Program (B.1.13)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Nickel alloy core shroud and core plate access hole cover (mechanical covers) (3.1.1-46)	Cracking due to SCC, IGSCC, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	None	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.3.4
Stainless steel and nickel-alloy reactor vessel internals exposed to reactor coolant (3.1.1-47)	Loss of material due to pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	One-Time Inspection Program (B.1.15.2); Water Chemistry Control-BWR Program (B.1.30.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.10)
Steel and stainless steel Class 1 piping, fittings and branch connections < 4 inches NPS exposed to reactor coolant (3.1.1-48)	Cracking due to SCC, IGSCC (for stainless steel only), and thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	Inservice Inspection Program (B.1.15.2); One-Time Inspection Program (B.1.21); Water Chemistry Control-BWR Program (B.1.30.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.11)
Nickel alloy core shroud and core plate access hole cover (welded covers) (3.1.1-49)	Cracking due to SCC, IGSCC, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and, for BWRs with a crevice in the access hole covers, augmented inspection using UT or other demonstrated acceptable inspection of the access hole cover welds	BWR Vessel Internals Program (B.1.7); Water Chemistry Control-BWR Program (B.1.30.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.12)
High-strength low alloy steel top head closure studs and nuts exposed to air with reactor coolant leakage (3.1.1-50)	Cracking due to SCC and IGSCC	Reactor Head Closure Studs	Reactor Head Closure Studs Program (B.1.23); Inservice Inspection Program (B.1.15.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.13)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
CASS jet pump assembly castings; orificed fuel support (3.1.1-51)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	Thermal Aging and Neutron Irradiation Embrittlement of CASS Program (B.1.29)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Steel and stainless steel RCPB pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems (3.1.1-52)	Cracking due to SCC, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	Bolting Integrity Program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.14)
Steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.1.1-53)	Loss of material due to general, pitting and crevice corrosion	Closed-Cycle Cooling Water System	None	Not applicable. (There are no steel components of the Class 1 reactor vessel, vessel internals or RCPB exposed to closed cycle cooling water.) (See SER Section 3.1.2.3.4)
Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water (3.1.1-54)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	None	Not applicable. (There are no copper alloy components of the Class 1 reactor vessel, vessel internals or RCPB exposed to closed cycle cooling water.) (See SER Section 3.1.2.3.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
CASS Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant > 250°C (> 482°F) (3.1.1-55)	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection (IWB, IWC, and IWD). Thermal aging susceptibility screening is not necessary, inservice inspection requirements are sufficient for managing these aging effects. ASME Code Case N-481 also provides an alternative for pump casings.	Inservice Inspection Program (B.1.15.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.15)
Copper alloy > 15 percent Zn piping, piping components, and piping elements exposed to closed cycle cooling water (3.1.1-56)	Loss of material due to selective leaching	Selective Leaching of Materials	None	Not applicable (There are no steel components of the Class 1 reactor vessel, vessel internals or RCPB exposed to closed cycle cooling water.) (See SER Section 3.1.2.3.4)
CASS Class 1 piping, piping component, and piping elements and CRD pressure housings exposed to reactor coolant > 250°C (> 482°F) (3.1.1-57)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	One-Time Inspection Program (B.1.21)	(See SER Section 3.1.2.1.16)
Steel RCPB external surfaces exposed to air with borated water leakage (3.1.1-58)	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	None	Not applicable to BWRs
Steel steam generator steam nozzle and safe end, FW nozzle and safe end, auxiliary feedwater nozzles and safe ends exposed to secondary FW/steam (3.1.1-59)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel flux thimble tubes (with or without chrome plating) (3.1.1-60)	Loss of material due to Wear	Flux Thimble Tube Inspection	None	Not applicable to BWRs
Stainless steel, steel pressurizer integral support exposed to air with metal temperature up to 288°C (550°F) (3.1.1-61)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD)	None	Not applicable to BWRs
Stainless steel, steel with stainless steel cladding reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings exposed to reactor coolant (3.1.1-62)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD)	None	Not applicable to BWRs
Steel reactor vessel flange, stainless steel and nickel alloy reactor vessel internals exposed to reactor coolant (e.g., upper and lower internals assembly, CEA shroud assembly, core support barrel, upper grid assembly, core support shield assembly, lower grid assembly) (3.1.1-63)	Loss of material due to Wear	Inservice Inspection (IWB, IWC, and IWD)	None	Not applicable to BWRs
Stainless steel and steel with stainless steel or nickel alloy cladding pressurizer components (3.1.1-64)	Cracking due to SCC, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nickel alloy reactor vessel upper head and CRD penetration nozzles, instrument tubes, head vent pipe (top head), and welds (3.1.1-65)	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	None	Not applicable to BWRs
Steel steam generator secondary manways and handholds (cover only) exposed to air with leaking secondary-side water and/or steam (3.1.1-66)	Loss of material due to erosion	Inservice Inspection (IWB, IWC, and IWD) for Class 2 components	None	Not applicable to BWRs
Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant (3.1.1-67)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	None	Not applicable to BWRs
Stainless steel, steel with stainless steel cladding Class 1 piping, fittings, pump casings, valve bodies, nozzles, safe ends, manways, flanges, CRD housing; pressurizer heater sheaths, sleeves, diaphragm plate; pressurizer relief tank components, reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings (3.1.1-68)	Cracking due to SCC	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel, nickel alloy safety injection nozzles, safe ends, and associated welds and buttering exposed to reactor coolant (3.1.1-69)	Cracking due to SCC, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	None	Not applicable to BWRs
Stainless steel; steel with stainless steel cladding Class 1 piping, fittings and branch connections < 4 inches NPS exposed to reactor coolant (3.1.1-70)	Cracking due to SCC, thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	None	Not applicable to BWRs
High-strength low alloy steel closure head stud assembly exposed to air with reactor coolant leakage (3.1.1-71)	Cracking due to SCC; loss of material due to wear	Reactor Head Closure Studs	None	Not applicable to BWRs
Nickel alloy steam generator tubes and sleeves exposed to secondary FW/steam (3.1.1-72)	Cracking due to OD SCC and intergranular attack, loss of material due to fretting and wear	Steam Generator Tube Integrity and Water Chemistry	None	Not applicable to BWRs
Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant (3.1.1-73)	Cracking due to primary water stress corrosion cracking	Steam Generator Tube Integrity and Water Chemistry	None	Not applicable to BWRs
Chrome plated steel, stainless steel, nickel alloy steam generator anti-vibration bars exposed to secondary FW/steam (3.1.1-74)	Cracking due to SCC, loss of material due to crevice corrosion and fretting	Steam Generator Tube Integrity and Water Chemistry	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nickel alloy once-through steam generator tubes exposed to secondary FW/steam (3.1.1-75)	Denting due to corrosion of carbon steel tube support plate	Steam Generator Tube Integrity and Water Chemistry	None	Not applicable to BWRs
Steel steam generator tube support plate, tube bundle wrapper exposed to secondary FW/steam (3.1.1-76)	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Steam Generator Tube Integrity and Water Chemistry	None	Not applicable to BWRs
Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary FW/steam (3.1.1-77)	Loss of material due to wastage and pitting corrosion	Steam Generator Tube Integrity and Water Chemistry	None	Not applicable to BWRs
Steel steam generator tube support lattice bars exposed to secondary FW/steam (3.1.1-78)	Wall thinning due to flow-accelerated corrosion	Steam Generator Tube Integrity and Water Chemistry	None	Not applicable to BWRs
Nickel alloy steam generator tubes exposed to secondary FW/steam (3.1.1-79)	Denting due to corrosion of steel tube support plate	Steam Generator Tube Integrity; Water Chemistry and, for plants that could experience denting at the upper support plates, evaluate potential for rapidly propagating cracks and then develop and take corrective actions consistent with Bulletin 88-02.	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
CASS reactor vessel internals (e.g., upper internals assembly, lower internal assembly, CEA shroud assemblies, control rod guide tube assembly, core support shield assembly, lower grid assembly) (3.1.1-80)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	None	Not applicable to BWRs
Nickel alloy or nickel-alloy clad steam generator divider plate exposed to reactor coolant (3.1.1-81)	Cracking due to primary water stress corrosion cracking	Water Chemistry	None	Not applicable to BWRs
Stainless steel steam generator primary side divider plate exposed to reactor coolant (3.1.1-82)	Cracking due to SCC	Water Chemistry	None	Not applicable to BWRs
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor vessel internals and RCPB components exposed to reactor coolant (3.1.1-83)	Loss of material due to pitting and crevice corrosion	Water Chemistry	None	Not applicable to BWRs
Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary FW/steam (3.1.1-84)	Cracking due to SCC	Water Chemistry and One-Time Inspection or Inservice Inspection (IWB, IWC, and IWD).	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.1.1-85)	None	None	None	Consistent with GALL Report (See SER Section 3.1.2.1)
Stainless steel piping, piping components, and piping elements exposed to air - indoor uncontrolled (External); air with borated water leakage; concrete; gas (3.1.1-86)	None	None	None	Consistent with GALL Report (See SER Section 3.1.2.1)
Steel piping, piping components, and piping elements in concrete (3.1.1-87)	None	None	None	Not applicable (There are no components of the Class 1 reactor vessel, vessel internals or RCPB exposed to concrete.)

The staff's review of the reactor vessel, reactor vessel internals, and reactor coolant system component groups followed any one of several approaches. One approach, documented in SER Section 3.1.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.1.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.1.2.3, reviewed AMR results for components that the applicant indicated are not consistent with or not addressed in the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the reactor vessel, reactor vessel internals, and reactor coolant system components is documented in SER Section 3.0.3.

3.1.2.1 AMR Results Consistent with the GALL Report

Summary of Technical Information in the Application. LRA Section 3.1.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the reactor vessel, reactor vessel internals, and reactor coolant system components:

- BWR Control Rod Drive Return Line Nozzle Program
- BWR Feedwater Nozzle Program
- BWR Penetrations Program
- BWR Stress Corrosion Cracking Program

- BWR Vessel Inside Diameter Attachment Welds Program
- BWR Vessel Internals Program
- Flow-Accelerated Corrosion Program
- Inservice Inspection Program
- One-Time Inspection Program
- Reactor Head Closure Studs Program
- Reactor Vessel Surveillance Program
- System Walkdown Program
- Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program
- Water Chemistry Control - BWR Program
- Water Chemistry Control - Closed Cooling Water Program

Staff Evaluation. LRA Tables 3.1.2-1 through 3.1.2-3 summarize AMRs for the reactor vessel, reactor vessel internals, and reactor coolant system components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determines whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determines whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determines whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determines whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.
The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the reactor vessel, reactor vessel internals, and reactor coolant system components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.1.1, the applicant's references to the GALL Report are acceptable and no further staff review is required.

3.1.2.1.1 Loss of Material Due to General, Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.1.1, Item 3.1.1-11, the applicant stated that the Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in carbon steel components of the reactor vessel. The Inservice Inspection Program supplements the applicant's Water Chemistry Control-BWR Program for components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in LRA Tables 3.1.2-1 to 3.1.2-3. The staff reviewed the applicant's Water Chemistry Control – BWR Program, One-Time Inspection Program, and Inservice Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11, 3.0.3.1.6, and 3.0.3.3.3, respectively. The staff found each program acceptable.

During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.1.1, Item 3.1.1-11 in the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore is acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.1.2 Loss of Material Due to General (Steel Only), Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.1.1, Item 3.1.1-13, the applicant stated that Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in carbon steel components of the reactor vessel. The Inservice Inspection Program supplements the applicant's Water Chemistry Control-BWR Program for certain of these components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in LRA Tables 3.1.2-1 to 3.1.2-3. The staff reviewed the applicant's Water Chemistry Control – BWR Program, One-Time Inspection Program, and Inservice Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11, 3.0.3.1.6, and 3.0.3.3.3, respectively. The staff found each program acceptable.

During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.1.1, Item 3.1.1-13 in the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore is acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.3 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.1.1, Item 3.1.1-14, the applicant stated that the Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in carbon steel components of the reactor vessel. Either the Inservice Inspection Program or the BWR Vessel Internals Program supplements the applicant's Water Chemistry Control-BWR Program for certain of these components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in LRA Tables 3.1.2-1 to 3.1.2-3. The staff reviewed the applicant's Water Chemistry Control – BWR Program, One-Time Inspection Program, Inservice Inspection Program, and BWR Vessel Internals Program. These evaluations are documented in SER Sections 3.0.3.1.11, 3.0.3.1.6, 3.0.3.3.3, and 3.0.3.2.7, respectively. The staff found each program acceptable.

During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.1.1, Item 3.1.1-14 in the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore is acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.4 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.1.1, Item 3.1.1-15, the applicant stated that the Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in carbon steel components of the reactor vessel. The Inservice Inspection Program supplements the applicant's Water Chemistry Control-BWR Program for certain of these components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified. The staff reviewed the applicant's Water Chemistry Control – BWR Program, One-Time Inspection Program, and Inservice Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11, 3.0.3.1.6, and 3.0.3.3.3, respectively. The staff found each program acceptable.

During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.1.1, Item 3.1.1-15 in the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore is acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.5 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

In the discussion column of LRA Table 3.1.1, Item 3.1.1-17, the applicant stated that loss of fracture toughness for the reactor vessel beltline shell and welds is a TLAA.

During the audit and review, the staff noted that the applicant's controlling documentation for materials in the nozzles leading to the vessel lacked sufficient calculations and accountability for errors. According to Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," analytic uncertainty is to be considered in the calculation of fluence. The staff further noted that in the applicant's NSSS supplier document, GE-NE-000-0007-2342-R1-NP (dated July 2003), "Entergy Northeast Vermont Yankee Neutron

Flux Evaluation," flux variations of up to but less than 19 percent were considered. During the audit and review, the applicant provided extrapolated data for determining if the top of the recirculation inlet nozzles might experience an extended power uprate fluence of greater than $1X10^{17}$ n/cm^2.

In RAI 3.1.1-17-P-01, the staff asked the applicant if a maximum variation of approximately 19 percent was considered in this extrapolated data. If not, what calculated fluence level that could be experienced by the top of the recirculation inlet nozzles if the applicant considered a maximum flux variation of just less than 19 percent.

In its response, by letter dated September 5, 2006, the applicant stated that a 19 percent uncertainty was not added to the fluence value in determining whether the nozzle (nozzle to vessel weld) would exceed $1X10^{17}$ n/cm^2 (e>1mev). The applicant further stated that the fluence was extrapolated to determine the height at which fluence would equal 1 $x10^{17}$ n/cm^2 rather than to specifically estimate the fluence at the nozzle.

The applicant also stated that the projected fluence in this region changes rapidly with elevation. The projected 1/4 T fluence at the bottom of the active fuel is 0.985 $X10^{17}$ n/cm^2, and 5.5 inches lower, at the nozzle to vessel weld, the estimated fluence is 0.66 $X10^{17}$ n/cm^2. The applicant stated that if the fluence is increased by 19 percent to cover possible error in the analysis, the fluence at the nozzle to vessel weld would be 0.792 $X10^{17}$ n/cm^2. Therefore, the recirculation injection nozzles, and their welds, remain below the $1X10^{17}$ n/cm^2 threshold for the period of extended operation.

The staff reviewed the GE fluence calculations, GE-NE-000-0007-2342-R1-NP, in conjunction with RAI 4.2-1. The staff's evaluation of this TLAA is documented in SER Section 4.2. The staff found the applicant's response acceptable because the applicant used up to 19 percent flux variations in its fluence calculation. The staff's concern described in RAI 3.3.1-17-P-01 is resolved.

3.1.2.1.6 Cracking Due to Flow-Induced Vibration

In the discussion column of LRA Table 3.1.1, Item 3.1.1-29, the applicant stated that the BWR Vessel Internals Program will manage cracking in the stainless steel steam dryers.

During the audit and review, the staff asked the applicant for additional information on the AMP. VYNPS technical personnel stated that a steam dryer monitoring plan had been submitted as part of the power uprate application and approved by the staff. In addition, BWRVIP-139, "Steam Dryer Inspection and Flaw Evaluation Guidelines," has been submitted to the NRC for review and approval. It is expected that this BWRVIP will be approved by the NRC prior to the period of extended operation and as such will become a part of the BWR Vessel Internals Program. VYNPS will manage cracking of the steam dryers per the BWR Vessel Internals Program during the period of extended operation. Exceptions, if any, will be subject to review and approval by the staff.

The staff finds that since the applicant committed (Commitment #37) to implement BWRVIP-139 as approved by the staff, if the staff does approve BWRVIP-139, this aging effect/mechanism will be adequately managed as recommended by the GALL Report. If the staff does not issue an SER approving the use of BWRVIP-139, a plant-specific program must be submitted at least 24 months prior to the period of extended operation for review and approval.

3.1.2.1.7 Cracking Due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking, Cyclic Loading

In the discussion column of LRA Table 3.1.1, Item 3.1.1-40, the applicant stated that cracking in stainless steel and nickel-alloy nozzles and penetrations in the reactor vessel is managed by the Water Chemistry Control-BWR Program and either BWR Penetrations Program, BWR Vessel Internals Program, or Inservice Inspection Program.

The applicant also stated that cracking of the nickel-based alloy CRD stub tubes is managed using the BWR Vessel Internals Program and the Water Chemistry Control – BWR Program.

The staff reviewed the applicant's BWR Vessel Internals Program. This evaluation is documented in SER Section 3.0.3.2.7. The staff finds that inspection guidance for the CRD stub tubes is included in BWRVIP-47, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines," which has been reviewed and accepted by the staff. Because the BWR Vessel Internals Program incorporates the applicable guidelines of BWRVIP-47, the staff finds it to be an acceptable method for aging management of cracking of the CRD stub tubes.

The applicant also stated that stainless steel incore housings are managed using the Inservice Inspection Program and the Water Chemistry Control – BWR Program.

The staff reviewed the applicant's Inservice Inspection Program. This evaluation is documented in SER Section 3.0.3.3.3. The program is plant-specific and incorporates the inspection requirements of ASME Code, Section XI in accordance with 10 CFR 50.55a. Because the Inservice Inspection Program provides for inspections that satisfy the requirements of the ASME Code as reviewed and accepted by the staff, the staff finds it to be an acceptable method for aging management of cracking of the incore housings.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.8 Cracking Due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

In LRA Table 3.1.1, Item 3.1.1-41, the applicant stated that cracking in stainless steel and nickel-alloy piping, nozzle safe ends, and associated welds is managed by its Water Chemistry Control – BWR Program and the BWR Stress Corrosion Cracking Program. Cracking due to SCC and IGSCC is managed in this way for stainless steel safe ends on recirculation nozzles (inlet and outlet) and jet pump instrument nozzles as well as nickel-based alloy safe ends for CS.

In LRA Table 3.1.2-3, for pump casings and valve bodies of CASS, as well as piping, fittings, flow elements, and thermowells of stainless steel, the applicant augments the BWR Stress Corrosion Cracking Program and the Water Chemistry Programs with the Inservice Inspection Program. This meets the recommendations of the GALL Report for this item and is acceptable to the staff.

The applicant also stated that other component types associated with this item but outside the scope of the BWR Stress Corrosion Cracking Program are to be managed using the Inservice Inspection Program and the Water Chemistry Control – BWR Program. Cracking is managed in this manner for stainless-steel-clad nozzles of low-alloy steel (recirculation, CS, head spray, head instrumentation, head vent, and jet pump instrument nozzles); nickel-based alloy flange leakoff nozzles; stainless steel head nozzle flanges, blank flanges, as well as safe ends for the SLC/ΔP and instrumentation nozzles. Low-alloy steel is not susceptible to SCC and components less than 4 inches nominal pipe size (NPS) are not within the scope of the BWR Stress Corrosion Cracking Program. The FWthermal sleeves of stainless steel and nickel-based alloy are also managed using the Inservice Inspection Program and the Water Chemistry Control – BWR Program.

During the audit and review, the staff asked the applicant's technical personnel to clarify how the FW inlet thermal sleeves can be managed with the Inservice Inspection - Inservice Inspection Program. The applicant's technical personnel stated that the VYNPS thermal sleeves are not welded in place, but rather they are installed with an interference fit. As such, there is no weld to the pressure boundary piping that can be examined by the Inservice Inspection Program. The applicant's technical personnel further stated that because there is no pressure boundary weld, these sleeves are not part of the pressure boundary. By letter dated July 14, 2006, the applicant revised LRA Table 3.1.2-1 to remove all line items for the “Thermal Sleeves Feedwater Inlets (N4)” component type.

Interference fitted thermal sleeves are not subject to SCC and IGSCC. The thermal sleeves are managed using the Water Chemistry Control – BWR Program. On this basis, the staff determines that the aging of the thermal sleeves is adequately managed.

The staff reviewed the applicant’s Inservice Inspection Program. This evaluation is documented in SER Section 3.0.3.3.3. The staff found the program acceptable. The program is plant-specific and incorporates the inspection requirements of ASME Code, Section XI in accordance with 10 CFR 50.55a.

Because the Inservice Inspection Program provides for inspections to satisfy the requirements of the ASME Code as reviewed and accepted by the staff, the staff finds it to be an acceptable method for management of cracking of these components.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.9 Cracking Due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking, Irradiation-Assisted Stress Corrosion Cracking

In the discussion column of LRA Table 3.1.1, Item 3.1.1-44, the applicant stated that cracking due to SCC, IGSCC, and IASCC in the CASS, stainless steel, and nickel-based alloy components internal to the reactor vessel is to be managed using the BWR Vessel Internals Program and the Water Chemistry Control-BWR Program. The applicant included access hole cover plates among these items, for which the GALL Report recommends augmented inspection using the Inservice Inspection Program if the plate is mechanically fastened or welded in such a way that a crevice is formed.

In the LRA, the applicant stated that the access hole covers are welded in place, not mechanically fastened, and that they were welded in a manner that prevented the formation of a crevice.

The staff reviewed the applicant's BWR Vessel Internals Program and Water Chemistry Control-BWR Program. These evaluations are documented in SER Sections 3.0.3.2.7 and 3.0.3.1.11, respectively. The staff found each program acceptable. Management of cracking due to SCC, IGSCC, and IASCC of these components is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.10 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.1.1, Item 3.1.1-47, the applicant stated that loss of material in stainless steel and nickel-alloy components of the reactor vessel internals is managed by the Water Chemistry Control-BWR Program. The One-Time Inspection Program will verify the effectiveness of the applicant's Water Chemistry Control-BWR Program to manage loss of material. The applicant's Inservice Inspection Program is not applicable to most reactor vessel internals components since they are not part of the pressure boundary. Management of loss of material using the applicant's Water Chemistry Control-BWR Program augmented by its One-Time Inspection Program is consistent with similar items in LRA Table 3.1.1.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in LRA Tables 3.1.2-1 to 3.1.2-3. The staff reviewed the applicant's Water Chemistry Control – BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff found each program acceptable.

During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.1.1, Item 3.1.1-47 in the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.11 Cracking Due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking (For Stainless Steel Only), and Thermal and Mechanical Loading

In the discussion column of LRA Table 3.1.1, Item 3.1.1-48, the applicant stated that cracking of Class 1 stainless steel components less than 4 inches NPS is managed by the Water Chemistry Control-BWR Program and the One-Time Inspection Program.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff found each program acceptable.

The staff asked the applicant to justify the omission of ISI from the management of aging for Class 1 components. By letter dated July 14, 2006, the applicant revised LRA Table 3.1.2-3 to apply the Inservice Inspection Program, in addition to the Water Chemistry Control - BWR Program and One-Time Inspection Program, to manage cracking for all component types of piping and fittings less than 4 inches NPS, with the exception of the head seal leak detection line. With this change, the staff finds the applicant's management of cracking due to SCC, IGSCC, and thermal and mechanical loading of steel and stainless steel Class 1 piping, fittings, and branch connections less than 4 inches NPS consistent with the GALL Report and therefore acceptable.

The staff also asked the applicant for confirmation that CRD accumulators and condensing pots were less than 4 inches NPS and appropriate for inclusion with this item of LRA Table 3.1.1.

The applicant stated that these components are connected using tubing less than 4 inches NPS and are outside the scope of the its Inservice Inspection Program.

The staff reviewed the ISI database to confirm that these items are not in the scope of the applicant’s Inservice Inspection Program, and concludes that the use of the Water Chemistry Control-BWR Program and the One-Time Inspection Program to manage cracking of these components is appropriate.

Cracking due to SCC, IGSCC and thermal and mechanical loading of stainless steel CRD drives exposed to treated water greater than 270°F in the RCPB is to be managed using "Inservice Inspection Program."

The staff's review of the applicant's Inservice Inspection Program is documented in SER Section 3.0.3.3.3, which the staff found acceptable. The staff finds that this program satisfies the criteria of SRP-LR Appendix A.1 for stainless steel CRD drives in the RCPB and is therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.12 Cracking Due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking, Irradiation-Assisted Stress Corrosion Cracking

In the discussion column of LRA Table 3.1.1, Item 3.1.1-49, the applicant stated that VYNPS has welded access hole covers with no crevice behind the weld. Cracking of the nickel-alloy shroud support access hole covers is managed by “BWR Vessel Internals Program,” and “Water Chemistry Control-BWR Program,” as described in LRA Table 3.1.1, Item 3.1.1-44. The staff's evaluation of this AMR is documented in SER Section 3.1.2.1.9.

On the basis of its review, the staff finds that augmented inspection of the access hole covers is not required to adequately manage this aging effect/mechanism and that management of cracking of the core shroud and core plate access hole cover is consistent with the recommendations of the GALL Report and is therefore acceptable.

3.1.2.1.13 Cracking Due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

In the discussion column of LRA Table 3.1.1, Item 3.1.1-50, the applicant stated that the Reactor Head Closure Studs Program manages cracking in low alloy steel head closure flange bolting while the Inservice Inspection Program manages cracking in other low-alloy steel bolting of the RCS pressure boundary.

The staff reviewed the applicant's Reactor Head Closure Studs Program and Inservice Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.14 and 3.0.3.3.3, respectively. The staff found each program acceptable.

The staff noted that the applicant was managing cracking of other low alloy steel pressure boundary bolting (i.e., flange bolts and nuts [N6A, N6B, N7] and CRD flange capscrews and washers) with the Inservice Inspection Program. The staff asked the applicant to clarify how aging of steel and stainless steel bolting would be adequately managed in the absence of a Bolting Integrity Program. In a letter dated July 6, 2006, the applicant committed (Commitment #34) to prepare and submit an AMP consistent with GALL AMP XI.M18, “Bolting Integrity,” for approval. In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Bolting Integrity Program. The staff’s evaluation of this program is documented in SER Section 3.0.3.2.19. With this AMP, the staff finds that the applicant's management of cracking of other low alloy steel bolting will be consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant, with the Commitment #34 identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.14 Cracking Due to Stress Corrosion Cracking, Loss of Material Due to Wear, Loss of Preload Due to Thermal Effects, Gasket Creep, and Self-Loosening

In the discussion column of LRA Table 3.1.1, Item 3.1.1-52, the applicant stated that cracking due to SCC, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening is to be managed using the Inservice Inspection Program.

The staff reviewed the applicant’s Inservice Inspection Program. This evaluation is documented in SER Section 3.0.3.3.3 and was found acceptable by the staff.

During the audit and review, the staff asked the applicant to clarify how aging of steel and stainless steel bolting would be managed in the absence of a Bolting Integrity Program. In a letter dated July 6, 2006, the applicant committed (Commitment #34) to prepare and submit an AMP consistent with GALL AMP XI.M18, “Bolting Integrity,” for approval. In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Bolting Integrity Program. The staff’s evaluation of this program is documented in SER Section 3.0.3.2.19, which the staff found acceptable. With this AMP, the staff finds that the applicant's management of low alloy steel bolting will be consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant, with the Commitment #34 identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.15 Loss of Fracture Toughness Due to Thermal Aging Embrittlement

In the discussion column of LRA Table 3.1.1, Item 3.1.1-55, the applicant stated that the Inservice Inspection Program and the One-Time Inspection Program will be used to manage the reduction of fracture toughness in CASS components of the RCPB.

The staff reviewed the applicant’s Inservice Inspection Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.3.3 and 3.0.3.1.6, respectively. The staff found each program acceptable.

The applicant’s management of loss of fracture toughness due to thermal aging embrittlement of CASS pump casings and valve bodies 4 inches NPS and larger with the Inservice Inspection Program and the One-Time Inspection Program is consistent with the GALL Report and therefore acceptable to the staff. The use of the applicant’s Inservice Inspection Program and One-Time Inspection Program for managing loss of fracture toughness of CASS valve bodies less than 4 inches NPS is appropriate because the adequacy of ISI has been demonstrated by NRC-performed bounding integrity analysis.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.1.2.1.16 Loss of Fracture Toughness Due to Thermal Aging Embrittlement

In the discussion column of LRA Table 3.1.1, Item 3.1.1-57, the applicant stated that the One-Time Inspection Program will be used to manage aging of the CASS main steam flow restrictors. VYNPS has no other Class 1 piping, piping components, piping elements, or CRD housings made of CASS.

During the audit and review, the applicant clarified the location and method of attachment of this component, which is welded to the inner surface of the main steam piping upstream of the main steam isolation valves (MSIVs).

The staff finds that the CASS flow restrictor is not within the scope of GALL AMP XI.M12, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS),” because it is neither a pressure-retaining component nor internal to the reactor vessel. In addition, the staff finds that the applicant’s One-Time Inspection Program provides an appropriate way to confirm that no AERM affects the flow restrictor.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

Conclusion. The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the associated aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs in the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.1.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the reactor vessel, reactor vessel internals, and reactor coolant system components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of fracture toughness due to neutron irradiation embrittlement
- cracking due to stress corrosion cracking and intergranular stress-corrosion cracking
- crack growth due to cyclic loading
- loss of fracture toughness due to neutron irradiation embrittlement and void swelling
- cracking due to stress corrosion cracking
- cracking due to cyclic loading
- loss of preload due to stress relaxation
- loss of material due to erosion
- cracking due to flow-induced vibration
- cracking due to stress corrosion cracking and irradiation-assisted stress corrosion cracking
- cracking due to primary water stress corrosion cracking
- wall thinning due to flow-accelerated corrosion
- changes in dimensions due to void swelling
- cracking due to stress corrosion cracking and primary water stress corrosion cracking
- cracking due to stress corrosion cracking, primary water stress corrosion cracking, and irradiation-assisted stress corrosion cracking
- quality assurance for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Appendix 3.1.2.2. The staff's review of the applicant's further evaluation follows.

3.1.2.2.1 Cumulative Fatigue Damage

LRA Section 3.1.2.2.1 states that fatigue is a TLAA, as required by 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). The staff's review of the applicant's evaluation of fatigue for the reactor vessel and the reactor vessel internals is discussed in SER Sections 4.3.1.1 and 4.3.1.2, respectively. The staff's review of the applicant's evaluation of fatigue for the Class 1 portions of the reactor coolant boundary piping and components, including those for interconnecting systems, is discussed in SER Section 4.3.1.3.

3.1.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.1.2.2.2 against the following SRP-LR Appendix 3.1.2.2.2 criteria:

(1) LRA Section 3.1.2.2.2 addresses loss of material in steel components of the reactor pressure vessel exposed to reactor coolant due to general, pitting and crevice corrosion.

SRP-LR Section 3.1.2.2.2 states that loss of material due to general, pitting, and crevice corrosion may occur in the steel pressurized water reactor (PWR) steam generator shell assembly exposed to secondary FW and steam. Loss of material due to general, pitting, and crevice corrosion also may occur in the steel top head enclosure (without cladding) top head nozzles (vent, top head spray or reactor core isolation cooling (RCIC), and spare) exposed to reactor coolant. The existing program controls reactor water chemistry to mitigate corrosion. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

LRA Section 3.1.2.2.2 states that loss of material due to general, pitting, and crevice corrosion in steel components of the reactor pressure vessel exposed to reactor coolant is managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow. The Inservice Inspection Program supplements the Water Chemistry Control-BWR Program for these components.

The staff finds that this meets the criteria of SRP-LR Section 3.1.2.2.2 and is therefore acceptable.

(2) LRA Section 3.1.2.2.2 addresses loss of material in other steel components within the RCPB exposed to reactor coolant due to general, pitting, and crevice corrosion.

SRP-LR Section 3.1.2.2.2 states that loss of material due to pitting and crevice corrosion may occur in stainless steel BWR isolation condenser components exposed to reactor coolant. Loss of material due to general, pitting, and crevice corrosion may occur in steel BWR isolation condenser components. The existing program controls reactor water chemistry to mitigate corrosion. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component’s intended functions will be maintained during the period of extended operation.

LRA Section 3.1.2.2.2 stated that this paragraph in the SRP-LR pertains to BWR isolation condenser components. VYNPS does not have an isolation condenser, however, loss of material due to general, pitting, and crevice corrosion in other steel components within the RCPB exposed to reactor coolant is managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow. For some components, the Inservice Inspection Program supplements the Water Chemistry Control-BWR Program.

The staff finds that this meets the criteria of SRP-LR Section 3.1.2.2.2 and is therefore acceptable.

(3) LRA Section 3.1.2.2.2 addresses loss of material of stainless steel, nickel alloy, and steel with stainless steel or nickel alloy cladding flanges, nozzles, penetrations, pressure housings, safe ends, and vessel shells, heads and welds exposed to reactor coolant due to pitting and crevice corrosion.

SRP-LR Section 3.1.2.2.2 states that loss of material due to pitting and crevice corrosion may occur in stainless steel, nickel alloy, and steel with stainless steel or nickel alloy cladding flanges, nozzles, penetrations, pressure housings, safe ends, and vessel shells, heads, and welds exposed to reactor coolant. The existing program controls reactor water chemistry to mitigate corrosion. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

LRA Section 3.1.2.2.2 stated that loss of material due to general, pitting, and crevice corrosion in stainless steel, nickel-alloy and steel with stainless steel cladding components of the reactor pressure vessel, and loss of material in stainless steel (including CASS) components of the RCPB exposed to reactor coolant is managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow. The One-Time Inspection Program is also used to manage loss of material from the main steam flow restrictor by means of a component-specific inspection. For some components, the Inservice Inspection or the BWR Vessel Internals Program supplements the Water Chemistry Control-BWR Program.

The staff finds that this meets the criteria of SRP-LR Section 3.1.2.2.2 and is therefore acceptable.

(4) LRA Section 3.1.2.2.2 addresses that this paragraph in the SRP-LR applies to PWRs only.

SRP-LR Section 3.1.2.2.2 states that loss of material due to general, pitting, and crevice corrosion may occur in the steel PWR steam generator upper and lower shell and transition cone exposed to secondary FW and steam. The existing program controls chemistry to mitigate corrosion and 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 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 occur. 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 with a high-stress region at the shell to transition cone weld.

Because VYNPS is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.2 does not apply to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.2 criteria. For those line items that apply to LRA Section 3.1.2.2.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

The staff reviewed LRA Section 3.1.2.2.3 against the following SRP-LR Section 3.1.2.2.3 criteria:

(1) LRA Section 3.1.2.2.3 states that neutron irradiation embrittlement is a TLAA, as required by 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.2 documents the staff's review of the applicant's evaluation of loss of fracture toughness for the reactor vessel beltline shell and welds.

(2) LRA Section 3.1.2.2.3 was reviewed by the staff and is addressed in SER Section 4.2.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.3 criteria. For those line items that apply to LRA Section 3.1.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.4 Cracking Due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.4 against the following SRP-LR Section 3.1.2.2.4 criteria:

(1) LRA Section 3.1.2.2.4 the applicant addresses cracking of stainless steel and nickel alloy BWR top head enclosure vessel flange leak detection lines due to SCC and IGSCC.

    SRP-LR Section 3.1.2.2.4 states that cracking due to SCC and IGSCC may 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.

    LRA Section 3.1.2.2.4 states that the Water Chemistry Control-BWR Program and the One-Time Inspection Program will manage cracking due to SCC and IGSCC in the stainless steel head seal leak detection lines. The One-Time Inspection Program will include a volumetric examination for the detection of cracking.

    The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff found each program acceptable.

    The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. The staff finds that this combination satisfies the criteria of SRP-LR Appendix A.1 and is therefore acceptable.

(2) LRA Section 3.1.2.2.4 states that VYNPS does not have an isolation condenser.

SRP-LR Section 3.1.2.2.4 states that cracking due to SCC and IGSCC may occur in stainless steel BWR isolation condenser components exposed to reactor coolant. The existing program controls reactor water chemistry to mitigate SCC and relies on ASME Code, Section XI, ISI; 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 component intended functions will be maintained during the period of extended operation.

Because VYNPS has no isolation condenser, the staff finds that this item of SRP-LR Section 3.1.2.2.4 does not apply to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.4 criteria. For those line items that apply to LRA Section 3.1.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.5 Crack Growth Due to Cyclic Loading

LRA Section 3.1.2.2.5 states that further evaluation of aging management in this area is not applicable to BWRs.

The staff reviewed LRA Section 3.1.2.2.5 against the criteria in SRP-LR Section 3.1.2.2.5.

In LRA Section 3.1.2.2.5, the applicant stated that SRP-LR Section 3.1.2.2.5 applies to PWRs only.

SRP-LR Section 3.1.2.2.5 stated that 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 staff confirmed that the VYNPS vessel shell forgings were not clad using a high-heat-input welding process.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.

3.1.2.2.6 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement and Void Swelling

The staff reviewed LRA Section 3.1.2.2.6 against the criteria in SRP-LR Section 3.1.2.2.6.

In LRA Section 3.1.2.2.6, the applicant stated that SRP-LR Section 3.1.2.2.6 applies to PWRs only.

SRP-LR Section 3.1.2.2.6 states that loss of fracture toughness due to neutron irradiation embrittlement and void swelling may occur in stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux. The GALL Report recommends no further AMR if the applicant commits in the FSAR supplement: (1) to participate in industry programs for investigating and managing aging effects on reactor internals; (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

The staff confirmed that the SRP-LR considers this aging effect/mechanism only for PWR components.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.
Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.6 criteria. For those line items that apply to LRA Section 3.1.2.2.6, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.7 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.7 against the following SRP-LR Section 3.1.2.2.7 criteria:

(1) In LRA Section 3.1.2.2.7, the applicant stated that SRP-LR Section 3.1.2.2.7 applies to PWRs only.

    SRP-LR Section 3.1.2.2.7 states that cracking due to SCC may occur in the PWR stainless steel reactor vessel flange leak detection lines and bottom-mounted instrument guide tubes exposed to reactor coolant as well as in Class 1 PWR CASS reactor coolant system piping, piping components, and pipping elements exposed to reactor coolant. The GALL Report recommends that a plant-specific AMP be evaluated to ensure that this aging effect is adequately managed.

The staff confirmed that the SRP-LR considers this aging effect/mechanism only for PWR components.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.7 criteria. For those line items that apply to LRA Section 3.1.2.2.7, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.8 Cracking Due to Cyclic Loading

The staff reviewed LRA Section 3.1.2.2.8 against the following SRP-LR Section 3.1.2.2.8 criteria:

(1) LRA Section 3.1.2.2.8 addresses cracking of stainless steel BWR jet pump sensing lines due to cyclic loading.

SRP-LR Section 3.1.2.2.8 states that cracking due to cyclic loading may occur in the stainless steel BWR jet pump sensing lines. The GALL Report recommends that a plant-specific AMP be evaluated to ensure that this aging effect is adequately managed.

LRA Section 3.1.2.2.8 stated that this paragraph in the SRP-LR pertains to the jet pump sensing lines inside the reactor vessel. At VYNPS, these lines have no license renewal intended function and thus are not subject to an AMR.

In addition, the LRA stated that the lines inside the vessel do not form part of the RCS pressure boundary and their failure would not affect the performance of any functions in the scope of license renewal. However, the lines outside the vessel are part of the RCS pressure boundary and are subject to an AMR. The staff's evaluation of these lines which are included as piping and fitting components less 4 inches NPS and managed using LRA Table 3.1-1, Item 3.1.1-48 is documented in SER Section 3.1.2.1.11.

The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

(2) LRA Section 3.1.2.2.8 addresses the applicant stated that this paragraph in the SRP-LR pertains to BWR isolation condenser components. In LRA Section 3.1.2.2.8, the applicant stated that VYNPS does not have an isolation condenser.

SRP-LR Section 3.1.2.2.8 states that cracking due to cyclic loading may occur in steel and stainless steel BWR isolation condenser components exposed to reactor coolant. The existing program relies on ASME Code, 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 component intended functions will be maintained during the period of extended operation.

Because VYNPS has no isolation condenser, the staff finds that this item in SRP-LR Section 3.1.2.2.8 does not apply to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.8 criteria. For those line items that apply to LRA Section 3.1.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.9 Loss of Preload Due to Stress Relaxation

The staff reviewed LRA Section 3.1.2.2.9 against the criteria in SRP-LR Section 3.1.2.2.9.

In LRA Section 3.1.2.2.9, the applicant stated that this paragraph in the SRP-LR applies to PWRs only.

SRP-LR Section 3.1.2.2.9 states that loss of preload due to stress relaxation may occur in stainless steel and nickel alloy PWR reactor vessel internals screws, bolts, tie rods, and hold-down springs exposed to reactor coolant. The GALL Report recommends no further AMR if the applicant commits in the FSAR supplement: (1) to participate in the industry programs for investigating and managing aging effects on reactor internals; (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.

3.1.2.2.10 Loss of Material Due to Erosion

The staff reviewed LRA Section 3.1.2.2.10 against the criteria in SRP-LR Section 3.1.2.2.10.

In LRA Section 3.1.2.2.10, the applicant stated that this paragraph in the SRP-LR applies to PWRs only.

SRP-LR Section 3.1.2.2.10 states that loss of material due to erosion may occur in steel steam generator FW impingement plates and supports exposed to secondary FW. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.

3.1.2.2.11 Cracking Due to Flow-Induced Vibration

The staff reviewed LRA Section 3.1.2.2.11 against the criteria in SRP-LR Section 3.1.2.2.11.

LRA Section 3.1.2.2.11 addresses cracking of stainless steel steam dryers due to flow-induced vibration.

SRP-LR Section 3.1.2.2.11 states that loss of material due to erosion may occur in steel steam generator FW impingement plates and supports exposed to secondary FW. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed.

The staff, as part of the its review of the applicant’s extended power uprate (EPU) application, conducted extensive reviews of the steam dryers. The staff reviewed the steam dryer analysis, and conducted technical audits at the GE Scale Model Test facility near San Jose, California and the GE office in Washington, DC. The steam dryer analysis involved evaluation of the pressure loads acting on the steam dryer during operation using computational fluid dynamics and acoustic circuit model analyses. The staff found that the uncertainty assumed by the applicant in its determination of the loads from the computational fluid dynamics analysis was significantly underestimated. To address this concern, and to confirm the applicant’s predictions regarding the hydrodynamic and acoustic loads on the steam dryer, the staff added license conditions to the VYNPS Facility Operation License when it approved the EPU in March 2006. The license conditions require monitoring, evaluating, and taking prompt action in response to potential adverse flow effects as a result of operation under extended power uprate conditions. One license condition also specifies visual inspections of the steam dryers during three consecutive refueling outages beginning with the spring 2007 refueling outage.

The staff reviewed plant experience at Hatch and Brunswick related to plant transients after extended power uprates and did not observe any abnormal behavior in the steam dryers. On the basis of the operating experience and license conditions, the staff concludes that there is reasonable assurance that the VYNPS steam dryers will perform satisfactorily in-service under extended power uprate conditions during the proposed renewal period provided an adequate aging management program is used.

The applicant stated that cracking due to flow-induced vibration in the stainless steel steam dryers is managed by the BWR Vessel Internals Program. The BWR Vessel Internals Program currently incorporates the guidance of GE-SIL-644, Revision 1. VYNPS will evaluate BWRVIP-139 once it is approved by the staff and either include its recommendations in the VYNPS BWR Vessel Internals Program or inform the staff of VYNPS's exceptions to that document.

The staff finds the applicant's approach for managing cracking of steam dryers due to flow-induced vibration to be acceptable because the approach will be based on the guidelines developed by the ongoing activity of the BWRVIP. In addition, in a letter dated August 22, 2006, the applicant committed (Commitment #37) to continue inspections in accordance with the Steam Dryer Monitoring Program, Revision 3, in the event that BWRVIP-139 is not approved prior to the period of extended operation.

The staff finds that since the applicant has committed (Commiment #37) to implement BWRVIP-139 as approved by the staff, if the staff does approve BWRVIP-139, this aging effect/mechanism will be adequately managed as recommended by the GALL Report. If the staff does not issue an SER approving the use of BWRVIP-139, the applicant must submit, for review and approval, a plant-specific program to manage cracking of the steam dryers due to flow-induced vibration. This must occur at least 24 months prior to the period of extended operation.

The staff reviewed the applicant's BWR Vessel Internals Program and finds it to be an acceptable method for managing cracking of the steam dryers due to flow-induced vibration based upon a commitment to implement BWRVIP-139 or to provide a plant-specific program for management of cracking in the steam dryers to the NRC for review and approval prior to the period of extended operation.

Based on the programs identified above and Commitment #37, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.11 criteria. For those line items that apply to LRA Section 3.1.2.2.11, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.12 Cracking Due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.12 against the criteria in SRP-LR Section 3.1.2.2.12.

In LRA Section 3.1.2.2.12, the applicant stated that this paragraph in the SRP-LR applies to PWRs only.

SRP-LR Section 3.1.2.2.12 states that cracking due to SCC and IASCC may occur in PWR stainless steel reactor internals exposed to reactor coolant. The existing program controls water chemistry to mitigate these aging effects. The GALL Report recommends no further AMR if the applicant commits in the FSAR supplement: (1) to participate in the industry programs for investigating and managing aging effects on reactor internals; (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals;, and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.

3.1.2.2.13 Cracking Due to Primary Water Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.13 against the criteria in SRP-LR Section 3.1.2.2.13.

In LRA Section 3.1.2.2.13, the applicant stated that this paragraph in the SRP-LR applies to PWRs only.

SRP-LR Section 3.1.2.2.13 states that cracking due to primary water stress corrosion cracking (PWSCC) may occur in PWR components made of nickel alloy and steel with nickel alloy cladding, including RCPB components and penetrations inside the reactor coolant system such as pressurizer heater sheathes and sleeves, nozzles, and other internal components. Except for reactor vessel upper head nozzles and penetrations, the GALL Report recommends ASME Code, Section XI, ISI (for Class 1 components) and control of water chemistry. For nickel alloy components, no further AMR is necessary if the applicant complies with applicable NRC orders and commits in the FSAR supplement to implement applicable: (1) bulletins and GLs; and (2) staff-accepted industry guidelines.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.

3.1.2.2.14 Wall Thinning Due to Flow-Accelerated Corrosion

The staff reviewed LRA Section 3.1.2.2.14 against the criteria in SRP-LR Section 3.1.2.2.14.

In LRA Section 3.1.2.2.14, the applicant stated that this paragraph in the SRP-LR applies to PWRs only.

SRP-LR Section 3.1.2.2.14 states that wall thinning due to flow-accelerated corrosion may occur in steel FW inlet rings and supports. The GALL Report references IN 91-19, "Steam Generator Feedwater Distribution Piping Damage," for evidence of flow-accelerated corrosion in steam generators and recommends that a plant-specific AMP be evaluated because existing programs may not be capable of mitigating or detecting wall thinning due to flow-accelerated corrosion.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS

3.1.2.2.15 Changes in Dimensions Due to Void Swelling

The staff reviewed LRA Section 3.1.2.2.15 against the criteria in SRP-LR Section 3.1.2.2.15.

In LRA Section 3.1.2.2.15, the applicant stated that this paragraph in the SRP-LR applies to PWRs only.

SRP-LR Section 3.1.2.2.15 states that changes in dimensions due to void swelling may occur in stainless steel and nickel alloy PWR internal components exposed to reactor coolant. The GALL Report recommends no further AMR if the applicant commits in the FSAR supplement: (1) to participate in the industry programs for investigating and managing aging effects on reactor internals; (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.

3.1.2.2.16 Cracking Due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.16 against the following SRP-LR Section 3.1.2.2.16 criteria:

In LRA Section 3.1.2.2.16, the applicant stated that this paragraph in the SRP-LR applies to PWRs only.

SRP-LR Section 3.1.2.2.16 states that cracking due to SCC may occur on the primary coolant side of PWR steel steam generator upper and lower heads, tubesheets, and tube-to-tube sheet welds made or clad with stainless steel. Cracking due to PWSCC may occur on the primary coolant side of PWR steel steam generator upper and lower heads, tubesheets, and tube-to-tube sheet welds made or clad with nickel alloy. Cracking due to SCC could occur on stainless steel pressurizer spray heads; and cracking due to PWSCC could occur on nickel-alloy pressurizer spray heads. The GALL Report recommends ASME Code, Section XI, ISI and control of water chemistry to manage this aging effect and recommends no further AMR for PWSCC of nickel alloy if the applicant complies with applicable NRC orders and commits in the FSAR supplement to implement applicable: (1) bulletins and GLs; and (2) staff-accepted industry guidelines.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.

3.1.2.2.17 Cracking Due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.17 against the criteria in SRP-LR Section 3.1.2.2.17.

In LRA Section 3.1.2.2.17, the applicant stated that this paragraph in the SRP-LR applies to PWRs only.

SRP-LR Section 3.1.2.2.17 states that cracking due to SCC, PWSCC, and IASCC may occur in PWR stainless steel and nickel alloy reactor vessel internals components. The existing program controls water chemistry to mitigate these aging effects; however, the existing program should be augmented to manage these aging effects for reactor vessel internals components. The GALL Report recommends no further AMR if the applicant commits in the FSAR supplement: (1) to participate in the industry programs for investigating and managing aging effects on reactor internals; (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

On the basis that VYNPS does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at VYNPS.

3.1.2.2.18 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program, which the staff found acceptable.

Conclusion. On the basis of its review, for applicable component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff determines that the applicant adequately addressed the issues that were further evaluated. The staff finds that the applicant had demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.1.2-1 through 3.1.2-3, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.1.2-1 through 3.1.2-3, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.1.2.3.1 Reactor Vessel Summary of Aging Management Evaluation – LRA Table 3.1.2-1

The staff reviewed LRA Table 3.1.2-1, which summarizes the results of AMR evaluations for the reactor vessel component groups.

In LRA Table 3.1.2-1, the applicant proposed to manage loss of material from low-alloy steel closure flange studs, nuts, washers and bushings exposed to air using AMP B.1.23, "Reactor Head Closure Studs Program."

The staff reviewed the Reactor Head Closure Studs Program and its evaluation is documented in SER Section 3.0.3.2.14. The program includes ISI in conformance with the requirements of ASME Code, Section XI, Subsection IWB, and preventive measures to mitigate cracking and loss of material of reactor head closure studs, nuts, washers, and bushings. The staff determines that the AMP is adequate for managing the aging effects for which it is credited. On the basis of its review, the staff finds the aging effect of loss of material from low-alloy steel closure flange studs, nuts, washers and bushings exposed to air is effectively managed using the Reactor Head Closure Studs Program.

In LRA Table 3.1.2-1, the applicant proposed to manage loss of material from low-alloy steel stabilizer pads and support skirt exposed to air using the Inservice Inspection (ISI) Program.

The staff reviewed the Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.3, which the staff found acceptable. The plant-specific program implements ISI in conformance with the requirements of ASME Code, Section XI and 10 CFR 50.55a. The staff determines that the AMP is adequate for managing the aging effects for which it is credited. On the basis of its review, the staff finds the aging effect of loss of material from low-alloy steel stabilizer pads and support skirt exposed to air is effectively managed using the Inservice Inspection Program.

In LRA Table 3.1.2-1, the applicant proposed to manage cracking of the stainless steel cap on the CRD return line exposed to treated water greater than 270°F using the BWR CRD Return Line Nozzle Program and the Water Chemistry Control – BWR Program. The staff reviewed the BWR CRD Return Line Nozzle Program and the Water Chemistry Control – BWR Program. These evaluations are documented in SER Sections 3.0.3.2.2 and 3.0.3.1.11, respectively. The staff found each program acceptable.

The applicant stated that it has rerouted the CRD return flow to the reactor water cleanup (RWCU) system and capped the CRD return line vessel nozzle to mitigate cracking. The applicant further stated that it will monitor the effects of crack initiation and growth on the intended function of the control rod drive return line nozzle and cap by implementing AMP B.1.2, “BWR CRD Return Line Nozzle.” AMP B.1.2 complies with the requirements of GALL AMP XI.M6, “BWR CRD Return Line Nozzle,” with one exception. The staff reviewed this exception and to determine the validity of the applicant’s technical basis to exclude the weld joint between CRD return line and the RWCU piping from the aging management review. GALL AMP XI.M6 requires application of the American Society of Mechanical Engineers (ASME) Code Section XI, 2001 Edition through 2003 Addenda, Subsection IWB 2500-1 inspection requirements, and the NUREG-0619, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking,” recommendations to monitor this aging effect in the CRD return line welds.

With respect to the aging degradation of the capped CRD return line nozzle, the applicant stated that the capped CRD return line nozzle at the VYNPS unit will be monitored by the ASME Code, Section XI in-service inspection (ISI) examination as required by AMP B.1.2. In RAI B.1.2-1, dated August 16, 2006, the staff requested that the applicant provide the following information regarding the CRD return line capped weld:

(1) Configuration, location and material of construction of the capped nozzle. This should include the existing base material for the nozzle, piping (if piping remnants exist) and cap material, and any welds.

(2) Inspection criteria for this weld and the cap are managed in accordance with the guidelines of BWRVIP-75, "BWR Vessel and Internals Project (BWRVIP), Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedule."

(3) The effect of the event at Pilgrim (leaking weld at capped nozzle, September 30, 2003) is applicable to VYNPS. The staff issued Information Notice 2004-08, "Reactor Coolant Pressure Boundary Leakage Attributable to Propagation of Cracking in Reactor Vessel Nozzle Welds," dated April 22, 2004, which states that the cracking occurred in an Alloy 182 weld that was previously repaired extensively. Discuss experience with previous leakage at the VYNPS capped nozzle, if any. Include in your discussion the past inspection techniques applied, the results obtained, and mitigative strategies imposed. Provide information as to how the plant-specific experience related to this aging effect impacts the attributes specified in AMP B.1.2, "BWR CRD Return line Nozzles."

In response to RAI B.1.2-1, in a letter dated August 30, 2006, the applicant stated that the material of construction of the cap at the VYNPS unit is ASME SA 182 Grade 316 L (low carbon) stainless steel. Type 316L (low carbon) stainless steel weld material, which has better resistance to IGSCC than non-L grade stainless steel weld material, was used for the cap-to-nozzle weld. At the time of installation (1979) visual testing (VT), liquid penetrant testing (PT), and radiographic testing (RT) were performed on the cap-to-nozzle weld and no reportable indications were found. Subsequent examinations included ultrasonic testing (UT) and VT in 1979, PT in 1989, and UT and PT in 2002, and thus far no reportable indications were identified. The applicant stated that by using a low carbon stainless steel base metal cap and low carbon stainless steel weld material, it can mitigate IGSCC in the cap-to-nozzle weld. Since past inspections indicated no active aging degradation in the cap-to-nozzle weld, the applicant concluded that the aging degradation in the subject weld is adequately managed by the BWR CRD Return Line Nozzle Program.

The staff reviewed the applicant's response and finds it acceptable because implementation of the BWR CRD Return Line Nozzle Program and the inspection requirements of the ASME Code, Section XI ISI Program for the CRD return lines would be consistent with the GALL AMP XI.M6. The staff's concern described in RAI B.1.2-1 is resolved. On the basis of its review, the staff finds the aging effect of cracking of the stainless steel CRD return line cap is effectively managed using the BWR CRD Return Line Nozzle Program and the Water Chemistry Control – BWR Program.

In LRA Table 3.1.2-1, the applicant proposed to manage cracking of the low-alloy steel bottom head, upper head, closure flanges, shell, main steam nozzle, and drain nozzle exposed to treated water greater than 220°F using the Inservice Inspection (ISI) Program and the Water Chemistry Control – BWR Program.

The staff reviewed the Inservice Inspection Program and the Water Chemistry Control – BWR Program. These evaluations are documented in SER Sections 3.0.3.3.3 and 3.0.3.1.11, respectively. The Water Chemistry Control – BWR Program mitigates cracking of low-alloy steel components fully or partially clad with stainless steel in contact with reactor coolant. The Inservice Inspection Program monitors the effects of crack initiation and growth on the intended function of bottom head, upper head, closure flanges, shell, main steam nozzle, and drain nozzle. The staff determines that these programs are adequate to manage the aging effects for which they are credited. On the basis of its review the staff finds the aging effect of cracking of the low-alloy steel bottom head, upper head, closure flanges, shell, main steam nozzle, and drain nozzle is effectively managed using the Inservice Inspection Program and the Water Chemistry Control – BWR Program.

In LRA Table 3.1.2-1, the applicant proposed to manage fatigue damage (cracking-fatigue) of the stainless steel bolting for flanges and incore housing exposed to air using a TLAA.

During the audit and review, the staff noted that TLAA-metal fatigue was credited for managing cracking due to fatigue for almost all of the component types in the reactor coolant system. The applicant responded that entries listing cracking fatigue with TLAA-metal fatigue only met the screening criteria and these entries must be reviewed to determine if a TLAA-metal fatigue analysis exists. In a letter dated July 14, 2006, the applicant revised the LRA by deleting the line item in LRA Table 3.1.2-1 for incore housing bolting in which cracking-fatigue was managed by TLAA-metal fatigue. The staff finds this acceptable. On the basis of its review, the staff finds cracking due to fatigue for incore housing bolting is not managed by TLAA-metal fatigue as previously stated in the LRA. Cracking is instead managed using the Inservice Inspection Program. The staff determines that this program is adequate to manage the aging effects for which it is credited.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.2 Reactor Vessel Internals Summary of Aging Management Evaluation – LRA Table 3.1.2-2

The staff reviewed LRA Table 3.1.2-2, which summarizes the results of AMR evaluations for the reactor vessel internals component groups.

In LRA Table 3.1.2-2, the applicant proposed to manage loss of preload of stainless steel core plate rim hold-down bolts exposed to treated water greater than 270°F using a TLAA.

The core plate rim hold-down bolts are subject to stress relaxation due to thermal and irradiation effects and, consequently, they would experience 5 to 19 percent loss of preload. The applicant identified that loss of preload in core plate rim hold-down bolts is a TLAA issue. The applicant, in LRA Section 4.7.2.2, stated that it would comply with the guidelines specified in the Boiling Water Reactor Vessel Inspection Program BWRVIP-25 report, "BWR Core Plate Inspection and Flaw Evaluation Guidelines," which includes inspection criteria for the core plate rim hold-down bolts. The applicant claimed that by invoking the inspection requirements of the BWRVIP-25 report it would adequately manage loss of preload of the core plate rim hold-down bolts during the extended period of operation.

With respect to the TLAA issue associated with the loss of preload for the core plate rim hold-down bolts, the applicant stated that to date no plant-specific analysis was done in accordance with the current licensing basis. The applicant however, made a commitment (Commitment # 29) to either install wedges or perform plant-specific analysis that meets the requirements of the BWRVIP-25 report. If the applicant chooses to install wedges, the core plate rim hold-down bolts are excluded from the BWRVIP-25 inspection guidelines. The staff evaluation of this TLAA is documented in SER Section 4.7.

On the basis of its review, the staff finds that, with Commitment #29, the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3 Reactor Coolant Pressure Boundary Summary of Aging Management Evaluation – LRA Table 3.1.2-3

The staff reviewed LRA Table 3.1.2-3, which summarizes the results of AMR evaluations for the RCPB component groups.

In LRA Table 3.1.2-3, the applicant proposed to manage cracking of low-alloy and stainless steel bolting exposed to air using the Inservice Inspection Program.
The staff reviewed the Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.3. The staff asked the applicant to clarify how aging of stainless steel bolting would be adequately managed in the absence of a Bolting Integrity Program. In a letter dated July 6, 2006, the applicant agreed to prepare and submit an AMP consistent with GALL AMP XI.M18, “Bolting integrity,” for approval. In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Bolting Integrity Program. The staff’s evaluation of this program is documented in SER Section 3.0.3.2.19. The staff finds that, with this AMP, the applicant's management of low-alloy and stainless steel bolting of the RCS pressure boundary is consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.4 Aging Effect/Mechanism in Table 3.1.1 That are Not Applicable for VYNPS

The staff reviewed LRA Table 3.1.1, which provides a summary of aging management evaluations for the reactor vessel, internals and reactor coolant system evaluated in the GALL Report.

In LRA Table 3.1.1, Item 3.1.1-25, the applicant stated that the jet pump instrumentation lines inside the reactor vessel have no intended function within the scope of license renewal and for that reason are not subject to an AMR. The lines outside the vessel are part of the RCS pressure boundary and are subject to an AMR. These lines are included as piping and fittings less than 4 inches NPS. During the audit and review, the applicant confirmed that component types subject to this aging effect are addressed by LRA Table 3.1.1, Item 3.1.1-48. The evaluation of Table 3.1.1, Item 3.1.1-48 is documented in SER Section 3.1.2.1.11.

In LRA Table 3.1.1, Item 3.1.1-46, the applicant stated that the cracking of nickel alloy core shroud and core plate access hole cover (mechanical covers) due to SCC, IGSCC, and IASCC is not applicable at VYNPS. On the basis that the access hole covers are welded in a manner that leaves no crevice for which augmented inspection would be appropriate, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.1.1, Item 3.1.1-53, the applicant stated that the loss of material of steel piping, piping components, and piping elements exposed to closed cycle cooling water due to general, pitting and crevice corrosion is not applicable at VYNPS. On the basis that there are no components exposed to closed cycle cooling water in the reactor vessel, internals and reactor coolant system at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for these systems.

In LRA Table 3.1.1, Item 3.1.1-54, the applicant stated that the loss of material of copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water due to pitting, crevice, and galvanic corrosion is not applicable at VYNPS. On the basis that there are no copper-alloy components in the reactor vessel, internals and reactor coolant system at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for these systems.

In LRA Table 3.1.1, Item 3.1.1-56, the applicant stated that the loss of material of copper alloy greater than 15 percent zinc piping, piping components, and piping elements exposed to closed cycle cooling water due to selective leaching is not applicable at VYNPS. On the basis that there are no copper-alloy components in the reactor vessel, internals and reactor coolant system at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for these systems.

3.1.2.3.5 Reactor Vessel, Internals and Reactor Coolant System AMR Line Items That Have No Aging Effects (LRA Tables 3.1.2-1 through 3.1.2-3)

In LRA Tables 3.1.2-1 through 3.1.2-3, the applicant identified line items where no aging effects were identified as a result of its aging review process.

In LRA Tables 3.1.2-1 through 3.1.2-3, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from carbon and low-alloy steel are exposed to an (indoor) air environment.

Industry experience has shown that general corrosion of carbon steel or low-alloy steel components occurs only if the components were exposed to outdoor environments or to indoor environments that could promote the condensation of water on the external surfaces of the components. The external surface of the reactor vessel and the piping, fittings, and valve bodies of the reactor pressure boundary are normally at elevated temperatures. Consequently they are always dry, and corrosion is not observed.

The staff acknowledged, in NUREG-1833, that steel in an indoor controlled air environment exhibits no aging effect and that steel components and structures will therefore remain capable of performing intended functions consistent with the CLB for the period of extended operation. Because the external surface of the reactor vessel and the piping, fittings, and valve bodies of the reactor pressure boundary are not subject to an AERM, the staff finds the absence of an AMP for these component types to be acceptable. The staff concludes that there are no AERMs for carbon and low-alloy steel components exposed to indoor air.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the reactor vessel, reactor vessel internals, and reactor coolant system components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2 Aging Management of Engineered Safety Features Systems

This section of the SER documents the staff's review of the applicant's AMR results for the ESF systems components and component groups of:

- residual heat removal system
- core spray system
- automatic depressurization system
- high pressure coolant injection system
- reactor core isolation cooling system
- standby gas treatment system
- primary containment penetrations

3.2.1 Summary of Technical Information in the Application

LRA Section 3.2 provides AMR results for the ESF systems components and component groups. LRA Table 3.2.1, “Summary of Aging Management Evaluations for the Engineered Safety Features,” is a summary comparison of the applicant’s AMRs with those evaluated in the GALL Report for the ESF systems components and component groups.

The applicant’s AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant’s review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.2.2 Staff Evaluation

The staff reviewed LRA Section 3.2 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the ESF systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant’s claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff’s evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff’s audit evaluation are documented in SER Section 3.2.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant’s further evaluations were consistent with the SRP-LR Section 3.2.2.2 acceptance criteria. The staff’s audit evaluations are documented in SER Section 3.2.2.2.

The staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff’s evaluations are documented in SER Section 3.2.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant’s operating experience to verify the applicant’s claims.

Table 3.2-1 summarizes the staff’s evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.2 and addressed in the GALL Report.

Table 3.2-1 Staff Evaluation for Engineered Safety Features Systems Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel and stainless steel piping, piping components, and piping elements in ECCS (3.2.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	Fatigue is a TLAA. (See SER Section 4.3.1.3.2)
Steel with stainless steel cladding pump casing exposed to treated borated water (3.2.1-2)	Loss of material due to cladding breach	A plant-specific AMP is to be evaluated. Reference NRC Information Notice 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks"	None	Not applicable to BWRs
Stainless steel containment isolation piping and components internal surfaces exposed to treated water (3.2.1-3)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.3)
Stainless steel piping, piping components, and piping elements exposed to soil (3.2.1-4)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	None	Not applicable (See SER Section 3.2.2.2.3)
Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water (3.2.1-5)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.3)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.2.1-6)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis Program (B.1.20); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Partially encased stainless steel tanks with breached moisture barrier exposed to raw water (3.2.1-7)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated for pitting and crevice corrosion of tank bottoms because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	None	Not applicable (See SER Section 3.2.2.2.3)
Stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal) (3.2.1-8)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.3)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil (3.2.1-9)	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis Program (B.1.20); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.4)
Stainless steel heat exchanger tubes exposed to treated water (3.2.1-10)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.4)
Elastomer seals and components in SGTS exposed to air - indoor uncontrolled (3.2.1-11)	Hardening and loss of strength due to elastomer degradation	A plant-specific AMP is to be evaluated.	None	Not applicable (See SER Section 3.2.2.2.5)
Stainless steel high-pressure safety injection (charging) pump miniflow orifice exposed to treated borated water (3.2.1-12)	Loss of material due to erosion	A plant-specific AMP is to be evaluated for erosion of the orifice due to extended use of the centrifugal high pressure safety injection pump for normal charging.	None	Not applicable (PWR)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled (internal) (3.2.1-13)	Loss of material due to general corrosion and fouling	A plant-specific AMP is to be evaluated.	None	Not applicable (See SER Section 3.2.2.2.7)
Steel piping, piping components, and piping elements exposed to treated water (3.2.1-14)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One Time Inspection Program (B.1.21	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.8)
Steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water (3.2.1-15)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.8)
Steel piping, piping components, and piping elements exposed to lubricating oil (3.2.1-16)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis Program (B.1.20); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.8)
Steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil (3.2.1-17)	Loss of material due to general, pitting, crevice, and MIC	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	Buried Piping Inspection Program (B.1.1)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.9)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.2.1-18)	Cracking due to SCC and IGSCC	BWR Stress Corrosion Cracking and Water Chemistry	BWR Stress Corrosion Cracking Program (B.1.5); Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.9)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to steam or treated water (3.2.1-19)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion Program (B.1.13)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.10)
CASS piping, piping components, and piping elements exposed to treated water (borated or unborated) > 250°C (> 482°F) (3.2.1-20)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	None	Not applicable (There are no CASS components in the ESF systems.) (See SER Section 3.2.2.3.8)
High-strength steel closure bolting exposed to air with steam or water leakage (3.2.1-21)	Cracking due to cyclic loading, SCC	Bolting Integrity	None	Not applicable (High strength steel closure bolting is not used in ESF systems.) (See SER Section 3.2.2.3.8)
Steel closure bolting exposed to air with steam or water leakage (3.2.1-22)	Loss of material due to general corrosion	Bolting Integrity	Bolting Integrity Program (B.1.31)	Consistent with the GALL Report. (See SER Section 3.2.2.3.8)
Steel bolting and closure bolting exposed to air - outdoor (external), or air - indoor uncontrolled (external) (3.2.1-23)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	System Walkdown Program (B.1.28) and Bolting Integrity Program (B.1.31)	Consistent with the GALL Report. (See SER Section 3.2.2.1.11)
Steel closure bolting exposed to air - indoor uncontrolled (external) (3.2.1-24)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	Bolting Integrity Program (B.1.31)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.18)
Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water > 60°C (> 140°F) (3.2.1-25)	Cracking due to SCC	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.2.1-26)	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	None	Not applicable. (Steel containment isolation components exposed to closed cycle cooling water are all part of other safety systems that are evaluated separately.) (See SER Section 3.2.2.3.8)
Steel heat exchanger components exposed to closed cycle cooling water (3.2.1-27)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water (3.2.1-28)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.2.1-29)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	None	There are no copper alloy components exposed to closed cycle cooling water in the ESF systems.) (See SER Section 3.2.2.3.8)
Stainless steel and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.2.1-30)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
External surfaces of steel components including ducting, piping, ducting closure bolting, and containment isolation piping external surfaces exposed to air - indoor uncontrolled (external); condensation (external) and air - outdoor (external) (3.2.1-31)	Loss of material due to general corrosion	External Surfaces Monitoring	System Walkdown Program (B.1.28)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.12)
Steel piping and ducting components and internal surfaces exposed to air - indoor uncontrolled (Internal) (3.2.1-32)	Loss of material due to general corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	System Walkdown Program (B.1.28); Periodic Surveillance and Preventive Maintenance Program (B.1.22); Fire Protection Program (B.1.12.1); Fire Water System Program (B.1.12.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.13)
Steel encapsulation components exposed to air - indoor uncontrolled (internal) (3.2.1-33)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	None	Not applicable (The ESF systems include no steel encapsulation components.)
Steel piping, piping components, and piping elements exposed to condensation (internal) (3.2.1-34)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.14)
Steel containment isolation piping and components internal surfaces exposed to raw water (3.2.1-35)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	Containment Leak Rate Program (B.1.8); Containment Inservice Inspection Program (B.1.15.1)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.15)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel heat exchanger components exposed to raw water (3.2.1-36)	Loss of material due to general, pitting, crevice, galvanic, and MIC, and fouling	Open-Cycle Cooling Water System	Service Water Integrity Program (B.1.26); Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.16)
Stainless steel piping, piping components, and piping elements exposed to raw water (3.2.1-37)	Loss of material due to pitting, crevice, and MIC	Open-Cycle Cooling Water System	Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.17)
Stainless steel containment isolation piping and components internal surfaces exposed to raw water (3.2.1-38)	Loss of material due to pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	None	Not applicable (There are no stainless steel containment isolation components exposed to raw water in the ESF systems.) (See SER Section 3.2.2.3.8)
Stainless steel heat exchanger components exposed to raw water (3.2.1-39)	Loss of material due to pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	Service Water Integrity Program (B.1.26)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water (3.2.1-40)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	Service Water Integrity Program (B.1.26)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Copper alloy > 15 percent Zn piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.2.1-41)	Loss of material due to selective leaching	Selective Leaching of Materials	None	Not applicable (There are no copper alloy > 15 percent zinc components exposed to closed cycle cooling water in the ESF systems.) (See SER Section 3.2.2.3.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Gray cast iron piping, piping components, piping elements exposed to closed-cycle cooling water (3.2.1-42)	Loss of material due to selective leaching	Selective Leaching of Materials	Selective Leaching Program (B.1.25)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Gray cast iron piping, piping components, and piping elements exposed to soil (3.2.1-43)	Loss of material due to selective leaching	Selective Leaching of Materials	None	Not applicable (There are no gray cast iron components exposed to soil in the ESF systems.) (See SER Section 3.2.2.3.8)
Gray cast iron motor cooler exposed to treated water (3.2.1-44)	Loss of material due to selective leaching	Selective Leaching of Materials	Selective Leaching Program (B.1.25)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Aluminum, copper alloy > 15 percent Zn, and steel external surfaces, bolting, and piping, piping components, and piping elements exposed to air with borated water leakage (3.2.1-45)	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	None	Not applicable to BWRs
Steel encapsulation components exposed to air with borated water leakage (internal) (3.2.1-46)	Loss of material due to general, pitting, crevice and boric acid corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	None	Not applicable to BWRs
CASS piping, piping components, and piping elements exposed to treated borated water > 250°C (> 482°F) (3.2.1-47)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel or stainless-steel-clad steel piping, piping components, piping elements, and tanks (including safety injection tanks/accumulators) exposed to treated borated water > 60°C (> 140°F) (3.2.1-48)	Cracking due to SCC	Water Chemistry	None	Not applicable to BWRs
Stainless steel piping, piping components, piping elements, and tanks exposed to treated borated water (3.2.1-49)	Loss of material due to pitting and crevice corrosion	Water Chemistry	None	Not applicable to BWRs
Aluminum piping, piping components, and piping elements exposed to air - indoor uncontrolled (internal/external) (3.2.1-50)	None	None	None	Not applicable (See SER Section 3.2.2.1)
Galvanized steel ducting exposed to air - indoor controlled (external) (3.2.1-51)	None	None	None	Not applicable
Glass piping elements exposed to air - indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water (3.2.1-52)	None	None	None	Consistent with GALL Report Galvanized steel surfaces are evaluated as steel in the ESF systems.)
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.2.1-53)	None	None	None	Consistent with GALL Report 9 See SER Section 3.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.2.1-54)	None	None	None	Not applicable (There are no steel components of the ESF systems in indoor controlled air environments. All indoor air environments are conservatively considered to be uncontrolled)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.2.1-55)	None	None	None	Not applicable (There are no steel or stainless steel components in the ESF systems embedded in concrete).
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas (3.2.1-56)	None	None	None	Consistent with GALL Report (See SER Section 3.2.2.1)
Stainless steel and copper alloy < 15 percent Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.2.1-57)	None	None	None	Not applicable to BWRs

The staff's review of the ESF systems component groups followed any one of several approaches. One approach, documented in SER Section 3.2.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.2.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.2.2.3, reviewed AMR results for components that the applicant indicated are not consistent with or not addressed in the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the ESF systems components is documented in SER Section 3.0.3.

3.2.2.1 AMR Results Consistent with the GALL Report

Summary of Technical Information in the Application LRA Section 3.2.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the ESF systems components:

- Buried Piping and Tanks Inspection Program
- Containment Leak Rate Program
- Flow-Accelerated Corrosion Program
- Heat Exchanger Monitoring Program
- Oil Analysis Program
- One-Time Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Selective Leaching Program
- Service Water Integrity Program
- System Walkdown Program
- Water Chemistry Control - Auxiliary Systems Program
- Water Chemistry Control - BWR Program
- Water Chemistry Control - Closed Cooling Water Program

Staff Evaluation. LRA Tables 3.2.2-1 through 3.2.2-7 summarize AMRs for the ESF systems components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determines whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL

Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determines whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determines whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determines whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the ESF systems components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.2.1, the applicant's references to the GALL Report are acceptable and no further staff review is required.

3.2.2.1.1 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-3, the applicant stated that the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material for stainless steel containment isolation piping and components internal surfaces exposed to treated water of the ESF system.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the LRA Tables 3.2.2-1 to 3.2.2-7. The staff reviewed the applicant's Water Chemistry Control – BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff found each program acceptable. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-3 within the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.1.2 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-5, the applicant stated that the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in stainless steel and aluminum piping and piping components exposed to treated water of the ESF system.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the LRA Tables 3.2.2-1 to 3.2.2-7. The staff reviewed the applicant's Water Chemistry Control – BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff found each program acceptable. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-5 within the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.3 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-6, the applicant stated that the Oil Analysis Program manages loss of material in stainless steel and copper alloy components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the LRA Tables 3.2.2-1 to 3.2.2-7. In a letter dated July 14, 2006, the applicant revised the LRA so that the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff reviewed the applicant's Oil Analysis Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.13 and 3.0.3.1.6, respectively. The staff found each program acceptable. With the change discussed above, the applicant is managing the loss of material due to pitting, and crevice corrosion of stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil in a manner that is consistent with the GALL Report and therefore acceptable to the staff. In addition, this aging effect is also managed for carbon steel gauges, filter housings, heater housings, pump casings, strainer housings, tanks, gear boxes, and heat exchanger shells as well as gray cast iron valve bodies exposed to lubricating oil.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.4 Reduction of Heat Transfer Due to Fouling

In the discussion column of LRA Table 3.2.1, Item 3.2.1-9, the applicant stated that the Oil Analysis Program manages reduction of heat transfer in steel, stainless steel and copper alloy components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the LRA Tables 3.2.2-1 to 3.2.2-7. In a letter dated July 14, 2006, the applicant revised the LRA so that the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff reviewed the applicant's Oil Analysis Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.13 and 3.0.3.1.6, respectively. With the change discussed above, the applicant is managing the reduction of heat transfer due to fouling of steel, stainless steel and copper alloy heat exchanger tubes exposed to lubricating oil in a manner that is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.5 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-10, the applicant stated that the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in stainless steel heat exchanger tubes exposed to treated water of the ESF system.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the LRA Tables 3.2.2-1 to 3.2.2-7. The staff reviewed the applicant’s Water Chemistry Control – BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff found each program acceptable. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-10 within the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.6 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-14, the applicant stated that the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in steel piping, piping components, and piping elements exposed to treated water of the ESF system.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the LRA Tables 3.2.2-1 to 3.2.2-7. The staff reviewed the applicant's Water Chemistry Control – BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff found each program acceptable. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-14 within the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.7 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-15, the applicant stated that the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated of the ESF system.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the LRA Tables 3.2.2-1 to 3.2.2-7. The staff reviewed the applicant's Water Chemistry Control – BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff found each program acceptable. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-15 within the population that is subject to the One-Time Inspection Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.8 Loss of Material Due to General, Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-16 the applicant stated that the Oil Analysis Program manages loss of material in steel components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the LRA Tables 3.2.2-1 to 3.2.2-7. In a letter dated July 14, 2006, the applicant revised the LRA so that the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff reviewed the applicant's Oil Analysis Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.13 and 3.0.3.1.6, respectively. The staff found each program acceptable. With the change discussed above, the applicant is managing the loss of material due to general pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to lubricating oil in a manner that is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.9 Cracking Due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

In the discussion column of LRA Table 3.2.1, Item 3.2.1-18, the applicant stated that the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage cracking due to SCC and IGSCC in stainless steel piping, piping components, and piping elements of the ESF system. The VYNPS Water Chemistry Control – BWR Program optimizes the primary water chemistry to minimize the potential for cracking. This is accomplished by limiting the levels of contaminants in the reactor coolant system that could cause cracking. Additionally, VYNPS has instituted hydrogen water chemistry with noble metals to limit the potential for IGSCC through the reduction of dissolved oxygen in the treated water.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the LRA Tables 3.2.2-1 to 3.2.2-7. The staff reviewed the applicant's Water Chemistry Control – BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff found each program acceptable.

On the basis of its review, the staff finds that managing cracking due to SCC and IGSCC Water Chemistry Control-BWR Program, One-Time Inspection Program, and Inservice Inspection Program appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.10 Wall Thinning Due to Flow-Accelerated Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-19, the applicant stated that the Flow-Accelerated Corrosion Program will be used to manage wall thinning in steel piping, piping components, and piping elements exposed to steam or treated water of the ESF system.

The staff reviewed the applicant’s Flow-Accelerated Corrosion Program. This evaluation is documented in SER Section 3.0.3.1.2, which the staff found acceptable. During interviews with the applicant’s technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-19 within the population that is subject to the Flow-Accelerated Corrosion Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.11 Loss of Material Due to General, Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-23 the applicant stated that the System Walkdown Program manages loss of material due to general, pitting and crevice corrosion exposed to air outdoor (external) or air indoor uncontrolled (external) for steel bolting and closure bolting components.

During the audit and review, the staff asked the applicant to clarify the basis for using its System Walkdown Program to manage aging of carbon steel bolting instead the AMP recommended by the GALL Report. In a letter dated July 6, 2006, the applicant agreed to prepare and submit an AMP consistent with GALL AMP XI.M18, “Bolting Integrity,” for review and approval. In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Bolting Integrity Program. The staff’s evaluation of this program is documented in SER Section 3.0.3.2.19. With this change, the applicant’s management of loss of material due to general, pitting and crevice corrosion of steel bolting and closure bolting, will be consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.12 Loss of Material Due to General Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-31, the applicant stated that the System Walkdown Program will be used to manage loss of material to external surfaces of steel components including ducting, piping, ducting closure bolting, and containment isolation piping external surfaces exposed to air-indoor uncontrolled (external); condensation (external) and air-outdoor (external) in the ESF system.

The staff reviewed the applicant’s System Walkdown Program. This evaluation is documented in SER Section 3.0.3.1.9, which the staff found acceptable. During interviews with the applicant’s technical personnel, the staff confirmed that the applicant included all components in LRA

Table 3.2.1, Item 3.2.1-31 within the population that is subject to the System Walkdown Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.13 Loss of Material Due to General Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-32, the applicant stated that the System Walkdown Program, Periodic Surveillance and Preventive Maintenance Program, Fire Protection Program, Fire Water System Program, and the One-Time Inspection Program will be used to manage loss of material to steel piping and ducting components and internal surfaces exposed to air-indoor uncontrolled (internal) in the ESF system.

The staff reviewed the applicant's System Walkdown Program, Periodic Surveillance and Preventive Maintenance Program, Fire Protection Program, Fire Water System Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.9, 3.0.3.3.5, 3.0.3.2.11, 3.0.3.2.12, and 3.0.3.1.6, respectively. The staff found each program acceptable. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-32 within the population that is subject to the five programs. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.14 Loss of Material Due to General, Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-34, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program will be used to manage loss of material to steel piping, piping components and piping elements exposed to condensation (internal) in the ESF system.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program. This evaluation is documented in SER Section 3.0.3.3.5, which the staff found acceptable. Preventive maintenance activities and periodic surveillances provide for periodic component inspections and testing to detect aging effects. Inspection intervals are established such that they provide timely detection of degradation. Inspection intervals are dependent on component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-34 within the population that is subject to the Periodic Surveillance and Preventive Maintenance Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.15 Loss of Material Due to General, Pitting, Crevice Corrosion, Microbiologically-Influenced Corrosion and Fouling

In the discussion column of LRA Table 3.2.1, Item 3.2.1-35, the applicant stated that the Containment Leak Rate Program will be used to manage loss of material due to general, pitting, crevice corrosion, MIC and fouling of steel containment isolation piping and components internal surfaces exposed to raw water in the ESF system.

The staff reviewed the applicant's Containment Leak Rate Program. This evaluation is documented in SER Section 3.0.3.2.8, which the staff found acceptable. During the audit and review, the staff confirmed that the Containment Leak Rate Program is supplemented by the Containment Inservice Inspection Program, which performs inspections to validate the Containment Leak Rate Program. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-35 within the population that is subject to the Containment Leak Rate Program. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.16 Loss of Material Due to General, Pitting, Crevice, Galvanic, Microbiologically-Influenced Corrosion and Fouling

In the discussion column of LRA Table 3.2.1, Item 3.2.1-36, the applicant stated that the Service Water Integrity Program manages loss of material for carbon steel components exposed to raw water and for other piping components of the SGTS while the Periodic Surveillance and Preventive Maintenance Program manages loss of material for carbon steel components exposed to raw water in the ESF system.

The staff reviewed the applicant's Service Water Integrity Program and Periodic Surveillance and Preventive Maintenance Program. These evaluations are documented in SER Sections 3.0.3.2.16 and 3.0.3.3.5, respectively. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.2.1, Item 3.2.1-36 within the population that is subject to the Service Water Integrity and Periodic Surveillance and Preventive Maintenance Programs. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.17 Loss of Material Due to Pitting, Crevice Corrosion and Microbiologically-Influenced Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-37, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program will be used to manage loss of material due to pitting, crevice corrosion, MIC and fouling of stainless steel piping, piping components and piping elements exposed to raw water in the ESF system.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program. This evaluation is documented in SER Section 3.0.3.3.5. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.2.2.1.18 Loss of Preload Due to Thermal Effects, Gasket Creep and Self-Loosening

In the discussion column of LRA Table 3.2.1, Item 3.2.1-24 the applicant stated that the loss of preload was not an AERM.

During the audit and review, the staff asked the applicant to justify the position that was taken in not managing the aging effect for loss of preload, instead of using the AMP recommended in the GALL Report. In a letter dated July 6, 2006, the applicant committed (Commitment #34) to prepare and submit an AMP consistent with GALL AMP XI.M18, "Bolting Integrity," for review and approval. In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Bolting Integrity Program. The staff's evaluation of this program is documented in SER Section 3.0.3.2.19, which the staff found acceptable. In addition, by letter dated January 4, 2007, the applicant provided clarification that its Bolting Integrity Program addresses all bolting. With this change, the applicant's management of loss of preload due to thermal effects, gasket creep and self loosening of steel closure bolting, will be consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant, with the change in the application and Commitment #34 identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

Conclusion. The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the associated aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs in the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In LRA Section 3.2.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the ESF systems components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to cladding

- loss of material due to pitting and crevice corrosion
- reduction of heat transfer due to fouling
- hardening and loss of strength due to elastomer degradation
- loss of material due to erosion
- loss of material due to general corrosion and fouling
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and MIC
- quality assurance for aging management of nonsafety-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.2.2.2. The staff's review of the applicant's further evaluation follows.

3.2.2.2.1 Cumulative Fatigue Damage

LRA Section 3.2.2.2.1 states that fatigue is a TLAA, as required by 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA.

3.2.2.2.2 Loss of Material Due to Cladding

The staff reviewed LRA Section 3.2.2.2.2 against the criteria in SRP-LR Section 3.2.2.2.2.

In LRA Section 3.2.2.2.2, the applicant stated that for the cracking due to underclad cracking, this aging effect is not applicable to VYNPS. This item covers underclad cracking of cladding on PWR steel pump casings. VYNPS is a BWR and does not have charging pumps or steel pump casings with stainless steel cladding.

SRP-LR Section 3.2.2.2.2 states that loss of material due to cladding breach may occur in PWR steel pump casings with stainless steel cladding exposed to treated borated water. The GALL Report references IN 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.

The staff determined that the cracking due to underclad cracking is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.2.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.2.2.2.3 against the following SRP-LR Section 3.2.2.2.3 criteria:

(1) LRA Section 3.2.2.2.3 addresses loss of material of internal surfaces of stainless steel piping and components in ESF systems exposed to treated water due to pitting and crevice corrosion.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur on internal surfaces of stainless steel containment isolation piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry to mitigate degradation. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The LRA states that loss of material due to pitting and crevice corrosion for internal surfaces of stainless steel piping and components in ESF systems exposed to treated water is managed by the Water Chemistry Control-BWR Program. The effectiveness of the applicant's Water Chemistry Control-BWR Program will be confirmed by VYNPS the One-Time Inspection Program, through an inspection of a representative sample of components including areas of stagnant flow.

The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. The staff finds that this combination satisfies the criteria of SRP-LR Section 3.2.2.2.3 and therefore is acceptable.

(2) LRA Section 3.2.2.2.3 addresses the loss of material due to pitting and crevice corrosion, this aging effect is not applicable to VYNPS. At VYNPS, there are no stainless steel ESF system components that are in contact with a soil environment. This item is therefore not applicable.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff determines that stainless steel components are not present in a soil environment, therefore, the loss of material due to pitting and crevice corrosion is not applicable at VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(3) LRA Section 3.2.2.2.3 addresses the loss of material of BWR stainless steel and aluminum piping and piping components exposed to treated water due to pitting and crevice corrosion.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in BWR stainless steel and aluminum piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry for BWRs to mitigate degradation. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The LRA states that loss of material from pitting and crevice corrosion for BWR stainless steel and aluminum piping and piping components exposed to treated water is managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components including areas of stagnant flow.

The applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. The staff finds that this combination satisfies the criteria of SRP-LR Section 3.2.2.2.3 and therefore is acceptable.

(4) LRA Section 3.2.2.2.3 addresses loss of material of copper alloy and stainless steel piping and components in ESF systems that are exposed to lubricating oil due to pitting and crevice corrosion.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The LRA states that loss of material from pitting and crevice corrosion could occur for copper alloy and stainless steel piping and components in ESF systems that are exposed to lubricating oil. Loss of material is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

The applicant’s Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates) thereby preserving an environment that is not conducive to loss of material. The staff reviewed the applicant's plant-specific and industry operating experience and confirmed that the program is maintaining contaminants within limits such that corrosion has not affected the intended functions of these components. In a letter dated July 14, 2006, the applicant stated that the Oil Analysis Program will be supplemented by the One-Time Inspection Program, to verify its effectiveness. The staff finds that this combination satisfies the criteria of SRP-LR Section 3.2.2.2.3 and therefore is acceptable.

(5) LRA Section 3.2.2.2.3 addresses the loss of material due to pitting and crevice corrosion, this aging effect is not applicable to VYNPS. Loss of material from pitting and crevice corrosion could occur for partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. At VYNPS, there are no outdoor stainless steel tanks in the ESF systems.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may 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 of a plant-specific AMP to ensure that this 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.

The staff determines through discussions with the applicant’s technical personnel, that the loss of material due to pitting and crevice corrosion is therefore not applicable.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(6) LRA Section 3.2.2.2.3 addresses loss of material of BWR stainless steel piping and piping components internally exposed to condensation due to pitting and crevice corrosion.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The LRA states that loss of material from pitting and crevice corrosion for BWR stainless steel piping and piping components internally exposed to condensation is managed by the Periodic Surveillance and Preventive Maintenance Program. This program uses visual and other NDE techniques to manage loss of material for these components.

The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for loss of material from pitting and crevice corrosion which may occur for stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. It is therefore acceptable to the staff.

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.2.2.2.3 criteria. For those line items that apply to LRA Section 3.2.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.4 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.2.2.2.4 against the following SRP-LR Section 3.2.2.2.4 criteria:

(1) LRA Section 3.2.2.2.4 addresses the reduction of heat transfer of copper alloy heat exchanger tubes exposed to lubricating oil in ESF systems due to fouling.

SRP-LR Section 3.2.2.2.4 states that reduction of heat transfer due to fouling may occur in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The existing AMP monitors and controls lube oil chemistry to mitigate reduction of heat transfer due to fouling. However, control of lube oil chemistry may not always be fully effective in precluding fouling; therefore, the effectiveness of lube oil chemistry control should be verified to ensure that fouling does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of lube oil chemistry control. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component’s intended functions will be maintained during the period of extended operation.

The LRA states that reduction of heat transfer due to fouling for copper alloy heat exchanger tubes exposed to lubricating oil in ESF systems is managed by the Oil Analysis Program. There are no stainless steel or steel heat exchanger tubes exposed to lubricating oil in the ESF systems. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to fouling. Operating experience has confirmed the effectiveness of this program in maintaining contaminants within limits such that fouling has not and will not affect the intended functions of these components.

The applicant's Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates) thereby preserving an environment that is not conducive to fouling. The staff reviewed the applicant's plant-specific and industry operating experience and confirmed that the program is maintaining contaminants within limits such that corrosion has not affected the intended functions of these components. In a letter dated July 14, 2006, the applicant stated that the Oil Analysis Program will be supplemented by the One-Time Inspection Program, to verify its effectiveness. The staff finds that this combination satisfies the criteria of SRP-LR Section 3.2.2.2.4 and is therefore acceptable.

(2) LRA Section 3.2.2.2.4 addresses the reduction of heat transfer of stainless steel heat exchanger tubes exposed to treated water in ESF systems due to fouling.

SRP-LR Section 3.2.2.2.4 states that reduction of heat transfer due to fouling may occur in stainless steel heat exchanger tubes exposed to treated water. The existing program controls water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may be inadequate; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that reduction of heat transfer due to fouling does not occur. A one-time inspection is an acceptable method to ensure that reduction of heat transfer does not occur and that component intended functions will be maintained during the period of extended operation.

The LRA states that reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water in ESF systems is managed by the Water Chemistry Control-BWR Program. The effectiveness of the applicant's Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

The applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements. The staff finds that this combination satisfies the criteria of SRP-LR Section 3.2.2.2.4 and is therefore acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.4 criteria. For those line items that apply to LRA Section 3.2.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.5 Hardening and Loss of Strength Due to Elastomer Degradation

The staff reviewed LRA Section 3.2.2.2.5 against the criteria in SRP-LR Section 3.2.2.2.5.

LRA Section 3.2.2.2.5 addresses the hardening and loss of strength due to elastomer degradation, this aging effect is not applicable to VYNPS. At VYNPS, there are no elastomeric components in the ESF systems.

SRP-LR Section 3.2.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer seals and components of the BWR SGTS ductwork and filters exposed to air - indoor uncontrolled. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff determines through discussions with the applicant's technical personnel that the hardening and loss of strength due to elastomer degradation is not applicable.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.2.2.2.6 Loss of Material Due to Erosion

The staff reviewed LRA Section 3.2.2.2.6 against the criteria in SRP-LR Section 3.2.2.2.6.

LRA Section 3.2.2.2.6 addresses the loss of material due to erosion, this aging effect is not applicable to VYNPS. This discussion refers to stainless steel high pressure safety injection (HPSI) pump miniflow recirculation orifice exposed to treated borated water. VYNPS is a BWR and has no HPSI pump miniflow orifice and as such this item is not applicable.

SRP-LR Section 3.2.2.2.6 states that loss of material due to erosion may occur in the stainless steel HPSI pump miniflow recirculation orifice exposed to treated borated water. The GALL Report recommends that plant-specific AMPs 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 50-275/94-023 for evidence of erosion. Further evaluation is recommended to ensure that the aging effect is adequately managed.

The staff determines, through discussions with the applicant's technical personnel, that the loss of material due to erosion is not applicable.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.2.2.2.7 Loss of Material Due to General Corrosion and Fouling

The staff reviewed LRA Section 3.2.2.2.7 against the criteria in SRP-LR Section 3.2.2.2.7.

LRA Section 3.2.2.2.7 addresses the loss of material due to general corrosion and fouling, this aging effect is not applicable to VYNPS. This item refers to loss of material due to general corrosion and fouling occurring for steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air-indoor uncontrolled (internal). At VYNPS, the spray nozzles are copper alloy and are not subject to loss of material due to general corrosion in an indoor air environment. There are also no orifices in ECCS systems exposed to an indoor air environment (internal).

SRP-LR Section 3.2.2.2.7 states that loss of material due to general corrosion and fouling may occur on steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air-indoor uncontrolled and may cause 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 this system is mostly 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.

The staff determined, through discussions with the applicant’s technical personnel, that the loss of material due to general corrosion and fouling in steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air-indoor uncontrolled (internal) is not applicable.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.2.2.2.8 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.2.2.2.8 against the following SRP-LR Section 3.2.2.2.8 criteria:

(1) LRA Section 3.2.2.2.8 addresses the loss of material of BWR steel piping and components in ESF systems exposed to treated water due to general, pitting, and crevice corrosion.

    SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur in BWR steel piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry for BWRs to mitigate degradation. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The LRA states that loss of material due to general, pitting and crevice corrosion for BWR steel piping and components in ESF systems exposed to treated water is managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

The applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The One-Time Inspection Program is used to verify the effectiveness through inspection of a representative inspection including stagnant and low flow areas. The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements. The staff finds that this combination satisfies the criteria of SRP-LR Section 3.2.2.2.8 and is therefore acceptable.

(2) LRA Section 3.2.2.2.8 addresses the loss of material of internal surfaces of primary containment penetration steel piping and components exposed to treated water due to general, pitting and crevice corrosion.

SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur on the internal surfaces of steel containment isolation piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry to mitigate degradation. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The LRA states that the loss of material due to general, pitting and crevice corrosion for internal surfaces of primary containment penetration steel piping and components exposed to treated water is managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components including areas of stagnant flow.

The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements. The staff finds that this combination satisfies the criteria of SRP-LR Section 3.2.2.2.8 and is therefore acceptable.

(3) LRA Section 3.2.2.2.8 addresses loss of material of steel piping and components in ESF systems exposed to lubricating oil due to general, pitting and crevice corrosion.

SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The LRA states that loss of material due to general, pitting and crevice corrosion for steel piping and components in ESF systems exposed to lubricating oil is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

The applicant's Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates) thereby preserving an environment that is not conducive to fouling. The staff reviewed the applicant's plant-specific and industry operating experience and confirmed that the program is maintaining contaminants within limits such that corrosion has not affected the intended functions of these components. In a letter dated July 14, 2006, the applicant stated that its Oil Analysis Program will be supplemented by the One-Time Inspection Program, to verify its effectiveness. The staff finds this combination satisfies the criteria of SRP-LR Section 3.2.2.2.8 and is therefore acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.8 criteria. For those line items that apply to LRA Section 3.2.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.9 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.2.2.2.9 against the criteria in SRP-LR Section 3.2.2.2.9.

LRA Section 3.2.2.2.9 addresses loss of material of steel (with or without coating or wrapping) piping and piping components buried in soil in ESF systems due to general, pitting, crevice, and MIC.

SRP-LR Section 3.2.2.2.9 states that loss of material due to general, pitting, crevice, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. Buried piping and tanks inspection programs rely on industry practice, frequency of pipe excavation, and operating experience to manage the aging effects of loss of material from general, pitting, and crevice corrosion, and MIC. The effectiveness of the buried piping and tanks inspection program should be verified by evaluation of an applicant's inspection frequency and operating experience with buried components to ensure that loss of material does not occur.

The LRA states that loss of material due to general, pitting, crevice, and MIC for steel (with or without coating or wrapping) piping and piping components buried in soil in ESF systems is managed by the Buried Piping Inspection Program. There are no buried tanks in the ESF systems. The applicant's Buried Piping Inspection Program will include: (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within 10 years of entering the period of extended operation, unless an opportunistic inspection occurred within this 10-year period.

The staff confirmed that buried piping has already been inspected within the final 10-year period before the period of extended operation. Therefore, even if no other buried piping is examined before the period of extended operation, VYNPS has followed staff guidance regarding the examination of buried piping through the end of the current operating license. The proposed schedule for inspection (if there is no other opportunity) is consistent with the staff's guidance and therefore acceptable to the staff.

Based on the program identified above, the staff concludes that it meets SRP-LR Section 3.2.2.2.9 criteria. For those line items that apply to LRA Section 3.2.2.2.9, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program, which the staff found acceptable.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff determines that the applicant adequately addressed the issues that were further evaluated. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.2.2-1 through 3.2.2-7, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.2.2-1 through 3.2.2-7, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report. These items were reviewed and they are further addressed in SER Section 3.2.2.3

In LRA Tables 3.2.2-1 through 3.2.2-7, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information concerning how the aging effects will be managed. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations that are not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether it had demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is discussed in the following sections.

3.2.2.3.1 Residual Heat Removal System Summary of Aging Management Evaluation – LRA Table 3.2.2-1

The staff reviewed LRA Table 3.2.2-1, which summarizes the results of AMR evaluations for the RHRS component groups.

In LRA Table 3.2.2-1, the applicant proposed to manage cracking and loss of material (wear) of stainless steel heat exchanger tubes exposed to raw and treated water environment using the Service Water Integrity Program.

The staff reviewed the applicant's Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.16. The applicant stated, in the LRA, that this program relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the SWS will be managed for the period of extended operation. The SWS includes the SW, RHRSW, and alternate cooling systems. The program includes surveillance and control techniques to manage aging effects in the SWS or SCs serviced by the SWS. The staff finds the cracking and loss of material (wear) of stainless steel heat exchanger tubes exposed to raw and treated water environments are effectively managed using the Service Water Integrity Program. On this basis, the staff finds that management of cracking and loss of material wear in the RHRS is acceptable.

In LRA Table 3.2.2-1, the applicant proposed to manage loss or material of carbon steel materials for component types of bolting exposed to air-indoor (external) environment using the System Walkdown Program.

During the audit and review, the staff asked the applicant to clarify the basis for using its System Walkdown Program to manage aging of carbon steel bolting instead of the recommended GALL AMP XI.M18, "Bolting Integrity." By a letter dated July 6, 2006, the applicant agreed to prepare and submit for review and approval an AMP consistent with GALL AMP XI.M18. By a letter dated October 17, 2006, the applicant revised its LRA to include a discussion of its Bolting Integrity Program in LRA Section B.1.31. The staff's evaluation of the applicant's System Walkdown Program and Bolting Integrity Program in documented in SER Sections 3.0.3.1.9 and in 3.0.3.2.19, respectively. The staff finds that the applicant's Bolting Integrity Program conformed to the GALL Report and encompass all safety-related bolting as delineated in NUREG-1339, which includes the criteria established in the 1995 Edition through the 1996 Addenda of ASME Code, Section XI and that the applicant's System Walkdown Program is comprised of inspections of external surfaces of components subject to an AMR. On this basis, the staff finds that the applicant's management of carbon steel bolting in the RHRS consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.2 Core Spray System Summary of Aging Management Evaluation – LRA Table 3.2.2-2

The staff reviewed LRA Table 3.2.2-2, which summarizes the results of AMR evaluations for the CSS component groups.

In LRA Table 3.2.2-2, the applicant proposed to manage loss or material of carbon steel materials for component types of bolting exposed to air-indoor (external) environment using the System Walkdown Program.

During the audit and review, the staff asked the applicant to clarify the basis for using the System Walkdown Program to manage aging of carbon steel bolting instead of the recommended GALL AMP XI.M18, “Bolting Integrity.” By a letter dated July 6, 2006, the applicant agreed to prepare and submit for review and approval an AMP consistent with GALL AMP XI.M18. By a letter dated October 17, 2006, the applicant revised its LRA to include a discussion of the Bolting Integrity Program in LRA Section B.1.31. The applicant’s System Walkdown Program and Bolting Integrity Program in documented in SER Sections 3.0.3.1.9 and 3.0.3.2.19, respectively. The staff finds that the applicant’s Bolting Integrity Program conformed to the GALL Report and is adequate. On this basis, the staff finds that the applicant’s management of carbon steel bolting, in the CSS, is consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.3 Automatic Depressurization System Summary of Aging Management Evaluation – LRA Table 3.2.2-3

The staff reviewed LRA Table 3.2.2-3, which summarizes the results of AMR evaluations for the automatic depressurization system component groups.

In LRA Table 3.2.2-3, the applicant proposed to manage loss or material of carbon steel materials for component types of bolting exposed to air-indoor (external) environment using the System Walkdown Program.

During the audit andf review, the staff asked the applicant to clarify the basis for using the System Walkdown Program to manage aging of carbon steel bolting instead of the recommended GALL AMP XI.M18, “Bolting Integrity.” By letter dated July 14, 2006, the applicant agreed to prepare and submit for review and approval an AMP consistent with GALL AMP XI.M18l. By a letter dated October 17, 2006, the applicant revised its LRA to include a discussion of the Bolting Integrity Program in LRA Section B.1.31. The staff's evaluation of the applicant's System Walkdown Program and Bolting Integrity Program in documented in SER Sections 3.0.3.1.9 and 3.0.3.2.19, respectively. The staff finds that the applicant's Bolting Integrity Program conformed to the GALL Report and is adequate. On this basis, the staff finds that the applicant's management of carbon steel bolting, in the automatic depressurization system, consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.4 High Pressure Coolant Injection System Summary of Aging Management Evaluation – LRA Table 3.2.2-4

The staff reviewed LRA Table 3.2.2-4, which summarizes the results of AMR evaluations for the HPCIS component groups.

In LRA Table 3.2.2-4, the applicant proposed to manage loss of material wear of copper alloy and stainless steel materials for component types of heat exchanger tubes and orifice exposed to lube oil and treated water environments using the Heat Exchanger Monitoring Program.

The staff reviewed the applicant's Heat Exchanger Monitoring Program and its evaluation is documented in SER Section 3.0.3.3.1. The Heat Exchanger Monitoring Program will be used to inspect heat exchanger tubes for degradation using eddy current inspections. As stated in the LRA, this AMP is credited with managing the aging effect of loss of material on the pressure boundary intended function for the components for which this AMP is credited. The staff finds the aging effect of loss of material due to wear of copper alloy heat exchanger tubes exposed to lube oil and treated water are effectively managed using Heat Exchanger Monitoring Program. On this basis, the staff finds that management of loss of material wear in the HPCIS is acceptable.

In LRA Table 3.2.2-4, the applicant proposed to manage cracking of stainless steel material for component types of valve body exposed to lube oil environments using the Oil Analysis Program.

The staff reviewed the Oil Analysis Program and its evaluation is documented in SER Section 3.0.3.2.13. LRA Section A.2.1.22, states that the Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates) thereby preserving an environment that is not conducive to loss of material, cracking, or fouling. Activities include sampling and analysis of lubricating oil for detrimental contaminants, water, and particulates. In a letter dated July 14, 2006, the applicant stated that the effectiveness of the Oil Analysis Program will be confirmed by the One-Time Inspection Program. On this basis the staff finds that the aging effect of cracking of stainless steel material exposed to a lube oil environment is effectively managed using the Oil Analysis Program and that management of cracking in the HPCIS is acceptable.

In LRA Table 3.2.2-4, the applicant proposed to manage loss or material of carbon steel and stainless steel materials for component types of bolting exposed to an air-indoor (external) and air-outdoor (external) environment using the System Walkdown Program.

Durng the audit anr review, the staff asked the applicant to clarify the basis for using the System Walkdown Program to manage aging of carbon steel and stainless steel bolting instead of the recommended GALL AMP XI.M18, “Bolting Integrity.” By a letter dated July 14, 2006, the applicant agreed to prepare and submit for review and approval an AMP consistent with GALL AMP XI.M18l. By a letter dated October 17, 2006, the applicant revised its LRA to include a discussion of the Bolting Integrity Program in LRA Section B.1.31. The staff’s evaluation of the applicant’s System Walkdown Program and Bolting Integrity Program in documented in SER Sections 3.0.3.1.9 and 3.0.3.2.19, respectively. The staff finds that the applicant’s Bolting Integrity Program conformed to the recommendations of the GALL Report and encompass all safety-related bolting as delineated in NUREG-1339, which includes the criteria established in the 1995 Edition through the 1996 Addenda of ASME Code, Section XI and the applicant’s System Walkdown Program comprised of inspections of external surfaces of components subject to an AMR. On this basis, the staff finds that the applicant’s management of carbon steel and stainless steel bolting, in the HPCIS, consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.5 Reactor Core Isolation Cooling System Summary of Aging Management Evaluation – LRA Table 3.2.2-5

The staff reviewed LRA Table 3.2.2-5, which summarizes the results of AMR evaluations for the reactor core isolation cooling system (RCICS) component groups.

In LRA Table 3.2.2-5, the applicant proposed to manage loss of material wear of copper alloy and aluminum materials for component types of heat exchanger tubes and steam headers exposed to steam, treated water and a lube oil environment using the Heat Exchanger Monitoring Program.

The staff review the Heat Exchanger Monitoring Program and its evaluation is documented in SER Section 3.0.3.3.1. The Heat Exchanger Monitoring Program will inspect heat exchangers for degradation. Loss of material is the aging effect managed by this program. Representative tubes within the sample population of heat exchangers will be eddy current tested at a frequency determined by internal and external operating experience to ensure that effects of aging are identified prior to loss of intended function. The sample population of heat exchangers includes the HPCI GSC, HPCI lube oil cooler, RCIC lube oil cooler, CST steam reheat coil, drywell atmospheric cooling units (RRU-1, 2, 3 and 4), RRP seal water coolers, RRP motor upper and lower bearing oil coolers, and RRP motor air coolers. If degradation is found, then an evaluation will be performed to evaluate its effects on the heat exchanger's design functions including its ability to withstand a seismic event. The staff determines that the preventive actions program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.3. In the LRA, this AMP is credited with managing the aging effect of loss of material on the pressure boundary intended function for the components for which this AMP is credited. On this basis, the staff finds that management of loss of material wear in the RCICS is acceptable.

In LRA Table 3.2.2-5, the applicant proposed to manage loss of material of carbon steel and stainless steel materials for component types of bolting exposed to an air-indoor (external) and air-outdoor (external) environment using the System Walkdown Program.

During the audit and review, the staff asked the applicant to clarify the basis for using the System Walkdown Program to manage aging of carbon steel and stainless steel bolting instead of the recommended GALL AMP XI.M18, “Bolting Integrity.” By a letter dated July 6, 2006, the applicant agreed to prepare and submit for review and approval an AMP consistent with GALL AMP XI.M18. By a letter dated October 17, 2006, the applicant revised its LRA to include a discussion of the Bolting Integrity Program in LRA Section B.1.31. The staff’s evaluation of the applicant’s System Walkdown Program and Bolting Integrity Program in documented in SER Sections 3.0.3.1.9 and 3.0.3.2.19, respectively.The staff finds that the applicant’s Bolting Integrity Program conformed to the recommendations of the GALL Report and encompass all safety-related bolting as delineated in NUREG-1339, which includes the criteria established in the 1995 Edition through the 1996 Addenda of ASME Code, Section XI and the applicant’s System Walkdown Program comprised of inspections of external surfaces of components subject to an AMR. On this basis, the staff finds that the applicant’s management of carbon steel and stainless steel bolting, in the RCICS, consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.6 Standby Gas Treatment System Summary of Aging Management Evaluation – LRA Table 3.2.2-6

The staff reviewed LRA Table 3.2.2-6, which summarizes the results of AMR evaluations for the SGTS component groups.

In LRA Table 3.2.2-6, the applicant proposed to manage loss of material of carbon steel materials for component types of bolting exposed to an air-indoor (external) environment using the System Walkdown Program.

During the audit and review, the staff asked the applicant to clarify the basis for using the System Walkdown Program to manage aging of carbon steel bolting instead of the recommended GALL AMP XI.M18, “Bolting Integrity.” By a letter dated July 6, 2006, the applicant agreed to prepare and submit for review and approval an AMP consistent with GALL AMP XI.M18I. By a letter dated October 17, 2006, the applicant revised its LRA to include a discussion of the Bolting Integrity Program in LRA Section B.1.31. The staff’s evaluation of the applicant’s System Walkdown Program and Bolting Integrity Program in documented in SER

Sections 3.0.3.1.9 and 3.0.3.2.19, respectively.The staff finds that the applicant's Bolting Integrity Program conformed to the recommendations of the GALL Report and encompass all safety-related bolting as delineated in NUREG-1339, which includes the criteria established in the 1995 Edition through the 1996 Addenda of ASME Code, Section XI and the applicant's System Walkdown Program comprised of inspections of external surfaces of components subject to an AMR. On this basis, the staff finds that the applicant's management of carbon steel bolting, in the SGTS, consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.7 Primary Containment Penetrations Summary of Aging Management Evaluation – LRA Table 3.2.2-7

The staff reviewed LRA Table 3.2.2-7, which summarizes the results of AMR evaluations for the primary containment penetrations component groups.

In LRA Table 3.2.2-7, the applicant proposed to manage loss of material of carbon steel materials for component types of piping and valve body exposed to an untreated water environment using the Containment Leak Rate Program.

The staff's evaluation of the applicant's Containment Leak Rate Program and is documented in SER Section 3.0.3.2.8. The containment leak rate tests are required to assure that: (a) leakage through primary reactor containment and systems and components penetrating primary containment shall not exceed allowable values specified in technical specifications or associated bases and (b) periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of containment, and systems and components penetrating primary containment. As documented in the Audit and Review Report, the Containment Leak Rate Program is supplemented by the Containment Inservice Inspection Program, which performs inspections of containment including the penetrations. The staff finds that the aging effect of loss of material of carbon steel material exposed to an untreated water environment is effectively managed using the Containment Leak Rate Program. On this basis, the staff finds that management of loss of material in the primary containment penetrations is acceptable.

In LRA Table 3.2.2-7, the applicant proposed to manage loss of material of carbon steel materials for component types of bolting exposed to an air-indoor (external) environment using the System Walkdown Program.

During the audit and review, the staff asked the applicant to clarify the basis for using the System Walkdown Program to manage aging of carbon steel bolting instead of the recommended GALL AMP XI.M18, "Bolting Integrity." By a letter dated July 6, 2006, the applicant agreed to prepare and submit for review and approval an AMP consistent with GALL AMP XI.M18. By a letter dated October 17, 2006, the applicant revised its LRA to include a discussion of the Bolting Integrity Program in LRA Section B.1.31.The staff's evaluation of the applicant's System Walkdown Program and Bolting Integrity Program in documented in SER Sections 3.0.3.1.9 and 3.0.3.2.19, respectively. The staff finds that the applicant's management of carbon steel bolting, in the primary containment penetrations, consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.8 Aging Effects/Mechanisms Not Applicable at VYNPS – LRA Table 3.2.1

The staff reviewed LRA Table 3.2.1, which provides a summary of aging management evaluations for the ESF systems evaluated in the GALL Report.

In LRA Table 3.2.1, Item 3.2.1-20, the applicant stated that loss of fracture toughness of CASS piping, piping components, and piping elements exposed to treated water (borated or unborated) greater than250°C (482°F) due to thermal aging embrittlement is not applicable at VYNPS.

The staff reviewed, in the LRA and supporting documents, the ESF systems for any CASS piping, piping components, and piping elements exposed to treated water (borated or unborated) greater than 250°C (482°F), that have loss of fracture toughness due to thermal aging embrittlement. The staff determines that the loss of fracture toughness of CASS piping, piping components, and piping elements exposed to treated water is not applicable at VYNPS. On the basis that there are no CASS piping, piping components, and piping elements exposed to treated water in the ESF systems at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for this component type.

In LRA Table 3.2.1, Item 3.2.1-21, the applicant stated that cracking of high-strength steel closure bolting exposed to air with steam or water leakage due to cyclic loading and SCC is not applicable at VYNPS.

The staff reviewed, in the LRA and supporting documents, the ESF systems for any high-strength steel closure bolting exposed to air with steam or water leakage due to cyclic loading. The staff determines that cracking of high-strength steel closure bolting exposed to air with steam or water leakage due to cyclic loading and SCC is not applicable at VYNPS. On the basis that there are no high-strength steel closure bolting in the ESF systems at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for this component type.

In LRA Table 3.2.1, Item 3.2.1-22, the applicant stated that loss of material of steel closure bolting exposed to air with steam or water leakage due to general corrosion is not applicable at VYNPS. However, by letter dated January 4, 2007, the applicant providing additional clarification stating that its Bolting Integrity Program applies to all bolting exposed to air.

The staff reviewed the applicant's January 4, 2007 letter and determined that loss of material of steel closure bolting is managed by Bolting Integrity Program and consistent with the GALL Report recommendation. On this basis, the staff finds this acceptable.

In LRA Table 3.2.1, Item 3.2.1-26, the applicant stated that loss of material of steel piping, piping components, and piping elements exposed to closed cycle cooling water due to general, pitting, and crevice corrosion is not applicable at VYNPS. Steel containment isolation components exposed to closed cycle cooling water are all part of other safety systems that are evaluated separately.

The staff reviewed, in the LRA and supporting documents, the ESF systems for loss of material of steel piping, piping components, and piping elements exposed to closed cycle cooling water due to general, pitting, and crevice corrosion.The staff finds that the loss of material of steel piping, piping components, and piping elements exposed to closed cycle cooling water due to general, pitting, and crevice corrosion is not applicable to VYNPS. On the basis that there are no steel piping, piping components, and piping elements in the ESF systems at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for this component type.

In LRA Table 3.2.1, Item 3.2.1-29, the applicant stated that the loss of material of copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water due to pitting, crevice, and galvanic corrosion is not applicable at VYNPS. There are no copper alloy components exposed to closed cycle cooling water in the ESF system.

The staff reviewed, in the LRA and supporting documents, the ESF systems for loss of material of copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water due to pitting, crevice, and galvanic corrosion. The staff that the loss of material of copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water due to pitting, crevice, and galvanic corrosion is not applicable to VYNPS. On the basis that there are no copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water in the ESF systems at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for this component type.

In LRA Table 3.2.1, Item 3.2.1-33, the applicant stated that the loss of material of steel encapsulation components exposed to air-indoor uncontrolled (internal) due to general, pitting, and crevice corrosion is not applicable at VYNPS. There are no steel encapsulation components in the ESF system.

The staff reviewed, in the LRA and supporting documents, the ESF systems for loss of material of steel encapsulation components exposed to air-indoor uncontrolled (internal) due to general, pitting, and crevice corrosion. The staff finds that the loss of material of steel encapsulation components exposed to air-indoor uncontrolled (internal) due to general, pitting, and crevice corrosion is not applicable to VYNPS. On the basis that there are no steel encapsulation components in the ESF systems at VYNPS, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.2.1, Item 3.2.1-38, the applicant stated that the loss of material of stainless steel containment isolation piping and components internal surfaces exposed to raw water due to pitting, crevice, and MIC, and fouling is not applicable at VYNPS. There are no stainless steel containment isolation piping and components internal surfaces exposed to raw water in the ESF system.

The staff reviewed, in the LRA and supporting documents, the ESF systems for loss of material of stainless steel containment isolation piping and components internal surfaces exposed to raw water due to pitting, crevice, and MIC, and fouling. The staff finds that the loss of material of stainless steel containment isolation piping and components internal surfaces exposed to raw water due to pitting, crevice, and MIC, and fouling is not applicable to VYNPS. On the basis that there are no stainless steel containment isolation piping and components internal surfaces exposed to raw water in the ESF systems at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for this component type.

In LRA Table 3.2.1, Item 3.2.1-41, the applicant stated that loss of material of copper alloy greater than 15 percent zinc piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water due to selective leaching is not applicable at VYNPS.

The staff reviewed, in the LRA and supporting documents, the ESF systems for loss of material of copper alloy greater than15 percent Zinc piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water due to selective leaching. The staff finds that the loss of material of copper alloy greater than 15 percent zinc piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water due to selective leaching is not applicable to VYNPS. On the basis that there are no copper alloy greater than 15 percent zinc piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water in the ESF systems at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for this component type.

In LRA Table 3.2.1, Item 3.2.1-43, the applicant stated that loss of material of gray cast iron piping, piping components, and piping elements exposed to soil due to selective leaching is not applicable at VYNPS. There are no gray cast iron piping, piping components, and piping elements exposed to soil in the ESF system.

The staff reviewed, in the LRA and supporting documents, the ESF systems for loss of material of gray cast iron piping, piping components, and piping elements exposed to soil due to selective leaching. The staff finds that the loss of material of gray cast iron piping, piping components, and piping elements exposed to soil due to selective leaching is not applicable to VYNPS. On the basis that there are no gray cast iron piping, piping components, and piping elements exposed to soil in the ESF systems at VYNPS, the staff finds that this aging effect is not applicable to VYNPS for this component type.

3.2.2.3.9 Engineered Safety Features Systems AMR Line Items With No Aging Effects (LRA Tables 3.2.2-1 through 3.2.2-7)

In LRA Tables 3.2.2-1 through 3.2.2-7, the applicant identified AMR line items where no aging effects were identified as a result of its AMR. Specifically, instances in which the applicant states that no aging effects were identified occurred with components fabricated from aluminum, copper alloy, fiberglass, and stainless steel material exposed to air indoor (internal/external), air outdoor (external), and sand/concrete environment. The GALL Report states that steel, copper and stainless steel in an environment of plant air indoor (external), are not subject to any aging mechanisms.

The staff reviewed LRA Tables 3.2.2-1 through 3.2.2-7 and concludes that the applicant's analysis of the material and environment combinations will allow components fabricated of these materials, in these environments, that are within the scope of license renewal, to perform their intended function during the period of extended operation. No aging effects are considered to be applicable to components fabricated from aluminum, copper alloy, fiberglass, and stainless steel material exposed to air indoor (internal/external), air outdoor (external) and sand/concrete environment.

As copper alloy and aluminum components and stainless steels are highly resistant to corrosion in dry atmospheres in the absence of corrosive species, as cited in the American Society for Metals International Metals Handbook, Ninth Edition, Volume 13, the staff has accepted the position that stainless steel in an indoor (internal/external) environment and copper alloy and aluminum in an indoor (internal/external) and sand/concrete environments exhibit no aging effects and that the component or structure will therefore remain capable of performing its intended functions consistent with the CLB for the period of extended operation.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERM, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the ESF systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3 Aging Management of Auxiliary Systems

This section of the SER documents the staff's review of the applicant's AMR results for the auxiliary systems components and component groups of:

- standby liquid control system
- service water systems
- reactor building closed cooling water system
- emergency diesel generator system
- fuel pool cooling systems
- fuel oil system
- instrument air system
- fire protection-water system
- fire protection-carbon dioxide system
- heating, ventilation, and air conditioning systems
- primary containment atmosphere control and containment atmosphere dilution systems
- John Deere diesel
- augmented off-gas system

- condensate system
- containment air dilution
- condensate demineralizer system
- control rod drive system
- core spray system
- condensate storage and transfer system
- reactor waste cleanup filter demineralizer system
- circulating water system
- diesel generator and auxiliaries
- diesel lube oil system
- demineralized water system
- feedwater system
- fuel oil system
- fire protection system
- fuel pool cooling system
- fuel pool cooling filter demineralizer system
- house heating boiler system
- hydraulic control units
- high pressure coolant injection system
- heating, ventilation and air conditioning systems
- instrument air system
- motor-generator lube oil system
- nitrogen system
- nuclear boiler system
- neutron monitoring system
- post-accident sampling system
- primary containment atmosphere control system
- potable water system
- reactor building closed cooling water system
- reactor core isolation cooling system
- radwaste, liquid and solid
- residual heat removal system
- residual heat removal service water system
- equipment retired in place
- reactor water clean-up system
- standby fuel pool cooling system
- standby gas treatment system
- stator cooling system
- standby liquid control system
- sampling system
- service water system
- miscellaneous systems in-scope for 10 CFR 54.4(a)(2)

3.3.1 Summary of Technical Information in the Application

LRA Section 3.3 provides AMR results for the auxiliary systems components and component groups. LRA Table 3.3.1, “Summary of Aging Management Evaluations for the Auxiliary Systems Evaluated in Chapter VII of NUREG-1801,” is a summary comparison of the applicant’s AMRs with those evaluated in the GALL Report for the auxiliary systems components and component groups.

The applicant’s AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant’s review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.3.2 Staff Evaluation

The staff reviewed LRA Section 3.3 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the auxiliary systems components that are within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff performed an onsite audit of AMRs to ensure the applicant’s claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff’s evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff’s audit evaluation are documented in SER Section 3.3.2.1.

In the onsite audit, the staff also selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant’s further evaluations were consistent with the SRP-LR Section 3.3.2.2 acceptance criteria. The staff’s audit evaluations are documented in SER Section 3.3.2.2.

In the onsite audit, the staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff’s evaluations are documented in SER Section 3.3.2.3.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the auxiliary systems components.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant’s operating experience to verify the applicant’s claims.

Table 3.3-1 summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs, listed in LRA Section 3.3 and addressed in the GALL Report.

Table 3.3-1 Staff Evaluation for Auxiliary System Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel cranes - structural girders exposed to air - indoor uncontrolled (external) (3.3.1-1)	Cumulative fatigue damage	TLAA to be evaluated for structural girders of cranes. See the Standard Review Plan, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1).	None	This line item was not used. Steel cranes are evaluated as structural components in SER Section 3.5.
Steel and stainless steel piping, piping components, piping elements, and heat exchanger components exposed to air - indoor uncontrolled, treated borated water or treated water (3.3.1-2)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	None	Fatigue is a TLAA. (See SER Section 3.3.2.2.1)
Stainless steel heat exchanger tubes exposed to treated water (3.3.1-3)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.3.2.1.1 and 3.3.2.2.2)
Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution > 60°C (> 140°F) (3.3.1-4)	Cracking due to SCC	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Not applicable. (See SER Section 3.3.2.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and stainless clad steel heat exchanger components exposed to treated water > 60°C (> 140°F) (3.3.1-5)	Cracking due to SCC	Plant-specific	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.3.2.1.2 and 3.3.2.2.3)
Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-6)	Cracking due to SCC	Plant-specific	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.3 and 3.3.2.2.3)
Stainless steel non-regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-7)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	None	Not applicable to BWRs (See SER Section 3.3.2.2.4)
Stainless steel regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-8)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to SCC and cyclic loading. A plant-specific AMP is to be evaluated.	None	Not applicable to BWRs (See SER Section 3.3.2.2.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel high-pressure pump casing in PWR chemical and volume control system (3.3.1-9)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to SCC and cyclic loading. A plant-specific AMP is to be evaluated.	None	Not applicable to BWRs (See SER Section 3.3.2.2.4)
High-strength steel closure bolting exposed to air with steam or water leakage. (3.3.1-10)	Cracking due to SCC, cyclic loading	Bolting Integrity The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	None	Not applicable. (High-strength steel bolting is not used in the auxiliary systems.)
Elastomer seals and components exposed to air-indoor uncontrolled (internal/external) (3.3.1-11)	Hardening and loss of strength due to elastomer degradation	Plant-specific	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.3.2.1.4 and 3.3.2.2.5)
Elastomer lining exposed to treated water or treated borated water (3.3.1-12)	Hardening and loss of strength due to elastomer degradation	A plant-specific AMP that determines and assesses the qualified life of the linings in the environment is to be evaluated.	None	Not applicable (See SER Section 3.3.2.2.5)
Boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water (3.3.1-13)	Reduction of neutron-absorbing capacity and loss of material due to general corrosion	Plant-specific	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.3.2.1.5 and 3.3.2.2.6)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping component, and piping elements exposed to lubricating oil (3.3.1-14)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis Program (B.1.20); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.3.2.1.6 and 3.3.2.2.7)
Steel reactor coolant pump oil collection system piping, tubing, and valve bodies exposed to lubricating oil (3.3.1-15)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	None	Not applicable (See SER Section 3.3.2.2.7)
Steel reactor coolant pump oil collection system tank exposed to lubricating oil (3.3.1-16)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection to evaluate the thickness of the lower portion of the tank	None	Not applicable (See SER Section 3.3.2.2.7)
Steel piping, piping components, and piping elements exposed to treated water (3.3.1-17)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.3.2.1.7 and 3.3.2.2.7)
Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-18)	Loss of material/general (steel only), pitting and crevice corrosion	Plant-specific	Periodic Surveillance and Preventive Maintenance Program (B.1.22); Fire Protection Program (B.1.12.1)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.8 and 3.3.2.2.7)
Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil (3.3.1-19)	Loss of material due to general, pitting, crevice, and MIC	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	Buried Piping Inspection Program (B.1.1)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, piping elements, and tanks exposed to fuel oil (3.3.1-20)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Fuel Oil Chemistry and One-Time Inspection	Diesel Fuel Monitoring Program (B.1.9); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.9 and 3.3.2.2.9)
Steel heat exchanger components exposed to lubricating oil (3.3.1-21)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis Program (B.1.20); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.10 and 3.3.2.2.9)
Steel with elastomer lining or stainless steel cladding piping, piping components, and piping elements exposed to treated water and treated borated water (3.3.1-22)	Loss of material due to pitting and crevice corrosion (only for steel after lining/cladding degradation)	Water Chemistry and One-Time Inspection	None	Not applicable (See SER Section 3.3.2.2.10)
Stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water (3.3.1-23)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.11 and 3.3.2.2.10)
Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water (3.3.1-24)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.12 and 3.3.2.2.10)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Copper alloy HVAC piping, piping components, piping elements exposed to condensation (external) (3.3.1-25)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	System Walkdown Program (B.1.28); Periodic Surveillance and Preventive Maintenance Program (B.1.22); Service Water Integrity Program (B.1.26); Heat Exchanger Monitoring Program (B.1.14)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.13 and 3.3.2.2.10)
Copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.3.1-26)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis Program (B.1.20); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.14 and 3.3.2.2.10)
Stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation (3.3.1-27)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	System Walkdown Program (B.1.28); Periodic Surveillance and Preventive Maintenance Program (B.1.22); Service Water Integrity Program (B.1.26)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.15 and 3.3.2.2.10)
Copper alloy fire protection piping, piping components, and piping elements exposed to condensation (internal) (3.3.1-28)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	Periodic Surveillance and Preventive Maintenance Program (B.1.22); Instrument Air Quality Program (B.1.16)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.16 and 3.3.2.2.10)
Stainless steel piping, piping components, and piping elements exposed to soil (3.3.1-29)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	Periodic Surveillance and Preventive Maintenance Program (B.1.22); Instrument Air Quality Program (B.1.16)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.16 and 3.3.2.2.10)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution (3.3.1-30)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.18 and 3.3.2.2.10)
Copper alloy piping, piping components, and piping elements exposed to treated water (3.3.1-31)	Loss of material due to pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.19 and 3.3.2.2.11)
Stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil (3.3.1-32)	Loss of material due to pitting, crevice, and MIC	Fuel Oil Chemistry and One-Time Inspection	Diesel Fuel Monitoring Program (B.1.9); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.20 and 3.3.2.2.12)
Stainless steel piping, piping components, and piping elements exposed to lubricating oil (3.3.1-33)	Loss of material due to pitting, crevice, and MIC	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis Program (B.1.20)	Consistent with the GALL Report, which recommends further evaluation. (See SER Sections 3.3.2.1.21 and 3.3.2.2.12)
Elastomer seals and components exposed to air - indoor uncontrolled (internal or external) (3.3.1-34)	Loss of material due to Wear	Plant-specific	None	Not applicable. (See SER Section 3.3.2.2.13)
Steel with stainless steel cladding pump casing exposed to treated borated water (3.3.1-35)	Loss of material due to cladding breach	A plant-specific AMP is to be evaluated. Reference NRC IN 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks.”	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated water (3.3.1-36)	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	None	Not applicable. (Boraflex is not used in the VYNPS spent fuel storage racks.)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-37)	Cracking due to SCC, IGSCC	BWR Reactor Water Cleanup System	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.22)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-38)	Cracking due to SCC	BWR Stress Corrosion Cracking and Water Chemistry	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.23)
Stainless steel BWR spent fuel storage racks exposed to treated water > 60°C (> 140°F) (3.3.1-39)	Cracking due to SCC	Water Chemistry	None	Not applicable. There are no stainless steel spent fuel storage components with intended functions exposed to treated water >60°C (> 140°F).)
Steel tanks in diesel fuel oil system exposed to air-outdoor (external) (3.3.1-40)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Steel Tanks	System Walkdown Program (B.1.28)	Consistent with the GALL Report. (See SER Section 3.3.2.1.24)
High-strength steel closure bolting exposed to air with steam or water leakage (3.3.1-41)	Cracking due to cyclic loading, SCC	Bolting Integrity	None	Not applicable. (High-strength steel closure bolting is not used in the auxiliary systems.)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel closure bolting exposed to air with steam or water leakage (3.3.1-42)	Loss of material due to general corrosion	Bolting Integrity	None	This line item was not used. Loss of material of steel closure bolting was addressed by other line items including 3.3.1-43, 3.3.1-55 and 3.3.1-58.
Steel bolting and closure bolting exposed to air-indoor uncontrolled (external) or air-outdoor (External) (3.3.1-43)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	Bolting Integrity Program **[Commitment #34]**	Consistent with the GALL Report. (See SER Section 3.3.2.1.25)
Steel compressed air system closure bolting exposed to condensation (3.3.1-44)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	Bolting Integrity Program	Consistent with the GALL Report. (See SER Section 3.3.2.1.25)
Steel closure bolting exposed to air-indoor uncontrolled (external) (3.3.1-45)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	Bolting Integrity Program	Consistent with the GALL Report. (See Section 3.3.2.1.25)
Stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water > 60°C (> 140°F) (3.3.1-46)	Cracking due to SCC	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.26)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water (3.3.1-47)	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3); Water Chemistry Control-Auxiliary Systems Program (B.1.30.1); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.27)
Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water (3.3.1-48)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.28)
Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water (3.3.1-49)	Loss of material due to MIC	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.29)
Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.3.1-50)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3); Water Chemistry Control-Auxiliary Systems Program (B.1.30.1); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.30)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.3.1-51)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3); Water Chemistry Control-Auxiliary Systems Program (B.1.30.1); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.31)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.3.1-52)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.32)
Steel compressed air system piping, piping components, and piping elements exposed to condensation (internal) (3.3.1-53)	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	Instrument Air Quality Program (B.1.16)	Consistent with the GALL Report. (See SER Section 3.3.2.1.33)
Stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation (3.3.1-54)	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	Instrument Air Quality Program (B.1.16)	Consistent with the GALL Report. (See SER Section 3.3.2.1.34)
Steel ducting closure bolting exposed to air - indoor uncontrolled (external) (3.3.1-55)	Loss of material due to general corrosion	External Surfaces Monitoring	System Walkdown Program (B.1.28)	Consistent with the GALL Report. (See SER Section 3.3.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel HVAC ducting and components external surfaces exposed to air - indoor uncontrolled (external) (3.3.1-56)	Loss of material due to general corrosion	External Surfaces Monitoring	System Walkdown Program (B.1.28)	Consistent with the GALL Report. (See SER Section 3.3.2.1)
Steel piping and components external surfaces exposed to air - indoor uncontrolled (External) (3.3.1-57)	Loss of material due to general corrosion	External Surfaces Monitoring	System Walkdown Program (B.1.28)	Consistent with the GALL Report. (See SER Section 3.3.2.1)
Steel external surfaces exposed to air-indoor uncontrolled (external), air-outdoor (external), and condensation (external) (3.3.1-58)	Loss of material due to general corrosion	External Surfaces Monitoring	System Walkdown Program (B.1.28)	Consistent with the GALL Report. (See SER Section 3.3.2.1)
Steel heat exchanger components exposed to air-indoor uncontrolled (external) or air-outdoor (external) (3.3.1-59)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	System Walkdown Program (B.1.28)	Consistent with the GALL Report. (See SER Section 3.3.2.1)
Steel piping, piping components, and piping elements exposed to air-outdoor (external) (3.3.1-60)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	System Walkdown Program (B.1.28)	Consistent with the GALL Report. (See SER Section 3.3.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Elastomer fire barrier penetration seals exposed to air-outdoor or air-indoor uncontrolled (3.3.1-61)	Increased hardness, shrinkage and loss of strength due to weathering	Fire Protection	Fire Protection Program (B.1.12.1)	Consistent with the GALL Report. (See SER Section 3.3.2.1.35)
Aluminum piping, piping components, and piping elements exposed to raw water (3.3.1-62)	Loss of material due to pitting and crevice corrosion	Fire Protection	None	Not applicable. (There are no aluminum components with intended functions exposed to raw water in the auxiliary systems.)
Steel fire rated doors exposed to air-outdoor or air-indoor uncontrolled (3.3.1-63)	Loss of material due to Wear	Fire Protection	Fire Protection Program (B.1.12.1)	Consistent with the GALL Report. (See SER Section 3.3.2.1.36)
Steel piping, piping components, and piping elements exposed to fuel oil (3.3.1-64)	Loss of material due to general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	None	This line item was not used. Loss of material of steel components exposed to fuel oil was addressed by other line items including 3.3.1-20 and 3.3.1-32.
Reinforced concrete structural fire barriers-walls, ceilings and floors exposed to air-indoor uncontrolled (3.3.1-65)	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	None	This line item was not used. Reinforced concrete structural fire barriers are evaluated as structural components in SER Section 3.5.
Reinforced concrete structural fire barriers-walls, ceilings and floors exposed to air-outdoor (3.3.1-66)	Concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	None	This line item was not used. Reinforced concrete structural fire barriers are evaluated as structural components in SER Section 3.5.

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Reinforced concrete structural fire barriers-walls, ceilings and floors exposed to air-outdoor or air-indoor uncontrolled (3.3.1-67)	Loss of material due to corrosion of embedded steel	Fire Protection and Structures Monitoring Program	None	This line item was not used. Reinforced concrete structural fire barriers are evaluated as structural components in SER Section 3.5.
Steel piping, piping components, and piping elements exposed to raw water (3.3.1-68)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Fire Water System	Fire Water System Program (B.1.12.2); Periodic Surveillance and Preventive Maintenance Program (B.1.22); One-Time Inspection Program (B.1.21)	Consistent with the GALL Report. (See SER Section 3.3.2.1.37)
Stainless steel piping, piping components, and piping elements exposed to raw water (3.3.1-69)	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System	Fire Water System Program (B.1.12.2); Fire Protection Program (B.1.12.1)	Consistent with the GALL Report. (See SER Section 3.3.2.1.38)
Copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-70)	Loss of material due to pitting, crevice, and MIC, and fouling	Fire Water System	Fire Water System Program (B.1.12.2); Fire Protection Program (B.1.12.1); Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with the GALL Report. (See SER Section 3.3.2.1.39)
Steel piping, piping components, and piping elements exposed to moist air or condensation (Internal) (3.3.1-71)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with the GALL Report. (See SER Section 3.3.2.1.40)
Steel HVAC ducting and components internal surfaces exposed to condensation (Internal) (3.3.1-72)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) MIC	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with the GALL Report. (See SER Section 3.3.2.1.41)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel crane structural girders in load handling system exposed to air-indoor uncontrolled (external) (3.3.1-73)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Periodic Surveillance and Preventive Maintenance Program (B.1.22); Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report. (See SER Section 3.3.2.1.42)
Steel cranes - rails exposed to air-indoor uncontrolled (external) (3.3.1-74)	Loss of material due to Wear	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	None	This line item was not used. Steel crane rails are evaluated as structural components in SER Section 3.5.
Elastomer seals and components exposed to raw water (3.3.1-75)	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Open-Cycle Cooling Water System	None	Not applicable. (There are no elastomeric components exposed to raw or untreated water in the auxiliary systems that require aging management.)
Steel piping, piping components, and piping elements (without lining/ coating or with degraded lining/coating) exposed to raw water (3.3.1-76)	Loss of material due to general, pitting, crevice, and MIC, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	Service Water Integrity Program (B.1.26)	Consistent with the GALL Report. (See SER Section 3.3.2.1)
Steel heat exchanger components exposed to raw water (3.3.1-77)	Loss of material due to general, pitting, crevice, galvanic, and MIC, and fouling	Open-Cycle Cooling Water System	Service Water Integrity Program (B.1.26); Heat Exchanger Monitoring Program (B.1.14)	Consistent with the GALL Report. (See SER Section 3.3.2.1.43)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel, nickel alloy, and copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-78)	Loss of material due to pitting and crevice corrosion	Open-Cycle Cooling Water System	None	This line was not used. There are no nickel alloy components exposed to raw water in the auxiliary systems. Stainless steel and copper alloy components exposed to raw water are addressed in other line items including 3.3.1-79 and 3.3.1-81.
Stainless steel piping, piping components, and piping elements exposed to raw water (3.3.1-79)	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	Service Water Integrity Program (B.1.26)	Consistent with the GALL Report. (See SER Section 3.3.2.1)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-80)	Loss of material due to pitting, crevice, and MIC	Open-Cycle Cooling Water System	None	Not applicable. (This line applies to EDG system components. At VYNPS, these components are not exposed to raw water (heat exchanger components exposed to raw water are addressed in Line Item 3.3.1-82).
Copper alloy piping, piping components, and piping elements, exposed to raw water (3.3.1-81)	Loss of material due to pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	Service Water Integrity Program (B.1.26)	Consistent with the GALL Report. (See SER Section 3.3.2.1)
Copper alloy heat exchanger components exposed to raw water (3.3.1-82)	Loss of material due to pitting, crevice, galvanic, and MIC, and fouling	Open-Cycle Cooling Water System	Service Water Integrity Program (B.1.26)	Consistent with the GALL Report. (See SER Section 3.3.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and copper alloy heat exchanger tubes exposed to raw water (3.3.1-83)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	Service Water Integrity Program (B.1.26); Fire Protection Program (B.1.12.1)	Consistent with the GALL Report. (See SER Section 3.3.2.1.44)
Copper alloy > 15 percent Zn piping, piping components, piping elements, and heat exchanger components exposed to raw water, treated water, or closed cycle cooling water (3.3.1-84)	Loss of material due to selective leaching	Selective Leaching of Materials	Selective Leaching Program (B.1.25)	Consistent with the GALL Report. (See SER Section 3.3.2.1)
Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water, or closed-cycle cooling water (3.3.1-85)	Loss of material due to selective leaching	Selective Leaching of Materials	Selective Leaching Program (B.1.25)	Consistent with the GALL Report. (See SER Section 3.3.2.1)
Structural steel (new fuel storage rack assembly) exposed to air-indoor uncontrolled (external) (3.3.1-86)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring Program	None	This line item was not used. Structural steel of the new fuel storage rack assembly is evaluated as a structural component in SER Section 3.5.
Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated borated water (3.3.1-87)	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Aluminum and copper alloy > 15 percent Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.3.1-88)	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	None	Not applicable to BWRs
Steel bolting and external surfaces exposed to air with borated water leakage (3.3.1-89)	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	None	Not applicable to BWRs
Stainless steel and steel with stainless steel cladding piping, piping components, piping elements, tanks, and fuel storage racks exposed to treated borated water > 60°C (> 140°F) (3.3.1-90)	Cracking due to SCC	Water Chemistry	None	Not applicable to BWRs
Stainless steel and steel with stainless steel cladding piping, piping components, and piping elements exposed to treated borated water (3.3.1-91)	Loss of material due to pitting and crevice corrosion	Water Chemistry	None	Not applicable to BWRs
Galvanized steel piping, piping components, and piping elements exposed to air-indoor uncontrolled (3.3.1-92)	None	None	None	Not applicable. (Galvanized steel surfaces are evaluated as steel for the auxiliary systems.)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Glass piping elements exposed to air, air-indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water (3.3.1-93)	None	None	None	Consistent with the GALL Report. (See LRA Section 3.3.2.1)
Stainless steel and nickel alloy piping, piping components, and piping elements exposed to air-indoor uncontrolled (external) (3.3.1-94)	None	None	None	Consistent with GALL Report. (See LRA Section 3.3.2.1)
Steel and aluminum piping, piping components, and piping elements exposed to air-indoor controlled (external) (3.3.1-95)	None	None	None	Not applicable. (There are no components exposed to controlled indoor air at VYNPS.)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.3.1-96)	None	None	None	Consistent with the GALL Report. (See LRA Section 3.3.2.1)
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.3.1-97)	None	None	None	Consistent with the GALL Report. (See LRA Section 3.3.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air (3.3.1-98)	None	None	None	Not applicable. (Dried (treated) air is maintained as an environment as a result of the Instrument Air Quality Program, so aging effects may occur without that program.)
Stainless steel and copper alloy < 15 percent Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.3.1-99)	None	None	None	Not applicable to BWRs

The staff's review of the auxiliary systems component groups followed any one of several approaches. One approach, documented in SER Section 3.3.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.3.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.3.2.3, reviewed AMR results for components that the applicant indicated are not consistent with or not addressed in the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the auxiliary systems components is documented in SER Section 3.0.3.

3.3.2.1 AMR Results Consistent with the GALL Report

Summary of Technical Information in the Amended Application. LRA Section 3.3.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the auxiliary systems components:

- Buried Piping and Tanks Inspection Program
- Diesel Fuel Monitoring Program
- Fire Protection Program
- Fire Water System Program
- Flow-Accelerated Corrosion Program
- Heat Exchanger Monitoring Program
- Instrument Air Quality Program
- Oil Analysis Program
- One-Time Inspection Program
- Periodic Surveillance and Preventive Maintenance Program

- Selective Leaching Program
- Service Water Integrity Program
- System Walkdown Program
- Water Chemistry Control - Auxiliary Systems Program
- Water Chemistry Control - BWR Program
- Water Chemistry Control - Closed Cooling Water Program

Staff Evaluation. LRA Tables 3.3.2-1 through 3.3.2-12 and Tables 3.3.2-13-1 through 3.3.2-13-42 summarize AMRs for the auxiliary systems components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determines whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determines whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determines whether the applicant’s AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determines whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff’s evaluation follows.

3.3.2.1.1 Reduction of Heat Transfer Due to Fouling

For reduction of heat transfer due to fouling of stainless steel heat exchanger tubes exposed to treated water, the GALL Report recommends programs consistent with GALL AMP XI.M2, “Water Chemistry” and GALL AMP XI.M32, “One-Time Inspection.”

In the LRA Table 3.3.1, Item 3.3.1-3, the applicant stated that its Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage reduction of heat transfer due to fouling in stainless steel heat exchanger tubes exposed to treated water.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). During interviews with the applicant’s technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.3.1, Item 3.3.1-3 in the population that is subject to the One-Time Inspection Program. The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The applicant’s Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. On this basis, the staff finds that the applicant’s management of the reduction of heat transfer due to fouling in stainless steel heat exchanger tubes exposed to treated water consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.2 Cracking Due to Stress Corrosion Cracking

For cracking due to SCC of stainless steel and stainless clad steel heat exchanger components exposed to treated water greater than60°C (greater than140°F), the GALL Report recommends a plant-specific program.

In LRA Table 3.3.1, Item 3.3.1-5, the applicant stated that cracking in stainless steel heat exchanger tubes exposed to treated water greater than140°F is managed by the Water Chemistry Control-BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.3.1, Item 3.1.1-5 in the population that is subject to the One-Time Inspection Program. The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. On this basis, the staff finds that the applicant's management of cracking in stainless steel heat exchanger tubes exposed to treated water greater than 140°F consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.3 Cracking Due to Stress Corrosion Cracking

For cracking due to SCC of stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust, the GALL Report recommends a plant-specific program.

In LRA Table 3.3.1, Item 3.3.1-6, the applicant stated that cracking of stainless steel exhaust components will be managed by the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program. This evaluation is documented in SER Section 3.0.3.3.5. This is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for expansion joints exposed to exhaust gas and therefore is acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.4 Hardening and Loss of Strength Due to Elastomer Degradation

For hardening and loss of strength due to elastomer degradation of elastomer seals and components exposed to air-indoor uncontrolled (internal/external), the GALL Report recommends a plant-specific program.

In LRA Table 3.3.1, Item 3.3.1-11, the applicant stated that the change in material properties of elastomer components exposed to indoor air will be managed by the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program. This evaluation is documented in SER Section 3.0.3.3.5. This is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for duct flexible connections in the HVAC system and therefore is acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.5 Reduction of Neutron-Absorbing Capacity and Loss of Material Due to General Corrosion

For reduction of neutron-absorbing capacity and loss of material due to general corrosion of boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water, the GALL Report recommends a plant-specific program.

In the LRA Table 3.3.1, Item 3.3.1-13, the applicant stated that the Water Chemistry Control-BWR Program manages the degradation of boral.

During the audit and review, the staff asked the applicant how a purely preventive program could address this aging effect. The applicant confirmed that where the Water Chemistry Control-BWR Program was applied, including prevention of loss of material from boral, the One-Time Inspection Program would be used to confirm its effectiveness.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state that the effectiveness of the Water Chemistry Control-BWR Program is confirmed by the One-Time Inspection Program.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The applicant’s Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. On this basis, the staff finds that the applicant's management of the degradation of boral using the combination of these AMPs satisfies the criteria of the SRP-LR Appendix A.1 and is therefore acceptable.

On the basis of its review, the staff determines that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.6 Loss of Material Due to General, Pitting, and Crevice Corrosion

For loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to lubricating oil, the GALL Report recommends programs consistent with GALL AMP XI.M39, "Lubricating Oil Analysis," and GALL AMP XI.M32, "One-Time Inspection."

In the discussion column of LRA Table 3.3.1, Item 3.3.1-14, the applicant stated that the Oil Analysis Program, manages loss of material in steel components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state that the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff reviewed the applicant's Oil Analysis Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.13 and 3.0.3.1.6, respectively. With the change discussed above, the applicant is managing the loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to lubricating oil in a manner that is consistent with the GALL Report and therefore acceptable. In addition, this aging effect is also managed for carbon steel gauges, filter housings, heater housings, pump casings, strainer housings, tanks, gear boxes, and heat exchanger shells as well as gray cast iron valve bodies exposed to lubricating oil.

On the basis of its review, the staff determines that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.7 Loss of Material Due to General, Pitting, and Crevice Corrosion

For loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to treated water, the GALL Report recommends programs consistent with GALL AMP XI.M2, "Water Chemistry" and GALL AMP XI.M32, "One-Time Inspection."

In LRA Table 3.3.1, Item 3.3.1-17, the applicant stated that the loss of material in steel components is managed by the Water Chemistry Control – BWR Program. The One-Time

Inspection Program will be used to verify the effectiveness of the Water Chemistry Program.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.3.1, Item 3.1.1-17 in the population that is subject to the One-Time Inspection Program. The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. On this basis, the staff finds that the applicant's management of loss of material in steel components consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.8 Loss of Material/General (Steel Only), Pitting and Crevice Corrosion

For loss of material/general (steel only), pitting and crevice corrosion of stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust, the GALL Report recommends a plant-specific program.

In the LRA Table 3.3.1, Item 3.3.1-18, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program and the Fire Protection-Fire Protection Program will manage loss of material in steel and stainless steel components exposed to diesel exhaust.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program. This evaluation is documented in SER Section 3.0.3.3.5. This is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 and therefore is acceptable.

The staff also reviewed the applicant's Fire Protection Program. This evaluation is documented in SER Section 3.0.3.2.11. This AMP is consistent, with exceptions and enhancements, with GALL AMP XI.M26, "Fire Protection," and the staff therefore finds it to be an acceptable method for management of loss of material from carbon steel expansion joints in the EDG system, stainless steel expansion joints and carbon steel piping, silencers, and turbochargers in the EDG, fire protection-water, and John Deere Diesel systems exposed to diesel exhaust.

On the basis of its review, the staff determines that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.9 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling

For loss of material due to general, pitting, crevice, and MIC, and fouling of steel piping, piping components, piping elements, and tanks exposed to fuel oil, the GALL Report recommends a program consistent with GALL AMP XI.M30, "Fuel Oil Chemistry" and GALL AMP XI.M32, "One-Time Inspection."

In LRA Table 3.3.1, Item 3.3.1-20, the applicant stated that the Diesel Fuel Monitoring Program manages loss of material in steel components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant amended its LRA. The applicant stated that the LRA is revised to state that the One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.3.1, Item 3.3.1-20 in the population that is subject to the One-Time Inspection Program. The staff reviewed the applicant's Diesel Fuel Monitoring Program and One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.2.9 and 3.0.3.1.6, respectively. The staff concludes that the applicant's Diesel Fuel Monitoring Program in conjunction with the One-Time Inspection Program provided assurance that the loss of material due to corrosion is adequately managed by monitoring and controlling conditions that would cause this aging effect and by monitoring the effectiveness of the program through surveillance and testing. On this basis, the staff finds that the applicant management of loss of material due to general, pitting, crevice, and MIC, and fouling of steel piping, piping components, piping elements, and tanks exposed to fuel oil consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.10 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling

For loss of material due to general, pitting, crevice, and MIC, and fouling of steel heat exchanger components exposed to lubricating oil, the GALL Report recommends programs consistent with GALL AMP XI.M39, "Lubricating Oil Analysis" and GALL AMP XI.M32, "One-Time Inspection."

In LRA Table 3.3.1, Item 3.3.1-21, the applicant stated that the Oil Analysis Program manages loss of material in steel heat exchanger components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant amended its LRA. The applicant stated that LRA is revised to state that the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.3.1, Item 3.3.1-21 in the population that is subject to the One-Time Inspection Program. The staff reviewed the applicant's Oil Analysis Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.13 and 3.0.3.1.6, respectively. The Oil Analysis Program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components. The Oil Analysis Program will be supplemented by the One-Time Inspection Program to verify its effectiveness. On this basis, the staff finds that the applicant's management of loss of material due to general, pitting, crevice, and MIC, and fouling of steel heat exchanger components exposed to lubricating oil consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.11 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water, the GALL Report recommends programs consistent with GALL AMP XI.M2, "Water Chemistry" and GALL AMP XI.M32, "One-Time Inspection."

In LRA Table 3.3.1, Item 3.3.1-23, the applicant stated that the loss of material in stainless steel heat exchanger components is managed by the Water Chemistry Control-BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). During interviews with the applicant's technical personnel staff, the staff confirmed that the applicant included all components in LRA Table 3.3.1, Item 3.3.1-23 in the population that is subject to the One-Time Inspection Program. The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. On this basis, the staff finds that the applicant's management of loss of material in stainless steel heat exchanger components consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.12 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of stainless steel and aluminum piping, piping components, and piping elements exposed to treated water, the GALL Report recommends programs consistent with GALL AMP XI.M2, "Water Chemistry" and GALL AMP XI.M32, "One-Time Inspection."

In LRA Table 3.3.1, Item 3.3.1-24, the applicant stated that the loss of material in stainless steel components is managed by the Water Chemistry Control-BWR Program. The One-Time

Inspection Program will be used to verify the effectiveness of the Water Chemistry Program.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.3.1, Item 3.3.1-24 in the population that is subject to the One-Time Inspection Program. The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. On this basis, the staff finds that the applicant's management of loss of material in stainless steel components consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.13 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of copper alloy HVAC piping, piping components, piping elements exposed to condensation (external), the GALL Report suggests that a plant-specific AMP is to be evaluated.

In LRA Table 3.3.1, Item 3.3.1-25, the applicant stated that the System Walkdown Program, Periodic Surveillance and Preventive Maintenance Program, Service Water Integrity Program and the Heat Exchanger Monitoring Program will manage loss of material in copper alloy components.

The applicant stated, in the LRA, that loss of material due to pitting and crevice corrosion from copper-alloy (greater than15 percent zinc) heat exchanger tubes exposed to condensation in the reactor building CCWS is to be managed using the Heat Exchanger Monitoring Program, a plant-specific AMP.

The staff's review of the applicant's Heat Exchanger Monitoring Program is documented in SER Section 3.0.3.3.1. This is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for heat exchanger tubes in the reactor building CCWS and therefore is acceptable.

The applicant stated, in the LRA, that loss of material due to pitting and crevice corrosion from copper-alloy (less than15 percent zinc) heat exchanger tubes exposed to condensation in the HVAC system is to be managed using the Periodic Surveillance and Preventive Maintenance Program, a plant-specific AMP.

The staff's review of the applicant's Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.5. This is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for heat exchanger tubes of the HVAC system and therefore is acceptable.

The applicant stated, in the LRA, that loss of material due to pitting and crevice corrosion from copper-alloy (greater than15 percent zinc) heat exchanger tubes exposed to condensation in the SW and HVAC systems is to be managed using the Service Water Integrity Program.

The staff's review of the applicant's Service Water Integrity Program is documented in SER Section 3.0.3.2.16. The program satisfies the criteria of SRP-LR Appendix A.1 for heat exchanger tubes in the SW and HVAC systems and therefore is acceptable.

The applicant stated, in the LRA, that loss of material due to pitting and crevice corrosion from copper-alloy (greater than15 percent zinc) valve bodies in the SWS and HVAC system exposed to condensation is to be managed using the System Walkdown Program.

The staff's review of the applicant's System Walkdown Program is documented in SER Section 3.0.3.1.9. The program satisfies the criteria of SRP-LR Appendix A.1 for valve bodies in the SWS and pump casings in the HVAC system exposed to condensation and therefore is acceptable.

The applicant stated, in the LRA, that loss of material due to pitting and crevice corrosion from copper-alloy (less than15 percent zinc) piping, tubing, valve bodies in the SWS, compressor housings, and tubing in the HVAC system, and tubing in the CW, house heating boiler, and RHRSW systems exposed to condensation is to be managed using the System Walkdown Program.

The staff's review of the applicant's System Walkdown Program is documented in SER Section 3.0.3.1.9. The program satisfies the criteria of SRP-LR Appendix A.1 for heat exchanger tubes exposed to condensation in the SW and HVAC systems and therefore is acceptable.

On the basis of its review, the staff determines that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.14 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of copper alloy piping, piping components, and piping elements exposed to lubricating oil, the GALL Report recommends programs consistent with GALL AMP XI.M39, "Lubricating Oil Analysis" and GALL AMP XI.M32, "One-Time Inspection."

In LRA Table 3.3.1, Item 3.3.1-26, the applicant stated that the Oil Analysis Program manages loss of material in copper alloy components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state that the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff reviewed the applicant's Oil Analysis Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.13 and 3.0.3.1.6, respectively. With the change discussed above, the applicant is managing the loss of material due to pitting and crevice corrosion of copper alloy piping, piping components, and piping elements exposed to lubricating oil in a manner that is consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff determines that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.15 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation, the GALL Report suggests that a plant-specific AMP is to be evaluated.

In LRA Table 3.3.1, Item 3.3.1-27, the applicant stated that the System Walkdown Program, Periodic Surveillance and Preventive Maintenance Program, and the Service Water Integrity Program manage loss of material in stainless steel components. The applicant also stated that there are no aluminum pressure boundary components exposed to condensation in the VYNPS auxiliary systems.

The staff’s evaluations of the applicant’s System Walkdown Program, Periodic Surveillance and Preventive Maintenance Program, and the Service Water Integrity Program are documented in SER Sections 3.0.3.1.9, 3.0.3.3.5, and 3.0.3.2.16, respectively. The System Walkdown Program is consistent with program described in GALL AMP XI.M36, “External Surface Monitoring.” The Periodic Surveillance and Preventive Maintenance Program includes periodic inspections and tests that manage aging effects not managed by other AMP s. The Service Water Integrity Program relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the SWSs will be managed for the period of extended operation.The staff determines that the combination of these AMPs satisfies the criteria of SRP-LR Appendix A.1 for a plant-specific AMP. On these basis, the staff finds that the applicant adequately manage the loss of material due to pitting and crevice corrosion of stainless steel components. The staff also reviewed LRA and supporting documents to confirm that there are no aluminum boundary components exposed to condensation in the VYNPS auxiliary systems.

The applicant stated that loss of material due to pitting and crevice corrosion from stainless steel piping, tanks, and valve bodies of the EDG system exposed to untreated air is to be managed using the Periodic Surveillance and Preventive Maintenance Program, a plant-specific AMP.

The staff’s evaluation of the applicant's Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.5. This program includes periodic inspections and tests of the EDG system to manage aging effects. On this basis, the staff finds the loss of material due to pitting and crevice corrosion from steel piping, tanks, and valve bodies of the EDG system adequately managed.

The applicant also stated that loss of material due to pitting and crevice corrosion from stainless steel suction barrels exposed to condensation in the SWS is to be managed using the Service Water Integrity Program.

The staff’s evaluation of the applicant's Service Water Integrity Program is documented in SER Section 3.0.3.2.16. The Service Water Integrity Program includes surveillance and control techniques to manage aging effects in the SWS or SCs by the SWS. The program relies on implementation of the recommendation of GL 89-13 to ensure that the effects of aging will be managed. On this basis, the staff finds that loss of material due to pitting and crevice corrosion from stainless steel suction barrels is adequately managed.

In addition, the applicant stated loss of material due to pitting and crevice corrosion in condensation from stainless steel piping, tubing, and valve bodies of the RHRSW system as well as from bolting, expansion joints, indicators, orifices, piping, tubing, thermowells, and valve bodies of the SWS is to be managed using the System Walkdown Program.

The staff’s evaluation of the applicant's System Walkdown Program is documented in SER Section 3.0.3.1.9. The System Walkdown Program is consistent with the program described in GALL AMP XI.M36, “External Surfaces Monitoring.” This program entails inspections of external surfaces of components subject to an AMR. The program is also credited with managing loss of material from internal surfaces where internal and external material-environment combinations are the same and external surface conditions represent internal surface conditions. On this basis, the staff finds that the loss of material due to pitting and crevice corrosion in condensation from stainless steel piping, tubing, and valve bodies of the RHRSW system as well as from bolting, expansion joints, indicators, orifices, piping, tubing, thermowells, and valves bodies of the SWS.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.16 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of copper alloy fire protection piping, piping components, and piping elements exposed to condensation (internal), the GALL Report suggests that a plant-specific AMP is to be evaluated.

In LRA Table 3.3.1, Item 3.3.1-28, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program and the Instrument Air Quality Program will manage loss of material in copper alloy components. The applicant also stated that loss of material due to pitting and crevice corrosion from copper alloy tubing and valve bodies of the EDG system exposed to untreated air is to be managed using the Periodic Surveillance and Preventive Maintenance Program, a plant-specific AMP.

The staff’s evaluation of the applicant's Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.5. The staff determines that the applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1, which includes periodic inspections and tests to manage aging effects. On the basis that the components are inspected and tested periodically, staff finds that the of loss of material due to pitting and crevice corrosion from copper alloy tubing and valve will be adequately managed.

The applicant also stated that loss of material due to pitting and crevice corrosion from copper-alloy valve bodies in the IA system exposed to treated air is to be managed using the Instrument Air Quality Program, a plant-specific AMP.

The staff’s evaluation of the applicant's Instrument Air Quality Program is documented in SER Section 3.0.3.3.4. The staff determines that the applicant’s Instrument Air Quality Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. The program ensures that IA supplied to components is maintained free of water and significant contaminants, thereby preserving an environment that is not conducive to loss of material. On this basis, the staff finds that the applicant’s management of the loss of material for copper-alloy components exposed to treated air (internal) using its Instrument Air Quality Program acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

3.3.2.1.17 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements exposed to soil, the GALL Report recommends that a plant-specific AMP is to be evaluated.

In LRA Table 3.3.1, Item 3.3.1-29, the applicant stated that the Buried Piping Inspection Program, manages loss of material in stainless steel components.

The staff reviewed the applicant's Buried Piping Inspection Program and its evaluation is documented in SER Section 3.0.3.2.1. The applicant’s Buried Piping Inspection Program is consistent, with exceptions and enhancement, with GALL AMP XI.M34, “Buried Piping and Tanks Inspection.” The staff concludes that the applicant’s Buried Piping Inspection Program provided assurance that the program will manage aging effects on the external surfaces of buried steel piping. On this basis, the staff finds that applicant’s management of loss of material in stainless steel components using its Buried Piping Inspection Program acceptable.

On the basis of its review, the staff determines that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.18 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution, the GALL Report recommends programs consistent with GALL AMP XI.M2, “Water Chemistry” and GALL AMP XI.M32, “One-Time Inspection.”

In LRA Table 3.3.1, Item 3.3.1-30, the applicant stated that the loss of material in stainless steel components is managed by the Water Chemistry Control-BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). During interviews with the applicant’s technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.3.1, Item 3.3.1-30 in the population that is subject to the One-Time Inspection Program. The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.2.11 and 3.0.3.1.6, respectively. The applicant’s Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. On this basis, the staff finds that the applicant’s management of loss of material in stainless steel components consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.19 Loss of Material Due to Pitting, Crevice, and Galvanic Corrosion

For loss of material due to pitting, crevice, and galvanic corrosion of copper alloy piping, piping components, and piping elements exposed to treated water, the GALL Report recommends programs consistent with GALL AMP XI.M2, “Water Chemistry” and GALL AMP XI.M32, “One-Time Inspection.”

In LRA Table 3.3.1, Item 3.3.1-31, the applicant stated that loss of material in copper alloy components exposed to treated water is managed by the Water Chemistry Control-BWR Program. The applicant also stated the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). During interviews with the applicant’s technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.3.1, Item 3.3.1-31 in the population that is subject to the One-Time Inspection Program. The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.2.11 and 3.0.3.1.6, respectively. The applicant’s Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR

Program provides both the preventive and inspection elements contained in a plant-specific program. On this basis, the staff finds that the applicant’s management of loss of material in copper alloy components exposed to treated water consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.20 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

For loss of material due to pitting, crevice, and MIC of stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil, the GALL Report recommends programs consistent with GALL AMP XI.M30, “Fuel Oil Chemistry” and GALL AMP XI.M32, “One-Time Inspection.”

In LRA Table 3.3.1, Item 3.3.1-32, the applicant stated that the Diesel Fuel Monitoring Program manages loss of material in stainless steel, aluminum and copper alloy components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state that the One-Time Inspection Program verifies the effectiveness of the Diesel Fuel Monitoring Program.

The staff reviewed the applicant's Diesel Fuel Monitoring Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.9 and 3.0.3.1.6, respectively. The staff determines that the applicant’s Diesel Fuel Monitoring Program in conjunction with the One-Time Inspection Program provided assurance that loss of material in stainless steel, aluminum and copper alloy components is adequately managed by monitoring and controlling conditions that would cause this aging effect and by monitoring the effectiveness of the program through surveillance and testing. On this basis, the staff finds that the applicant management of loss of material in stainless steel, aluminum and copper alloy components consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff determines that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.21 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

For loss of material due to pitting, crevice, and MIC of stainless steel piping, piping components, and piping elements exposed to lubricating oil, the GALL Report recommends programs consistent with GALL AMP XI.M39, “Lubricating Oil Analysis” and GALL AMP XI.M32, “One-Time Inspection.”

In the discussion column of LRA Table 3.3.1, Item 3.3.1-33, the applicant stated that the Oil Analysis Program manages loss of material in stainless steel components.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff reviewed the applicant's Oil Analysis Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.13 and 3.0.3.1.6, respectively. With the change discussed above, the applicant is managing the loss of material due to pitting, crevice, and MIC of stainless steel piping, piping components, and piping elements exposed to lubricating oil in a manner that is consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff determines that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.22 Cracking Due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking

For cracking due to SCC, IGSCC of stainless steel piping, piping components, and piping elements exposed to treated water greater than 140°F, the GALL Report recommends a program consistent with GALL AMP XI.M25, “BWR Reactor Water Cleanup System Program.”

In LRA Table 3.3.1, Item 3.3.1-37, the applicant stated that cracking of stainless steel components of the reactor water cleanup (RWCU) system is managed by the Water Chemistry Control-BWR Program. The applicant also stated the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program-BWR Program. In addition, the applicant stated that the only components to which this line item applies are included in-scope only in accordance with10 CFR 54.4(a)(2) and listed in the LRA series 3.3.2-13-xx tables. The GALL Report stated that no IGSCC inspection is recommended for plants that have piping made of material that is resistant to IGSCC, and that have satisfactorily completed all actions requested in GL 89-10.

During the audit and review, the staff confirmed that VYNPS meets these criteria. The staff finds that since VYNPS satisfies these criteria, the Water Chemistry Control-BWR Program is an acceptable alternative to GALL AMP XI.M25 to manage cracking. As described in LRA Table 3.3.1, Item 3.3.1-37, the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program-BWR Program.

The staff reviewed the applicant’s Water Chemistry Control-BWR Program and its evaluation is documented in SER Section 3.0.3.1.11. The staff finds this program to be effective in mitigating cracking due to SCC, IGSCC of stainless steel piping, piping components, and piping elements exposed to treated water greater than 140°F. It is to be combined with the One-Time Inspection Program to confirm the effectiveness of the Water Chemistry-BWR Program. The staff finds this combination of programs will adequately manage this aging effect and their use is acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.23 Cracking Due to Stress Corrosion Cracking

For cracking due to SCC of stainless steel piping, piping components, and piping elements exposed to treated water greater than140°F, the GALL Report recommends programs consistent with GALL AMP XI.M7, “BWR Stress Corrosion Cracking” and GALL AMP XI.M2, “Water Chemistry.”

In LRA Table 3.3.1, Item 3.3.1-38, the applicant stated that the Water Chemistry Control-BWR Program, manages cracking of stainless steel components. None of the auxiliary system components are within the scope of BWR Stress Corrosion Cracking Program, (all relevant components are included in the reactor vessel, internals and reactor coolant systems). The One-Time Inspection Program, will be used to verify the effectiveness of the Water Chemistry Program.

During the audit and review, the staff asked the applicant for clarification on the basis of which items were excluded. The applicant stated that all of the components addressed with auxiliary systems were less than 4 inches NPS. The staff reviewed drawings, as documented in the Audit and Review Report, and confirmed that all of the components addressed with the auxiliary systems were less than 4 inches NPS. The staff determines that the applicant's management of cracking of stainless steel flow elements, piping, tubing, and valve bodies of the nuclear boiler and primary containment atmospheric control and containment air dilution system exposed to treated water greater than 140°F using the its Water Chemistry Control -BWR Program and One-Time Inspection Program consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.24 Loss of Material Due to General, Pitting, and Crevice Corrosion

For loss of material due to general, pitting, and crevice corrosion of steel tanks in diesel fuel oil system exposed to air – outdoor (external), the GALL Report recommends program consistent with GALL AMP XI.M29, “Aboveground Steel Tanks Program.”

In LRA Table 3.3.1, Item 3.3.1-40, the applicant stated that the System Walkdown Program, manages loss of material in steel tanks of the diesel fuel oil system exposed to outdoor air through visual inspections.

The staff reviewed the applicant's System Walkdown Program and its evaluation is documented in SER Section 3.0.3.1.9. The System Walkdown Program manages the loss of material due to general, pitting, and crevice corrosion of steel tanks in diesel fuel oil systems exposed to outdoor air through periodic visual inspections which can detect this aging effect/mechanism before the loss of intended function. On this basis, the staff finds this acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.25 Loss of Material Due to General, Pitting, and Crevice Corrosion

For loss of material due to general, pitting, and crevice corrosion of steel bolting and closure bolting exposed to air, the GALL Report recommends a program consistent with GALL AMP XI.M18, "Bolting Integrity."

In LRA Table 3.3.1, Item 3.3.1-43, the applicant stated that the System Walkdown Program, manages the loss of material for steel bolting through the use of visual inspections that are performed at least once per refueling cycle.

During the audit and review, the staff asked the applicant to clarify how aging of steel bolting and closure bolting would be managed in the absence of a Bolting Integrity Program. In a letter dated July 6, 2006, the applicant agreed to prepare and submit an AMP consistent with GALL AMP XI.M18, "Bolting Integrity," for approval. In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Bolting Integrity Program. The staff's evaluation of the applicant's System Walkdown Program and Bolting Integrity Program in documented in SER Sections 3.0.3.1.9 and 3.0.3.3.0.3.2.19, respectively. The staff finds that the applicant's Bolting Integrity Program conformed to the recommendations of the GALL Report and encompass all safety-related bolting as delineated in NUREG-1339, which includes the criteria established in the 1995 Edition through the 1996 Addenda of ASME Code, Section XI and the applicant's System Walkdown Program comprised of inspections of external surfaces of components subject to an AMR. On this basis, the staff finds that the applicant's management of loss of material for steel bolting consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant, with the commitment identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.26 Cracking Due to Stress Corrosion Cracking

For cracking due to SCC of stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water greater than140°F, the GALL Report recommends a program consistent with GALL AMP XI.M21, "Closed-Cycle Cooling Water System."

In LRA Table 3.3.1, Item 3.3.1-46, the applicant stated that the Water Chemistry Control-Closed Cooling Water Program, manages cracking for stainless steel components.

During the audit and review, the applicant stated that for this aging effect, the One-Time Inspection Program will be explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control – Closed Cooling Water Program.

The staff reviewed the applicant's Water Chemistry Control-Closed Cooling Water Program and One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.2.18 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control-Closed Cooling Water Program is consistent with GALL AMP XI.M21 with one exception which is related to performance testing. This exception would not affect the management of cracking due to SCC. Therefore, the staff finds that the applicant is managing SCC of stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water greater than 140°F in a manner consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.27 Loss of Material Due to General, Pitting, and Crevice Corrosion

For loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water, the GALL Report recommends a program consistent with GALL AMP XI.M21, “Closed-Cycle Cooling Water System.”

In the discussion column of LRA Table 3.3.1, Item 3.3.1-47, the applicant stated that, for steel components of most auxiliary systems, the Water Chemistry Control-Closed Cooling Water Program, manages loss of material. Furthermore, the applicant stated that, for steel components of the house heating boiler and stator cooling systems, the Water Chemistry Control-Auxiliary Systems Program, manages loss of material.

During the audit and review, the applicant stated that for this aging effect, the One-Time Inspection Program will be explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state that the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control – Closed Cooling Water Program.

The staff reviewed the applicant's Water Chemistry Control-Auxiliary Systems Program. This evaluation is documented in SER Section 3.0.3.3.7. The applicant's program is a plant-specific program. This program includes application of the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Control-Auxiliary Systems Program. Therefore, the staff determines that the applicant is adequately managing the loss of material due to general, pitting, and crevice corrosion of steel coolers, piping, pump casings, steam traps, tanks, and valve bodies exposed to treated water in the house heating boiler and stator cooling systems.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.28 Loss of Material Due to General, Pitting, Crevice, and Galvanic Corrosion

For loss of material due to general, pitting, crevice, and galvanic corrosion of steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water, the GALL Report recommends a program consistent with GALL AMP XI.M21, “Closed-Cycle Cooling Water System.”

In LRA Table 3.3.1, Item 3.3.1-48 the applicant stated that the Water Chemistry Control-Closed Cooling Water Program, manages loss of material for steel heat exchanger components.

During the audit and review, the applicant stated that for this aging effect, the One-Time Inspection Program will be explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Contro-Closed Cooling Water Program.

The staff reviewed the applicant's Water Chemistry Control-Closed Cooling Water Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.18 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control-Closed Cooling Water Program is consistent with GALL AMP XI.M21 with one exception which is related to performance testing. This exception would not affect the management of loss of material due to general, pitting, crevice, and galvanic corrosion. Therefore, the staff determines that the applicant is managing loss of material due to general, pitting, crevice, and galvanic corrosion of steel heat exchanger components (bonnet, shell, tubes, and tubesheet) exposed to closed cycle cooling water in a manner consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.29 Loss of Material Due to Microbiologically-Influenced Corrosion

For loss of material due to MIC of stainless steel and steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water, the GALL Report recommends a program consistent with GALL AMP XI.M21, “Closed-Cycle Cooling Water System.”

In LRA Table 3.3.1, Item 3.3.1-49, the applicant stated that the Water Chemistry Control-Closed Cooling Water Program manages loss of material for stainless steel heat exchanger components.

During the audit and review, the applicant stated that for managing this aging effect, the One-Time Inspection Program will be explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state that the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control-Closed Cooling Water Program.

The staff reviewed the applicant's Water Chemistry Control-Closed Cooling Water Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.18 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control-Closed Cooling Water Program is consistent with GALL AMP XI.M21 with one exception which is related to performance testing. This exception would not affect the management of loss of material due to MIC. Therefore, the staff determines that the applicant is managing loss of material due to MIC of stainless steel and steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water in a manner consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.30 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water, the GALL Report recommends a program consistent with GALL AMP XI.M21, "Closed-Cycle Cooling Water System."

In LRA Table 3.3.1, Item 3.3.1-50, the applicant stated that the Water Chemistry Control-Closed Cooling Water Program manages loss of material for stainless steel components and that for stainless steel components of the demineralized water system, the Water Chemistry Control-Auxiliary Systems Program manages loss of material.

During the audit and review, the applicant stated that for managing this aging effect, the One-Time Inspection Program will be explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state that the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control-Closed Cooling Water Program.

The staff reviewed the applicant's Water Chemistry Control-Closed Cooling Water Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.18 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control-Closed Cooling Water Program is consistent with GALL AMP XI.M21 with one exception which is related to performance testing. This exception would not affect the management of loss of material due to pitting and crevice corrosion. Therefore, the staff determines that the applicant is managing loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water in a manner consistent with the GALL Report and therefore acceptable.

During the audit and review, the staff asked the applicant to clarify why there were no items in LRA Table 3.3.2-13-12 being managed by the Water Chemistry Control-Auxiliary Systems Program as stated in the discussion column of LRA Table 3.3.1, Item 3.3.1-50. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant revised LRA Table 3.3.1, Item 3.3.1-50 to replace the Water Chemistry Control-Auxiliary Systems Program in the Discussion column with the Water Chemistry Control-BWR Program. The LRA Table 3.3.1 item referenced in LRA Table 3.3.2-13-12 managed by the Water Chemistry Control-BWR Program is LRA Table 3.3.1, Item 3.3.1-17, which the staff evaluated in SER Section 3.3.2.1.7.The staff finds that for LRA Table 3.3.1, Item 3.3.1-17, the applicant stated that the loss of material in steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. On this basis, the staff finds this change acceptable.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.31 Loss of Material Due to Pitting, Crevice, and Galvanic Corrosion

For loss of material due to pitting, crevice, and galvanic corrosion of copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water, the GALL Report recommends a program consistent with GALL AMP XI.M21, "Closed-Cycle Cooling Water System."

In LRA Table 3.3.1, Item 3.3.1-51, the applicant stated that the Water Chemistry Control-Closed Cooling Water Program manages loss of material for copper alloy components.

During the audit and review, the applicant stated that for managing this aging effect, the One-Time Inspection Program will be explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control-Closed Cooling Water Program.

The staff reviewed the applicant's Water Chemistry Control-Closed Cooling Water Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.18 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control-Closed Cooling Water Program is consistent with GALL AMP XI.M21 with one exception which is related to performance testing. This exception would not affect the management of loss of material due to pitting, crevice, and galvanic corrosion. Therefore, the staff finds that the applicant is managing loss of material due to pitting, crevice, and galvanic corrosion of copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water in a manner consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

In LRA Table 3.3.1, Item 3.3.1-51, the applicant stated that, for copper alloy components of the house heating boiler system, demineralized water system, and portions of the HVAC system, the Water Chemistry Control-Auxiliary Systems Program manages loss of material.

The applicant's Water Chemistry Control-Auxiliary Systems Program is a plant-specific program. This program includes application of the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Control-Auxiliary Systems Program. The staff evaluations of these programs are documented in SER Section 3.0.3.3.7 and 3.0.3.1.6, respectively. The Water Chemistry Control-Auxiliary Systems Program uses specific manufacturer's recommendations and general guidelines provided in EPRI Report 1007820 as acceptance criteria for chemistry parameters. It is combined with the One-Time Inspection Program to confirm the effectiveness of the Water Chemistry-Auxiliary Systems Program. The staff finds this combination of programs will adequately manage this aging effect and their use is acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.32 Reduction of Heat Transfer Due to Fouling

For reduction of heat transfer due to fouling of steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water, the GALL Report recommends programs consistent with GALL AMP XI.M21, "Closed-Cycle Cooling Water System."

In LRA Table 3.3.1, Item 3.3.1-52, the applicant stated that the Water Chemistry Control-Closed Cooling Water Program manages reduction of heat transfer for copper alloy heat exchanger tubes exposed to closed cycle cooling water. The applicant also stated that auxiliary systems have no steel or stainless steel heat exchanger tubes exposed to closed cycle cooling water with a heat transfer intended function.

During the audit and review, the applicant stated that for managing this aging effect, the One-Time Inspection Program will be explicitly identified in the system tables (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control-Closed Cooling Water Program.

The staff reviewed the applicant's Water Chemistry Control – Closed Cooling Water Program and One-Time Inspection Program. These evaluations are documented in SER Sections 3.0.3.2.18 and 3.0.3.1.6, respectively. The applicant's Water Chemistry Control – Closed Cooling Water Program is consistent with GALL AMP XI.M21 with one exception which is related to performance testing.

During the audit and review, the staff asked the applicant to clarify how fouling would be adequately managed without performance testing. The applicant addressed the exception to the GALL Report for performance monitoring by stating that the One-Time Inspection Program includes inspections to verify the effectiveness of the water chemistry control AMP s by confirming that unacceptable cracking, loss of material, and fouling is not occurring. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control – Closed Cooling Water Program. The staff's evaluation of this exception is provided in SER Section 3.0.3.2.18.3. The staff determines that the applicant would select representative samples from the low-flow and stagnant flow areas of the listed CCWSs in the One-Time Inspection Program, which will provide assurance that the aging effects for this system will be adequately managed. On this basis, the staff finds this exception acceptable.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.33 Loss of Material Due to General and Pitting Corrosion

For loss of material due to general and pitting corrosion of steel compressed air system piping, piping components, and piping elements exposed to condensation (internal), the GALL Report recommends programs consistent with GALL AMP XI.M24, “Compressed Air Monitoring.”

In LRA Table 3.3.1, Item 3.3.1-53, the applicant stated that the Instrument Air Quality Program manages loss of material for carbon steel components exposed to treated air.

The staff’s evaluation of the applicant's Instrument Air Quality Program is documented in SER Section 3.0.3.3.4. The staff determines that the applicant’s Instrument Air Quality Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. The program ensures that IA supplied to components is maintained free of water and significant contaminants, thereby preserving an environment that is not conducive to loss of material. On this basis, the staff finds that the applicant’s management of the loss of material for carbon steel components exposed to treated air using its Instrument Air Quality Program acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

3.3.2.1.34 Loss of Material Due to Pitting and Crevice Corrosion

For loss of material due to pitting and crevice corrosion of stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation, the GALL Report recommends programs consistent with GALL AMP XI.M24, “Compressed Air Monitoring.”

In LRA Table 3.3.1, Item 3.3.1-54, the applicant stated that the Instrument Air Quality Program manages loss of material for stainless steel components of auxiliary system exposed to treated air.

The staff’s evaluation of the applicant's Instrument Air Quality Program is documented in SER Section 3.0.3.3.4. The staff determines that the applicant’s Instrument Air Quality Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. The program ensures that IA supplied to components is maintained free of water and significant contaminants, thereby preserving an environment that is not conducive to loss of material. On this basis, the staff finds that the applicant’s management of the loss of material for stainless steel components of auxiliary system exposed to treated air using its Instrument Air Quality Program acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

3.3.2.1.35 Increased Hardness, Shrinkage and Loss of Strength Due to Weathering

For increased hardness, shrinkage and loss of strength due to weathering of elastomer fire barrier penetration seals exposed to air, the GALL Report recommends programs consistent with GALL AMP XI.M26, “Fire Protection.”

In the LRA Table 3.3.1, Item 3.3.1-61, the applicant stated that this line item was not used in the auxiliary systems tables. Fire barrier seals are evaluated as structural components in LRA Section 3.5. Cracking and the change in material properties of elastomer seals are managed by the Fire Protection Program.

During the audit and review, the staff noted that in LRA Table 3.5.2-6 for component elastomer penetration sealant in a protected from weather environment, the aging effects are cracking and change in material properties. For this line item, two AMPs are shown, Fire Protection and Structures Monitoring. The referenced GALL Report line item is VII.G-1 and the LRA Table 3.3.1, Item 3.3.1-61. The GALL Report’s Line Item VII.G-1 is for component fire barrier penetration seals. Furthermore, in the discussion column for LRA Table 3.3.1, Item 3.3.1-61, the applicant stated:

> Cracking and the change in material properties of elastomer seals are managed by the Fire Protection Program.

The applicant was asked to clarify why this AMR line item is not split into two lines: (1) penetration sealant (fire) with AMP Fire Protection, the GALL Report reference VII.G-1, LRA Table 1 Line Item 3.3.1-61 and a NoteB; and, (2) penetration sealant (flood, radiation) with AMP Structures Monitoring, the GALL Report reference III.A6-12, LRA Table 1 Line Item 3.5.1-44 and a NoteC. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to separate this component line item into two line items as follows:

Table 3.3-2 AMR Line Items for Elastomer Penetration Sealants

a. Delete line item:

Bulk Commodities								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Penetration sealant (fire, flood, radiation)	EN, FB, FLB, PB, SNS	Elastomer	Protected from weather	Cracking, Change in material properties	Fire Protection, Structures Monitoring	III.A6-12 (TP-7)	3.5.1-44	C

b. Add line item:

Bulk Commodities								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Penetration sealant (fire)	EN, FB, PB, SNS	Elastomer	Protected from weather	Cracking, Change in material properties	Fire Protection	VII.G-1 (A-19)	3.3.1-61	B

c. Add line item:

Bulk Commodities								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Penetration sealant (flood, radiation)	EN, FLB, PB, SNS	Elastomer	Protected from weather	Cracking, Change in material properties	Structures Monitoring	III.A6-12 (TP-7)	3.5.1-44	C

During the audit and review, the staff noted that in LRA Table 3.5.2-6 for elastomer seismic isolation joints in a protected from weather environment, the aging effects are cracking and change in material properties. The AMP shown is Fire Protection. The referenced GALL Report line item is VII.G-1 and the LRA Table 3.3.1, Item 3.3.1-61. The GALL Report Line Item VII.G-1 is for component fire barrier penetration seals. In the discussion column for LRA Table 3.3.1, Item 3.3.1-61, the applicant stated:

> Cracking and the change in material properties of elastomer seals are managed by the Fire Protection Program

There is no mention of seismic gaps. In the discussion column for LRA Table 3.5.1, Item 3.5.1-44, the applicant stated:

> Loss of sealing is a consequence of elastomer cracking and change in material properties. Component types include: moisture barrier, compressible joints and seals used for seismic gaps, and fire barrier seals. The Structures Monitoring Program manages cracking and change in material properties.

Because this discussion addresses seismic gaps and fire barrier seals, the applicant was asked to clarify why this AMR line item does not show Structures Monitoring as the AMP instead of Fire Protection with the GALL Report reference III.A6-12, LRA Table 3.5.1, Item 3.5.1-44 with a NoteC. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to denote the following changes:

1. NoteC is changed to NoteE for this line item.

2. The discussion in LRA Table 3.3.1, Item 3.3.1-61 is revised to read as follows. “This line item was not used in the auxiliary systems tables. Fire barrier seals are evaluated as structural components in Section 3.5. Cracking and change in material properties of elastomer seals, including seismic isolation joints located in fire barriers, are managed by the Fire Protection Program.”
3. An additional line item is added to read as follows.

Table 3.3-3 AMR Line Item for Elastomer Seismic Isolation Joints

Bulk Commodities								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Seismic isolation joint	SSR	Elastomer	Protected from weather	Cracking, Change in material properties	Structures Monitoring	III.A6-12 (TP-7)	3.5.1-44	C

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.36 Loss of Material Due to Wear

For loss of material due to wear of steel fire rated doors exposed to air, the GALL Report recommends a program consistent with GALL AMP XI.M26, “Fire Protection.”

In LRA Table 3.3.1, Item 3.3.1-63, the applicant stated that this line item was not used in the auxiliary systems tables. Steel fire doors are evaluated as structural components in LRA Section 3.5. The loss of material for fire doors is managed by the Fire Protection Program.

During the audit and review, the staff noted that in LRA Table 3.5.2-6 for carbon steel fire doors in a protected from weather environment, the aging effect is loss of material. The referenced GALL Report line item is VII.G-3 and the LRA Table 3.3.1 Item is 3.3.1-63. The GALL Report Line Item VII.G-3 is for component fire rated doors. The applicant was asked to clarify why the note is C, (different component but consistent with the GALL Report otherwise) for this AMR line item, instead of NoteB (consistent with the GALL Report, but AMP takes exceptions). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA is revised to change ‘NoteC’ to ‘NoteB’ for this line item. The staff finds this change acceptable.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.37 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling

For loss of material due to general, pitting, crevice, and MIC, and fouling of steel piping, piping components, and piping elements exposed to raw water, the GALL Report recommends a program consistent with GALL AMP XI.M27, “Fire Water System.”

In LRA Table 3.3.1, Item 3.3.1-68, the applicant stated that the loss of material in steel components exposed to raw or untreated water is managed by the Fire Water System Program.

The staff reviewed the applicant's Fire Water System Program and its evaluation is documented in SER Section 3.0.3.2.12. The staff determined that the applicant’s Fire Water System Program consistent with GALL AMP XI.M27, with exceptions and enhancement, and finds that the applicant’s Fire Water System Program provided assurance that the aging effects for the components in the scope of its Fire Water System Program are adequately managed.

The applicant also stated, in the LRA, that for carbon steel tanks, traps and valve bodies of the IA system exposed to untreated water, the Periodic Surveillance and Preventive Maintenance Program manages loss of material.

The staff’s review of the applicant's Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.5. This is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for loss of material from carbon steel tanks, traps and valve bodies of the IA system, which the staff found acceptable.

The applicant stated, in the LRA, that for carbon steel piping retired in place, piping of the potable water system, as well as orifices, piping, pump casings, strainer housings, and valve bodies of the radwaste systems, the applicant proposes to manage loss of material due to general, pitting, crevice, and MIC in untreated water using the One-Time Inspection Program.

In RAI 3.3.1-68-K-01, the staff requested that the applicant provide justification for the use of the One-Time Inspection Program to management aging of carbon steel exposed to raw water in the potable water system; radwaste, liquid and solid system; and equipment retired in place system as opposed to a periodic inspection.

In its response, by letter dated September 5, 2006, the applicant states that the "untreated water" environment for the carbon steel potable water system components in LRA Table 3.3.2-13-29 is not "raw water"; it is actually treated water. Water for this system comes from onsite wells and is monitored and treated to meet the regulations of the state of Vermont. It was labeled "untreated water" because conductivity and dissolved oxygen are not monitored.

Carbon steel is not expected to experience significant aging effects in this treated water environment. The applicant states that a One-Time Inspection of carbon steel potable water system components exposed to "untreated water" will be performed to confirm the absence of significant aging effects. If the One-Time Inspection identifies significant aging effects, the corrective action program will ensure that appropriate follow-up actions are implemented including periodic inspections, if necessary.

The applicant also stated that the "untreated water" environment for the carbon steel and copper alloy radwaste system components in LRA Table 3.3.2-13-32 is originally treated water that may now contain contaminants. Therefore, the aging management program has been changed, from One-Time Inspection Program to Periodic Surveillance and Preventive Maintenance Program for managing loss of material for carbon steel and copper alloy components in the radwaste system exposed to untreated water (LRA Table 3.3.2-13-32). The "untreated water" environment for the equipment retired in place system carbon steel piping component in LRA Table 3.3.2-13-35 should be listed as Air - indoor (int) and that the LRA table will be changed to reflect the above environment.

Based on its review, the staff finds the applicant’s response to RAI 3.3.1-68-K-03 acceptable because this is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for loss of material from carbon steel components exposed to raw water in the potable water; radwaste, liquid and solid; and equipment retired in place systems. The staff’s concern described in RAI 3.3.1-68-K-03 is resolved.

On the basis of its review, the staff finds that the applicant, with the satisfactory resolution of the request for additional information identified above, appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

3.3.2.1.38 Loss of Material Due to Pitting and Crevice Corrosion, and Fouling

For loss of material due to pitting and crevice corrosion, and fouling of stainless steel piping, piping components, and piping elements exposed to raw water, the GALL Report recommends a program consistent with GALL AMP XI.M27, “Fire Water System.”

In LRA Table 3.3.1, Item 3.3.1-69, the applicant stated that the loss of material in stainless steel components exposed to raw water is managed by the Fire Water System Program, Fire Protection Program, and the One-Time Inspection Program.

During the audit and review, the staff noted that the applicant did not apply the One-Time Inspection Program to any AMR line items to which LRA Table 3.3.1, Item 3.3.1-69 was applied (Table 2s). In a letter dated July 14, 2006, the applicant revised its LRA. The applicant revised the LRA to remove the reference to the One-Time Inspection Program in LRA Table 3.3.1, Item 3.3.1-69. The staff finds this acceptable.

The staff also asked the applicant to justify the application of the Fire Protection Program rather than the Fire Water System Program to manage filters and filter housings in raw water. The applicant explained that the components in question were managed as support components of the engine that drives the fire pump. The Fire Protection Program performs tests and inspections of the diesel engine and its support components and is therefore credited for these components.

The staff reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. This AMP is consistent, with exceptions and enhancements, with GALL AMP XI.M26, “Fire Protection.” The staff determines it to be an acceptable method for management of loss of material from EDG stainless steel expansion filters and filter housings exposed to raw water. The staff determines that management of the stainless steel filters and filter housings in the fire protection water system using the Fire Protection Program to be consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant, with the change in the application identified above, appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.3.2.1.39 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling

For loss of material due to pitting, crevice, and MIC, and fouling of copper alloy piping, piping components, and piping elements exposed to raw water, the GALL Report recommends programs consistent with GALL AMP XI.M27, “Fire Water System.”

In LRA Table 3.3.1, Item 3.3.1-70, the applicant stated that the loss of material in copper alloy components exposed to raw water is managed by the Fire Water System Program, Fire Protection Program, and the One-Time Inspection Program.

The staff asked the applicant to justify the application of the Fire Protection Program rather than the Fire Water System Program to manage copper-alloy heat exchangers and tubing in raw water. The applicant explained that the components in question were managed as support components of the engine that drives the fire pump. The Fire Protection Program performs tests and inspections of the diesel engine and its support components and is therefore credited for these components.

The staff reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. This AMP is consistent, with exceptions and enhancements, with GALL AMP XI.M26, “Fire Protection.” The staff determines it to be an acceptable method for management of loss of material from fire water system copper-alloy heat exchangers and tubing exposed to raw water.

The staff determines that management of the copper-alloy heat exchangers and tubing in the fire protection water system using the Fire Protection Program to be consistent with the GALL Report and therefore acceptable.

During the audit and review, the staff asked the applicant to justify the application of the One-Time Inspection Program rather than the Fire Water System Program to manage copper-alloy tubing in untreated water of the radwaste, liquid and solid system. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant revised LRA Table 3.3.2-13-32 to replace the AMP of One-Time Inspection with the Periodic Surveillance and Preventive Maintenance Program for all line items containing carbon steel and copper alloy with an environment of untreated water.

The staff’s evaluation of the applicant's Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. The Periodic Surveillance and Preventive Maintenance Program manages loss of material of copper-alloy tubing exposed to untreated water by visual inspections or other NDE techniques. On this basis, the staff determines that this program is capable of detecting loss of material for copper-alloy tubing.

On the basis of its review, the staff finds that the applicant, with the application changes identified above, appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

3.3.2.1.40 Loss of Material Due to General, Pitting, and Crevice Corrosion

For loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to moist air or condensation (internal), the GALL Report recommends programs consistent with GALL AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components.”

In VYNPS LRA Table 3.3.1, Item 3.3.1-71, the applicant stated that the loss of material for steel components exposed to moist air or condensation is managed by the Periodic Surveillance and Preventive Maintenance Program using visual inspections or other NDE techniques.

The staff’s review of the applicant’s Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.5. The Periodic Surveillance and Preventive Maintenance Program will manage the loss of material through visual inspections or other NDE techniques. On this basis, the staff determines that the aging of the steel piping, piping components, and piping elements is adequately managed.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

3.3.2.1.41 Loss of Material Due to General, Pitting, Crevice, and (For Drip Pans and Drain Lines) Microbiologically-Influenced Corrosion

In LRA Table 3.3.1, Item 3.3.1-72, the applicant stated that loss of material of steel component internal surfaces exposed to condensation is managed by the Periodic Surveillance and Preventive Maintenance Program, using visual inspections or other NDE techniques.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program. This evaluation is documented in SER Section 3.0.3.3.5. This is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for loss of material from carbon steel exposed to condensation in fan housings of the SWS and from carbon steel exposed to condensation in heat exchanger housings of the HVAC system.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

3.3.2.1.42 Loss of Material Due to General Corrosion

In LRA Table 3.3.1, Item 3.3.1-73, the applicant stated that this line item was not used in the auxiliary systems tables. Steel crane structural girders are evaluated as structural components in SER Section 3.5. Loss of material for steel crane structural components is managed by the Periodic Surveillance and Preventive Maintenance Program and the Structures Monitoring Program.

During the audit and review, the applicant confirmed that aging management of steel crane structural girders in load handling will conform to the standards cited in GALL AMP XI.M23 "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." The applicant's technical personnel stated that reactor building steel crane structural girders used in load handling are inspected in accordance with the Periodic Surveillance and Preventive Maintenance Program and process facility crane rails and girders are inspected in accordance with the Structures Monitoring Program. The Structures Monitoring Program will be enhanced, as identified in Appendix B, to address crane rails and girders. Aging management activities for crane rails and girders in accordance with these two programs are consistent with the program element described for in GALL AMP XI.M23.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

3.3.2.1.43 Loss of Material Due to General, Pitting, Crevice, Galvanic, and Microbiologically-Influenced Corrosion, and Fouling

For loss of material due to general, pitting, crevice, galvanic, and MIC, and fouling of steel heat exchanger components exposed to raw water, the GALL Report recommends programs consistent with GALL AMP XI.M20, "Open-Cycle Cooling Water System."

In LRA Table 3.3.1, Item 3.3.1-77, the applicant stated that management of this aging effect is consistent with the GALL Report for most auxiliary systems. The Service Water Integrity Program manages loss of material for steel heat exchanger. For steel heat exchanger tubes of the reactor building CCWS, the Heat Exchanger Monitoring Program manages loss of material.

The staff's evaluation of the applicant's Service Water Integrity Program is documented in SER Section 3.0.3.2.16. The applicant's aging management of loss of material due to general, pitting, crevice, galvanic, and MIC, and fouling of steel heat exchanger components is consistent with the GALL Report and therefore acceptable.

The staff's evaluation of the applicant's Heat Exchanger Monitoring Program is documented in SER Section 3.0.3.3.1. The Heat Exchanger Monitoring Program manages the loss of material for steel heat exchanger tubes of the reactor building through visual inspections or eddy current inspections on selected heat exchangers in various systems. On this basis, the staff determines that the aging of steel heat exchanger of the reactor building is adequately managed.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

3.3.2.1.44 Reduction of Heat Transfer Due to Fouling

For reduction of heat transfer due to fouling of stainless steel and copper alloy heat exchanger tubes exposed to raw water, the GALL Report recommends programs consistent with GALL AMP XI.M20, “Open-Cycle Cooling Water System.”

In LRA Table 3.3.1, Item 3.3.1-83, the applicant stated that for the fire protection system, the Fire Protection Program manages reduction of heat transfer in copper alloy heat exchanger tubes.

During the audit and review, the staff asked the applicant to clarify the basis for management of fouling of copper alloy heat exchanger tubes exposed to raw water using the Fire Protection Program. The applicant stated that the heat exchangers represented are the fire pump diesel jacket water heat exchanger and the gear box oil cooler. Both heat exchangers use water from the fire water system (raw water) for cooling. The Fire Protection Program performs tests and inspections of the diesel engine. Since these heat exchangers are part of the fire diesel it is appropriate to manage fouling with the Fire Protection Program which tests the engine and its auxiliaries.

The staff reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. This AMP is consistent, with exceptions and enhancements, with GALL AMP XI.M26, “Fire Protection.” The staff determines it to be an acceptable method for management of fouling of copper-alloy heat exchanger tubes exposed to raw water.

The staff determines that management of fouling of the copper-alloy heat exchanger tubes in the fire protection water system using the fire protection AMP to be consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff determines that the applicant appropriately addressed the aging effect/mechanism, in a manner consistent with the GALL Report.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff determines that the applicant adequately addressed the issues that were further evaluated. The staff finds that the applicant had demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

Summary of Technical Information in the Amended Application. In LRA Section 3.3.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the auxiliary systems components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- reduction of heat transfer due to fouling
- cracking due to stress corrosion cracking
- cracking due to stress corrosion cracking and cyclic loading
- hardening and loss of strength due to elastomer degradation
- reduction of neutron-absorbing capacity and loss of material due to general corrosion
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and micobiologically-influenced corrosion
- loss of material due to general, pitting, crevice, micobiologically-influenced corrosion and fouling
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and galvanic corrosion
- loss of material due to pitting, crevice, and micobiologically-influenced corrosion
- loss of material due to wear
- loss of material due to cladding breach
- quality assurance for aging management of nonsafety-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.3.2.2. The staff's review of the applicant's further evaluation follows.

3.3.2.2.1 Cumulative Fatigue Damage

LRA Section 3.3.2.2.1 states that fatigue is a TLAA, as required by 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA.

3.3.2.2.2 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.3.2.2.2 against the criteria in SRP-LR Section 3.3.2.2.2.

LRA Section 3.3.2.2.2 addresses the reduction of heat transfer of stainless steel heat exchanger tubes exposed to treated water due to fouling.

SRP-LR Section 3.3.2.2.2 states that reduction of heat transfer due to fouling may occur in stainless steel heat exchanger tubes exposed to treated water. The existing program controls water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may be inadequate; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that reduction of heat transfer due to fouling does not occur. A one-time inspection is an acceptable method to ensure that reduction of heat transfer does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated that reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control-BWR Program. The effectiveness of the applicant's Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

The staff finds this to be consistent with the criteria of SRP-LR Section 3.3.2.2.2 and therefore acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.2 criteria. For those line items that apply to LRA Section 3.3.2.2.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.3.2.2.3 against the following SRP-LR Section 3.3.2.2.3 criteria:

(1) LRA Section 3.3.2.2.3 addresses the cracking due to SCC, this aging effect is not applicable to VYNPS. Cracking due to SCC can occur in the stainless steel piping, piping components, and piping elements of the BWR SLC system that are exposed to sodium pentaborate solution greater than 140°F. At VYNPS, the sodium pentaborate solution in the SLC system does not exceed 140°F. Therefore cracking due to SCC is not an AERM for the SLC system. This item is not applicable to VYNPS.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in the stainless steel piping, piping components, and piping elements of the BWR SLC system that are exposed to sodium pentaborate solution greater than 60 °C (140 °F). The existing AMP monitors and controls water chemistry to manage the aging effects of cracking due to SCC. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause SCC; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that SCC does not occur. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that SCC does not occur and that component intended functions will be maintained during the period of extended operation.

The staff determines that although the SLC injects through the drywell, where ambient temperatures may exceed 140°F, sodium pentaborate is not normally present in this portion of the system. For this reason, the staff finds that cracking in the SLC system due to SCC does not require aging management at VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(2) LRA Section 3.3.2.2.3 addresses cracking of stainless steel heat exchanger components exposed to treated water greater than 140°F due to SCC.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in stainless steel and stainless clad steel heat exchanger components exposed to treated water greater than 60 °C (140 °F). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated, in the LRA, that cracking due to SCC in stainless steel heat exchanger components exposed to treated water greater than 140°F is an AERM at VYNPS. There are no auxiliary system components at VYNPS with stainless steel cladding. For VYNPS auxiliary systems these stainless steel heat exchanger components are managed by the Water Chemistry Control-BWR Program. This program monitors parameters and contaminants to ensure they remain within the limits specified by the EPRI guidelines. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program for managing cracking using visual and ultrasonic inspection techniques.

The use of the applicant's One-Time Inspection Program in conjunction with its Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program.

The staff finds that this combination satisfies the criteria of SRP-LR Appendix A.1 and therefore is acceptable.

(3) LRA Section 3.3.2.2.3 addresses cracking of stainless steel diesel engine exhaust piping exposed to diesel exhaust due to SCC.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated, in the LRA, that cracking due to SCC in stainless steel diesel engine exhaust piping exposed to diesel exhaust is an AERM at VYNPS. At VYNPS, cracking of stainless steel exhaust piping in the EDG system is managed by the Periodic Surveillance and Preventive Maintenance Program. This program uses visual and other NDE techniques to manage cracking of the piping. These inspections will manage the aging effect of cracking such that the intended function of the component will not be affected.

The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for cracking of stainless steel due to SCC when exposed to diesel exhaust.

The staff finds that this satisfies the criteria of SRP-LR Section 3.3.2.2.3 and is therefore acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.3 criteria. For those line items that apply to LRA Section 3.3.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.4 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

The staff reviewed LRA Section 3.3.2.2.4 against the following SRP-LR Section 3.3.2.2.4 criteria:

(1) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading.

SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may 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 AMP monitors and controls primary water chemistry in PWRs to manage 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 water chemistry control programs should be verified to ensure that cracking does not occur. The GALL Report recommends that a plant-specific AMP be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are adequately managed. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water and eddy current testing of tubes. VYNPS is a BWR and does not have a non-regenerative heat exchanger exposed to treated borated water. This item is not applicable to VYNPS.

The staff confirmed that VYNPS has no components from this group.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(2) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading

SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may occur in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 60°C (140 °F). The existing AMP monitors and controls primary water chemistry in PWRs to manage 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 water chemistry control programs should be verified to ensure that cracking does not occur. The GALL Report recommends that a plant-specific AMP be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are adequately managed. VYNPS is a BWR and does not have a regenerative heat exchanger exposed to treated borated water. This item is not applicable to VYNPS.

The staff confirmed that VYNPS has no components from this group.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(3) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading.

SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may occur in the stainless steel pump casing for the PWR high-pressure pumps in the chemical and volume control system. The existing AMP monitors and controls primary water chemistry in PWRs to manage 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 water chemistry control programs should be verified to ensure that cracking does not occur. The GALL Report recommends that a plant-specific AMP be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are adequately managed. VYNPS is a BWR and does not have a chemical and volume control system. This item is not applicable to VYNPS.

The staff confirmed that VYNPS has no components from this group.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.3.2.2.5 Hardening and Loss of Strength Due to Elastomer Degradation

The staff reviewed LRA Section 3.3.2.2.5 against the following SRP-LR Section 3.3.2.2.5 criteria:

(1) LRA Section 3.3.2.2.5 addresses cracking and change of material properties due to elastomer degradation in elastomer duct flexible connections of the HVAC systems exposed to air-indoor.

SRP-LR Section 3.3.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer seals and components of heating and ventilation systems exposed to air-indoor uncontrolled (internal/external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated in the LRA that cracking and change in material properties due to elastomer degradation in elastomer duct flexible connections of the HVAC systems exposed to air-indoor are an AERM at VYNPS. These aging effects are managed by the Periodic Surveillance and Preventive Maintenance Program. This program includes visual inspections and physical manipulation of the flexible connections to confirm that the components are not experiencing any aging that would affect accomplishing their intended functions.

The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for cracking and change of material properties due to elastomer degradation in elastomer duct flexible connections of the HVAC systems exposed to air.

The staff finds that this satisfies the criteria of SRP-LR Section 3.3.2.2.5 and is therefore acceptable.

(2) LRA Section 3.3.2.2.5 addresses the hardening and loss of strength due to elastomer degradation, this aging effect is not applicable to VYNPS. For the auxiliary systems at VYNPS, no credit is taken for any elastomer linings to prevent loss of material from the underlying carbon steel material such that the material is identified as carbon steel for the AMR. This item is not applicable to VYNPS.

SRP-LR Section 3.3.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer linings of the filters, valves, and ion exchangers in spent fuel pool cooling and cleanup systems (BWR and PWR) exposed to treated water or treated borated water. The GALL Report recommends that a plant-specific AMP be evaluated to determine and assess the qualified life of the linings in the environment to ensure that these aging effects are adequately managed.

In the discussion column of LRA Table 3.3.1, Item 3.3.1-12, the applicant stated that there are no elastomer lined components exposed to treated water in the auxiliary systems.

The staff confirmed that VYNPS has no components from this group. On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.5 criteria. For those line items that apply to LRA Section 3.3.2.2.5, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material Due to General Corrosion

The staff reviewed LRA Section 3.3.2.2.6 against the criteria in SRP-LR Section 3.3.2.2.6.

LRA Section 3.3.2.2.6 addresses the loss of material and cracking of Boral spent fuel storage racks exposed to a treated water environment due to general corrosion.

SRP-LR Section 3.3.2.2.6 states that reduction of neutron-absorbing capacity and loss of material due to general corrosion may occur in the neutron-absorbing sheets of BWR and PWR spent fuel storage racks exposed to treated water or treated borated water. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated, in the LRA, that loss of material and cracking are an AERM for Boral spent fuel storage racks exposed to a treated water environment. These aging effects are managed by the Water Chemistry Control-BWR Program.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control-BWR Program. The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program. The Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry to manage aging effects caused by corrosion. The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. On this basis, the staff finds the aging effect of loss of material due to general corrosion to be adequately managed.

The applicant also stated that reduction of neutron-absorbing capacity is insignificant and requires no aging management. The potential for aging effects due to sustained irradiation of Boral was previously evaluated by the staff and determined to be insignificant. Plant operating experience with Boral coupons inspected in 1991 and 1996 is consistent with the staff's conclusion. Therefore, the staff finds that reduction of neutron-absorbing capacity does not require aging management.

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.3.2.2.6 criteria. For those line items that apply to LRA Section 3.3.2.2.6, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.7 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.3.2.2.7 against the following SRP-LR Section 3.3.2.2.7 criteria:

(1) LRA Section 3.3.2.2.7 addresses the loss of material of carbon steel piping and components in other auxiliary systems exposed to treated water due to general, pitting and crevice corrosion.

    SRP-LR Section 3.3.2.2.7 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements, including the tubing, valves, and tanks in the reactor coolant pump oil collection system, exposed to lubricating oil (as part of the fire protection system). The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lubricating oil program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation. In addition, corrosion may occur at locations in the reactor coolant pump oil collection tank where water from wash-downs may accumulate; therefore, the effectiveness of the program should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion, including determination of the thickness of the lower portion of the tank. A one-time inspection is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated, in the LRA, that steel piping and components in auxiliary systems at VYNPS that are exposed to lubricating oil are managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

During the audit and review, the staff determines that Oil Analysis Program alone is not sufficient in managing the loss of material of steel piping, piping components, and piping elements, including the tubing, and valves, exposed to lubricating oil (as part of the fire protection system). In a letter dated July 14, 2006, the applicant revised its LRA to state that the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.7.

Also, in the LRA, the applicant stated that VYNPS is a BWR with an inert containment atmosphere and has no reactor coolant pump oil collection system.

The staff confirmed that VYNPS has no components from this group.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(2) LRA Section 3.3.2.2.7 addresses loss of material of carbon steel piping and components in other auxiliary systems exposed to treated water due to general, pitting and crevice corrosion.

SRP-LR Section 3.3.2.2.7 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements in the BWR RWCU and shutdown cooling systems exposed to treated water. The existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from general, pitting, and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause general, pitting, or crevice corrosion; therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from general, pitting, and crevice corrosion to verify the effectiveness of the water chemistry program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated in the LRA that VYNPS does not have a separate shutdown cooling system. Loss of material due to general, pitting, and crevice corrosion in carbon steel piping and components in other auxiliary systems exposed to treated water are managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements. This combination satisfies the criteria of SRP-LR Section 3.2.2.2.7 and therefore is acceptable.

The staff finds this to be consistent with the criteria of SRP-LR Section 3.3.2.2.7 and therefore acceptable.

(3) LRA Section 3.3.2.2.7 addresses the loss of material of carbon steel and stainless steel diesel exhaust piping and components exposed to diesel exhaust in the EDG and John Deere Diesel generator systems due to general (steel only), pitting and crevice corrosion.

SRP-LR Section 3.3.2.2.7 states that loss of material due to general (steel only), pitting, and crevice corrosion may occur in steel and stainless steel diesel exhaust piping, piping components, and piping elements exposed to diesel exhaust. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated in the LRA that loss of material due to general (steel only), pitting and crevice corrosion for carbon steel and stainless steel diesel exhaust piping and components exposed to diesel exhaust in the EDG and John Deere Diesel generator systems is managed by the Periodic Surveillance and Preventive Maintenance Program. This program uses visual and other NDE techniques to manage loss of material for these components. The carbon steel and stainless steel diesel exhaust piping and components in the fire protection system are managed by the Fire Protection Program. The applicant's Fire Protection Program uses visual inspections of diesel exhaust piping and components to manage loss of material. These inspections in the Periodic Surveillance and Preventive Maintenance Program and Fire Protection Program will manage the aging effect of loss of material such that the intended function of the components will not be affected.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program. The Periodic Surveillance and Preventive Maintenance manages the loss of material due to general, pitting, and crevice corrosion through periodic inspections and tests. These inspections and tests include visual or other NDE techniques. On this basis, the staff determines that the aging of the steel and stainless steel diesel exhaust piping, piping components, and piping elements exposed to diesel exhaust is adequately managed.

The staff also reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The Fire Protection Program uses visual inspections of diesel exhaust piping and components. This AMP is consistent, with exceptions and enhancements, with GALL AMP XI.M26, “Fire Protection.” On this basis, staff determines that the aging of the carbon steel and stainless steel diesel exhaust piping and components in the fire protection system is adequately managed.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.7.

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.3.2.2.7 criteria. For those line items that apply to LRA Section 3.3.2.2.7, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.8 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.3.2.2.8 against the criteria in SRP-LR Section 3.3.2.2.8.

LRA Section 3.3.2.2.8 addresses loss of material of carbon steel (with or without coating or wrapping) piping and components buried in soil in the SW, fuel oil, and fire protection-water systems due to general, pitting, crevice, and MIC.

SRP-LR Section 3.3.2.2.8 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. Buried piping and tanks inspection programs rely on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion, and MIC. The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an applicant’s inspection frequency and operating experience with buried components, ensuring that loss of material does not occur.

The applicant stated in the LRA that loss of material due to general, pitting, crevice, and MIC for carbon steel (with or without coating or wrapping) piping and components buried in soil in the SW, fuel oil, and fire protection-water systems is managed by the Buried Piping Inspection

Program. This program will include: (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components.

The applicant also stated that buried components are to be inspected when excavated during maintenance. An inspection will be performed within 10 years of entering the period of extended operation, unless an opportunistic inspection occurs within this ten-year period. This program will manage the aging effect of loss of material such that the intended function of the components will not be affected.

During the audit and review, the staff confirmed that buried piping has already been inspected within the final ten-year period before the period of extended operation. Therefore, even if no other buried piping is examined before the period of extended operation, VYNPS has complied with staff guidance regarding the examination of buried piping before the end of the current operating license. The proposed schedule for inspection (if there is no other opportunity) is consistent with the staff's position and therefore acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.8 criteria. For those line items that apply to LRA Section 3.3.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.9 Loss of Material Due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

The staff reviewed LRA Section 3.3.2.2.9 against the following SRP-LR Section 3.3.2.2.9 criteria:

(1) LRA Section 3.3.2.2.9 addresses the loss of material of carbon steel piping and components exposed to fuel oil due to general, pitting, crevice, and MIC.

SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, MIC, and fouling may occur in steel piping, piping components, piping elements, and tanks exposed to fuel oil. The existing AMP relies on fuel oil chemistry programs to monitor and control fuel oil contamination to manage loss of material due to corrosion or fouling. Corrosion or fouling may occur at locations where contaminants accumulate. The effectiveness of fuel oil chemistry programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion, MIC, and fouling to verify the effectiveness of fuel oil chemistry programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated in the LRA that fouling is not an AERM for the fuel oil system at VYNPS. Loss of material due to general, pitting, crevice, and MIC for carbon steel piping and components exposed to fuel oil is an AERM at VYNPS and these components are managed by the Diesel Fuel Monitoring Program. This program includes sampling and monitoring of fuel oil quality to ensure they remain within the limits specified by the ASTM standards. Maintaining parameters within limits ensures that significant loss of material will not occur. Ultrasonic inspection of storage tank bottoms where water and contaminants accumulate will be performed to confirm the effectiveness of the Diesel Fuel Monitoring Program. In addition, operating experience has confirmed the effectiveness of this program in maintaining fuel oil quality within limits such that loss of material will not affect the intended functions of these components.

During the audit and review, the staff determines that Diesel Fuel Monitoring Program alone is not sufficient in managing the loss of material of steel piping, piping components, piping elements, and tanks exposed to fuel oil. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program verifies the effectiveness of the Diesel Fuel Monitoring Program.

The staff finds that, based on the programs and LRA review identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.9.

(2) LRA Section 3.3.2.2.9 addresses loss of material of carbon steel heat exchanger components exposed to lubricating oil due to general, pitting, crevice, MIC and fouling.

SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, MIC, and fouling may occur in steel heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated in the LRA that loss of material due to general, pitting, crevice, MIC and fouling for carbon steel heat exchanger components exposed to lubricating oil are an AERM in the auxiliary systems, and is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion or fouling. Operating experience has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion and fouling has not and will not affect the intended functions of these components.

The staff determines that Oil Analysis Program alone is not sufficient in managing the loss of material of steel heat exchanger components exposed to lubricating oil. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA is revised to state the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff finds that, based on the programs and LRA review identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.9.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.9 criteria. For those line items that apply to LRA Section 3.3.2.2.9, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.3.2.2.10 against the following SRP-LR Section 3.3.2.2.10 criteria:

(1) LRA Section 3.3.2.2.10 addresses loss of material from steel piping with elastomer lining or stainless steel cladding due to pitting and crevice corrosion is not applicable to VYNPS. Loss of material due to pitting and crevice corrosion could occur in BWR and PWR steel piping with elastomer lining or stainless steel cladding that are exposed to treated water and treated borated water if the cladding or lining is degraded. For the auxiliary systems at VYNPS no credit is taken for any elastomer linings or stainless steel cladding to prevent loss of material from the underlying carbon steel material such that the material is identified as carbon steel for the AMR.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in BWR and PWR steel piping with elastomer lining or stainless steel cladding exposed to treated water and treated borated water if the cladding or lining is degraded. The existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause pitting or crevice corrosion; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant was asked in RAI 3.3.1-22-K-01 to confirm that no auxiliary components have elastomer linings or stainless steel cladding. If there are such components, to provide a list of these components. The applicant was also asked to provide additional justification for the determination that pitting and crevice corrosion do not require aging management.

In a letter dated September 5, 2006, the applicant provided its response to

RAI 3.3.1-22-K-01. The applicant stated that elastomer linings are conservatively not credited to prevent loss of material of underlying carbon steel material in auxiliary systems. Furthermore, the applicant stated that in LRA Section 3.3.2.2.7, loss of material due to general, pitting, and crevice corrosion in carbon steel piping and components in auxiliary systems exposed to treated water in managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program.

The staff reviewed the applicant's response and finds it acceptable. The staff also confirmed that steel piping with elastomer lining is managed in accordance with the component group of carbon steel piping and components. Further, the staff's concern described in RAI 3.3.1-22-K-01 is resolved.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.10.

(2) LRA Section 3.3.2.2.10 addresses the loss of material of stainless steel piping and components and stainless steel heat exchanger components exposed to treated water due to pitting and crevice corrosion.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel and aluminum piping, piping components, piping elements, and for stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water. The existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause pitting or crevice corrosion; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated in the LRA that in the auxiliary systems at VYNPS there are no aluminum components exposed to treated water. Loss of material due to pitting and crevice corrosion for stainless steel piping and components, and for stainless steel heat exchanger components exposed to treated water in the auxiliary systems at VYNPS is managed by the Water Chemistry Control-BWR Program. The effectiveness of the program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program. The use of the One-Time Inspection Program in conjunction with the Water Chemistry Control-BWR Program provides both the preventive and inspection elements contained in a plant-specific program. This combination satisfies the criteria of SRP-LR Appendix A.1 and therefore is acceptable.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.10.

(3) LRA Section 3.3.2.2.10 addresses the loss of material of copper alloy components exposed to condensation (external) in the HVAC and other auxiliary systems due to pitting and crevice corrosion.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy HVAC piping, piping components, and piping elements exposed to condensation (external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated in the LRA that loss of material due to pitting and crevice corrosion for copper alloy components exposed to condensation (external) in the HVAC and other auxiliary systems is managed by the System Walkdown Program, the Periodic Surveillance and Preventive Maintenance Program, the Service Water Integrity Program, and the Heat Exchanger Monitoring Program. The applicant's System Walkdown Program includes a periodic visual inspection. The applicant's Periodic Surveillance and Preventive Maintenance Program, Service Water Integrity Program and the Heat Exchanger Monitoring Program include other NDE techniques to manage loss of material of the components. These inspections will manage the aging effect of loss of material such that the intended function of the components will not be affected.

The staff evaluated each auxiliary system AMR associated with copper alloy components exposed to condensation. The application of programs that are not plant-specific was discussed with the applicant's technical personnel. In each case, the staff finds that an appropriate program had been identified for monitoring loss of material due to pitting and crevice corrosion.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.10.

(4) LRA Section 3.3.2.2.10 addresses the loss of material of copper alloy components exposed to lubricating oil due to pitting and crevice corrosion.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated in the LRA that loss of material due to pitting and crevice corrosion for copper alloy components exposed to lubricating oil in auxiliary systems is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

During the audit and review, the staff determines that the applicant's Oil Analysis Program alone is not sufficient in managing the loss of material of copper alloy piping, piping components, and piping elements exposed to lubricating oil. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff determines that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.10.

(5) LRA Section 3.3.2.2.10 addresses the loss of material of HVAC aluminum piping, piping components, and piping elements and stainless steel ducting and components exposed to condensation due to pitting and crevice corrosion.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in HVAC aluminum piping, piping components, and piping elements and stainless steel ducting and components exposed to condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated, in the LRA, that loss of material due to pitting and crevice corrosion could occur for HVAC aluminum piping, piping components, and piping elements and stainless steel ducting and components exposed to condensation. At VYNPS, there are no aluminum components or stainless steel ducting exposed to condensation in the HVAC systems. However, this item can be applied to stainless steel components exposed to condensation, both internal and external, in other systems. The System Walkdown Program, and the Service Water Integrity Program, will manage loss of material in stainless steel components exposed externally to condensation. The Periodic Surveillance and Preventive Maintenance Program, will manage loss of material in stainless steel components exposed internally or externally to condensation. These programs include a periodic visual inspection and the Periodic Surveillance and Preventive Maintenance Program includes other NDE techniques to manage loss of material of the components.

The staff evaluated each auxiliary system AMR associated with stainless steel components exposed to condensation. The application of programs that are not plant-specific was discussed with the applicant's technical personnel. In each case, the staff finds that an appropriate program had been identified for monitoring loss of material due to pitting and crevice corrosion.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.10.

(6) LRA Section 3.3.2.2.10 addresses the loss of material of copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation due to pitting and crevice corrosion.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated in the LRA that loss of material due to pitting and crevice corrosion could occur for copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. At VYNPS, there are no copper alloy components exposed to condensation in the fire protection systems. However, this item can be applied to copper alloy components exposed to internal condensation in other systems.

The Periodic Surveillance and Preventive Maintenance Program, will manage loss of material in copper alloy components exposed internally to untreated air, which is equivalent to condensation, through the use of visual inspections or other NDE techniques.

The Instrument Air Quality Program, will manage loss of material in copper alloy components exposed internally to treated air. The applicant's Instrument Air Quality Program maintains humidity and particulates within acceptable limits, thereby preserving the environment of treated air that is not conducive to corrosion. This is equivalent to the management of loss of material in steel and stainless steel components addressed in LRA Table 3.3.1, Items 3.3.1-53 and 3.3.1-54, respectively.

The staff evaluated each auxiliary system AMR associated with copper alloy components exposed to condensation. The staff finds that the Periodic Surveillance and Preventive Maintenance Program would be an appropriate, plant-specific program for monitoring loss of material (copper) due to pitting and crevice corrosion. The staff finds that the plant-specific Instrument Air Quality Program served to prevent condensation from forming inside the IA system. Also by reviewing the implementing procedures for measuring dewpoint, particulate concentration and hydrocarbon concentration monitoring, the staff noted that a degradation of the piping and any components would become evident by excessive corrosion or by failure of the system or of any components to meet specified performance limits (see SER Section 3.0.3.3.4.1.4). The staff finds that the Instrument Air Quality Program would be an appropriate plant-specific program monitoring loss of material due to pitting and crevice corrosion.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.10.

(7) LRA Section 3.3.2.2.10 addresses the loss of material of stainless steel piping, piping components, and piping elements exposed to soil due to pitting and crevice corrosion.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated, in the LRA, that loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil. At VYNPS, there are no stainless steel piping components exposed to soil in the auxiliary systems. However, loss of material due to pitting and crevice corrosion for stainless steel bolting buried in soil in the fire protection-water systems is managed by the Buried Piping Inspection Program. This program will include: (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the buried stainless steel bolting.

The applicant also stated that buried components are to be inspected when excavated during maintenance. An inspection will be performed within 10 years of entering the period of extended operation, unless an opportunistic inspection occurs within this 10-year period. This program will manage the aging effect of loss of material such that the intended function of the components will not be affected.

During the audit and review, the staff confirmed that buried piping has already been inspected within the final 10-year period before the period of extended operation. Therefore, even if no other buried piping is examined before the period of extended operation, VYNPS has complied with staff guidance regarding the examination of buried piping before the end of the current operating license. The staff finds that the proposed schedule for inspection (if there is no other opportunity) is consistent with the staff's guidance and therefore acceptable.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.10.

(8) LRA Section 3.3.2.2.10 addresses loss of material of stainless steel piping and components of the SLC system exposed to sodium pentaborate solution due to pitting and crevice corrosion.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements of the BWR SLC system exposed to sodium pentaborate solution. The existing AMP monitors and controls water chemistry to manage the aging effects of loss of material due to pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause loss of material due to pitting and crevice corrosion; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that this aging does not occur. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that loss of material due to pitting and crevice corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated, in the LRA, that loss of material due to pitting and crevice corrosion for stainless steel piping and components of the SLC system exposed to sodium pentaborate solution is managed by the Water Chemistry Control-BWR Program. The effectiveness of the applicant's Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow. The staff determines this combination satisfies the criteria of SRP-LR Appendix A.1 and therefore is acceptable.

The staff finds this to be consistent with the criteria of SRP-LR Section 3.3.2.2.10 and therefore acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.10 criteria. For those line items that apply to LRA Section 3.3.2.2.10, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.11 Loss of Material Due to Pitting, Crevice, and Galvanic Corrosion

The staff reviewed LRA Section 3.3.2.2.11 against the criteria in SRP-LR Section 3.3.2.2.11.

LRA Section 3.3.2.2.11 addresses the loss of material of copper alloy piping and components exposed to treated water in the auxiliary and other systems due to pitting and crevice, and galvanic corrosion.

SRP-LR Section 3.3.2.2.11 states that loss of material due to pitting, crevice, and galvanic corrosion may occur in copper alloy piping, piping components, and piping elements exposed to treated water. Therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that this aging does not occur. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that loss of material due to pitting and crevice corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated, in the LRA, that loss of material due to pitting and crevice, and galvanic corrosion for copper alloy piping and components exposed to treated water in the auxiliary and other systems is managed by the Water Chemistry Control-BWR Program. The effectiveness of the program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow. The staff determines this combination satisfies the criteria of SRP-LR Appendix A.1 and therefore is acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.11 criteria. For those line items that apply to LRA Section 3.3.2.2.11, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.12 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.3.2.2.12 against the following SRP-LR Section 3.3.2.2.12 criteria:

(1) LRA Section 3.3.2.2.12 addresses the loss of material of stainless steel, aluminum and copper alloy piping, and components exposed to fuel oil due to pitting, crevice, and MIC.

SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting and crevice corrosion, and MIC may occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to fuel oil. The existing AMP relies on the fuel oil chemistry program for monitoring and control of fuel oil contamination to manage loss of material due to corrosion; however, corrosion may occur at locations where contaminants accumulate and the effectiveness of fuel oil chemistry control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the fuel oil chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated, in the LRA, that loss of material due to pitting, crevice, and MIC in stainless steel, aluminum and copper alloy piping, and components exposed to fuel oil is an AERM and these components are managed by the Diesel Fuel Monitoring Program. This program includes sampling and monitoring of fuel oil quality to ensure they remain within the limits specified by the ASTM standards. Maintaining parameters within limits ensures that significant loss of material will not occur. Operating experience has confirmed the effectiveness of this program in maintaining fuel oil quality within limits such that loss of material will not affect the intended functions of these components.

The staff finds that the applicant's Diesel Fuel Monitoring Program alone is not sufficient in managing the loss of material of stainless steel, aluminum and copper alloy piping, and components exposed to lubricating oil due to pitting, crevice, and MIC. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program verifies the effectiveness of the Diesel Fuel Monitoring Program.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.12.

(2) LRA Section 3.3.2.2.12 addresses loss of material of stainless steel piping and components exposed to lubricating oil due to pitting, crevice, and MIC.

SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting and crevice corrosion, and MIC may occur in stainless steel piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated in the LRA that loss of material due to pitting, crevice, and MIC in stainless steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

The staff finds that Oil Analysis Program alone is not sufficient in managing the loss of material of stainless steel piping and components exposed to lubricating oil due to pitting, crevice, and MIC. In a letter dated July 14, 2006, the applicant amended the its LRA. The applicant stated that LRA is revised to state the One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.13.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.12 criteria. For those line items that apply to LRA Section 3.3.2.2.12, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.13 Loss of Material Due to Wear

The staff reviewed LRA Section 3.3.2.2.13 against the criteria in SRP-LR Section 3.3.2.2.13.

LRA Section 3.3.2.2.13 addresses the loss of material due to wear, this aging effect is not applicable to VYNPS. Loss of material due to wear could occur in the elastomer seals and components exposed to air indoor uncontrolled (internal or external). At VYNPS, in the auxiliary systems, this specific aging effect for elastomers is not applicable based on operating experience. Where the aging effects of change in material properties and cracking are identified for elastomer components, they are managed by the Periodic Surveillance and Preventive Maintenance Program. This item is not applicable to VYNPS auxiliary systems.

SRP-LR Section 3.3.2.2.13 states that loss of material due to wear may occur in the elastomer seals and components exposed to air-indoor uncontrolled (internal or external). The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

During the audit and review, the staff finds that operating experience provided an insufficient basis for determining that this aging mechanism is not applicable at VYNPS. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant revised LRA Section 3.3.2.2.13 to state:

> Wear is the removal of surface layers due to relative motion between two surfaces. At VYNPS, in the auxiliary systems, this specific aging effect is not applicable because the HVAC elastomer coated fiberglass duct flexible connections are fixed at both ends, precluding wear. This item is not applicable to VYNPS auxiliary systems.

The staff finds that wear is precluded by the system design feature.

On this basis that this aging effect/mechanism is not applicable to VYNPS auxiliary systems, the staff finds that this aging effect is not applicable to VYNPS.

Based on the program identified above, the staff concludes that the applicant’s program meets SRP-LR Section 3.3.2.2.13 criteria. For those line items that apply to LRA Section 3.3.2.2.13, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.14 Loss of Material Due to Cladding Breach

The staff reviewed LRA Section 3.3.2.2.14 against the criteria in SRP-LR Section 3.3.2.2.14.

LRA Section 3.3.2.2.14 addresses the cracking due to underclad cracking, which could occur for PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. As VYNPS is a BWR and has no charging pumps. This item is not applicable to VYNPS

SRP-LR Section 3.3.2.2.14 states that loss of material due to cladding breach may occur in PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. The GALL Report references IN 94-63 and recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff confirmed that VYNPS has no components from this group.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafey-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff determines that the applicant adequately addressed the issues that were further evaluated. The staff finds that the applicant had demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.3.2-1 through 3.3.2-12 and Tables 3.3.2-13-1 through 3.3.2-13-42, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report. These items were reviewed and they are further addressed in SER Section 3.3.2.3.

In LRA Tables 3.3.2-1 through 3.3.2-12 and Tables 3.3.2-13-1 through 3.3.2-13-42, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.3.2.3.1 Standby Liquid Control System Summary of Aging Management Evaluation – LRA Table 3.3.2-1

The staff reviewed LRA Table 3.3.2-1, which summarizes the results of AMR evaluations for the SLC system component groups.

The staff finds that all AMR evaluation results in LRA Table 3.3.2-1 are consistent with the GALL

Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.2 Service Water Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-2

The staff reviewed LRA Table 3.3.2-2, which summarizes the results of AMR evaluations for the SWSs component groups.

In LRA Table 3.3.2-2, the applicant proposed to manage loss of material due to wear of copper-alloy heat exchanger tubes exposed to condensation and stainless steel heat exchanger tubes exposed to treated water and using the Service Water Integrity Program.

The staff reviewed the applicant's Service Water Integrity Program and Its evaluation is documented in SER Section 3.0.3.2.16. The applicant's Service Water Integrity Program relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the SWS will be managed for the period of extended operation. On this basis, the staff finds the loss of copper alloy due to wear when exposed to condensation is adequately managed using the Service Water Integrity Program.

In LRA Table 3.3.2-2, the applicant proposed to manage loss of material from stainless steel valve bodies exposed to outdoor air using the System Walkdown Program.

The staff reviewed the applicant's System Walkdown Program, which entails inspections of external surfaces of components subject to an AMR. The staff's evaluation is documented in SER Section 3.0.3.1.9. The System Walkdown Program includes inspections of external surfaces of components and is consistent with the program described in GALL AMP XI.M36, "External Surfaces Monitoring." On this basis, the staff finds loss of material of stainless steel from valve bodies exposed to air is adequately managed using the System Walkdown Program. On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.3 Reactor Building Closed Cooling Water System Summary of Aging Management Evaluation – LRA Table 3.3.2-3

The staff reviewed LRA Table 3.3.2-3, which summarizes the results of AMR evaluations for the RBCCW system component groups.

In LRA Table 3.3.2-3, the applicant proposed to manage loss of material due to wear of carbon steel heat exchanger tubes exposed to untreated water, copper alloy heat exchanger tubes exposed to lubricating oil or condensation, and stainless steel heat exchanger tubes exposed to treated water or indoor air using the Heat Exchanger Monitoring Program.

The staff reviewed the applicant's Heat Exchanger Monitoring Program and its evaluation is documented in SER Section 3.0.3.3.1. Heat exchanger monitoring program will inspect the heat exchangers for degradation. Eddy current inspections will be performed, where practical, to determine heat exchanger tube wall thickness. These inspections are to ensure that effects of aging are identified prior to loss of intended function. On this basis, the staff finds loss of material from carbon steel heat exchanger tubes exposed to untreated water, copper alloy heat exchanger tubes exposed to lubricating oil or condensation, and stainless steel heat exchanger tubes exposed to treated water or indoor air is adequately managed using the Heat Exchanger Monitoring Program

On this basis, the staff finds that management of loss of material due to wear in the RBCCW system is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.4 Emergency Diesel Generator System Summary of Aging Management Evaluation-LRA Table 3.3.2-4

The staff reviewed LRA Table 3.3.2-4, which summarizes the results of AMR evaluations for the EDG system component groups.

In LRA Table 3.3.2-4, the applicant proposed to manage cracking of stainless steel strainers exposed to a lubricating oil environment using the Oil Analysis Program. In a letter dated July 14, 2006, the applicant amended the LRA so that the One-Time Inspection Program, verified the effectiveness of the Oil Analysis Program.

The staff reviewed the applicant's Oil Analysis Program, which is a monitoring program that maintains oil systems free of contaminants (primarily water and particulates) thereby preserving an environment that is not conducive to loss of material, cracking, or fouling. The staff also reviewed the applicant's One-Time Inspection Program, which confirms the effectiveness of the Oil Analysis Program. The staff's evaluations are documented in SER Sections 3.0.3.2.13 and 3.0.3.1.6, respectively. Because the Oil Analysis Program has maintained VYNPS oil systems free of contaminants and the effectiveness of the program will be confirmed by the One-Time Inspection Program, the staff finds that the cracking of stainless steel strainers exposed to lubricating oil is adequately managed using the Oil Analysis Program and the One-Time Inspection Program.

On this basis, the staff finds that management of cracking in the EDG system is acceptable.

In LRA Table 3.3.2-4, the applicant proposed to manage fatigue damage to stainless steel expansion joints as well as carbon steel expansion joints, piping, silencers, and turbochargers exposed to exhaust gas using TLAA.

The staff's review of this TLAA evaluation is documented in SER Section 4.3.

In LRA Table 3.3.2-4, the applicant proposed to manage fouling of aluminum heat exchanger (fins) and copper-alloy heat exchanger (tubes) using the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the Periodic Surveillance and Preventive Maintenance Program. Its evaluation is documented in SER Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1.This program that includes periodic inspections and tests that manage aging effects not managed by other AMP s. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. On this basis, the staff finds that fouling of aluminum heat exchanger fins and copper alloy tubes when exposed to air is adequately managed using the Periodic Surveillance and Preventive Maintenance Program.

In LRA Table 3.3.2-4, the applicant proposed to manage loss of material due to wear of copper-alloy heat exchanger tubes exposed to lubricating oil or treated water using the Service Water Integrity Program.

The staff reviewed the Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.16. The program relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the SWSs will be managed for the period of extended operation. On this basis, the staff finds loss of copper alloy due to wear when exposed to treated water is adequately managed using the Service Water Integrity Program.

In LRA Table 3.3.2-4, the applicant proposed to manage loss of material due to wear of copper-alloy heat exchanger tubes exposed to indoor air using the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. This program includes periodic inspections and tests that manage aging effects not managed by other AMPs. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. On this basis, the staff finds that loss of material from copper alloy tubes exposed to indoor air is adequately managed using the Periodic Surveillance and Preventive Maintenance Program.

In LRA Table 3.3.2-4, the applicant proposed to manage loss of material from stainless steel strainers exposed to outdoor air using the System Walkdown Program.

The staff reviewed the applicant's System Walkdown Program, which entails inspections of external surfaces of components subject to an AMR.The staff's evaluation is documented in SER Section 3.0.3.1.9. The System Walkdown Program includes inspections of external surfaces of components and is consistent with the program described in GALL AMP XI.M36, "External Surfaces Monitoring." On this basis, the staff finds loss of stainless steel from strainers exposed to air is adequately managed using the System Walkdown Program.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERM, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.5 Fuel Pool Cooling Systems Summary of Aging Management Evaluation -LRA Table 3.3.2-5

The staff reviewed LRA Table 3.3.2-5, which summarizes the results of AMR evaluations for the fuel pool cooling systems component groups.

In LRA Table 3.3.2-5, the applicant proposed to manage cracking of stainless steel flex hoses exposed to fuel oil using the Diesel Fuel Monitoring Program. In a letter dated July 14, 2006, the applicant amended the LRA so that the One-Time Inspection Program, verified the effectiveness of the Diesel Fuel Monitoring Program.

The staff reviewed the applicant's Diesel Fuel Monitoring Program. The staff also reviewed the applicant's One-Time Inspection Program, which confirms the effectiveness of the Diesel Fuel Monitoring Program. The staff evaluations are documented in SER Sections 3.0.3.2.9 and 3.0.3.1.6, respectively. The Diesel Fuel Monitoring Program entails sampling to ensure that adequate diesel fuel quality is maintained to prevent corrosion of fuel systems. Exposure to fuel oil contaminants such as water and microbiological organisms is minimized by periodic draining and cleaning of tanks and by verifying the quality of new oil before its introduction into storage tanks. On this basis, the staff finds that cracking of stainless steel flex hoses exposed to fuel oil is adequately managed using the Diesel Fuel Monitoring Program and the One-Time Inspection Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.6 Fuel Oil System Summary of Aging Management Evaluation-LRA Table 3.3.2-6

The staff reviewed LRA Table 3.3.2-6, which summarizes the results of AMR evaluations for the fuel oil system component groups.

In LRA Table 3.3.2-6, the applicant proposed to manage loss of material from carbon steel tanks exposed to concrete using the Diesel Fuel Monitoring Program. In a letter dated July 14, 2006, the applicant amended the LRA so that the One-Time Inspection Program, verified the effectiveness of the Diesel Fuel Monitoring Program.

The staff reviewed the applicant's Diesel Fuel Monitoring Program. The staff also reviewed the applicant's One-Time Inspection Program, which confirms the effectiveness of the Diesel Fuel Monitoring Program. The staff's evaluations are documented in SER Sections 3.0.3.2.9 and 3.0.3.1.6, respectively. The Diesel Fuel Monitoring Program entails sampling to ensure that adequate diesel fuel quality is maintained to prevent corrosion of fuel systems. Exposure to fuel oil contaminants such as water and microbiological organisms is minimized by periodic draining and cleaning of tanks and by verifying the quality of new oil before its introduction into storage tanks. On this basis, the staff finds the loss of material from carbon-steel tanks is adequately managed using the Diesel Fuel Monitoring Program and the One-Time Inspection Program.

In LRA Table 3.3.2-6, the applicant proposed to manage cracking of stainless steel flex hoses exposed to fuel oil using the Diesel Fuel Monitoring Program. In a letter dated July 14, 2006, the applicant amended the LRA so that applicant's One-Time Inspection Program verified the effectiveness of its Diesel Fuel Monitoring Program.

The staff reviewed the applicant's Diesel Fuel Monitoring Program. The staff also reviewed the applicant's One-Time Inspection Program, which confirms the effectiveness of the Diesel Fuel Monitoring Program. The staff's evaluations are documented in SER Sections 3.0.3.2.9 and 3.0.3.1.6, respectively. The Diesel Fuel Monitoring Program entails sampling to ensure that adequate diesel fuel quality is maintained to prevent corrosion of fuel systems. Exposure to fuel oil contaminants such as water and microbiological organisms is minimized by periodic draining and cleaning of tanks and by verifying the quality of new oil before its introduction into storage tanks. On this basis, the staff finds the loss of material from carbon-steel tanks is adequately managed using the Diesel Fuel Monitoring Program and the One-Time Inspection Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.7 Instrument Air System Summary of Aging Management Evaluation-LRA Table 3.3.2-7

The staff reviewed LRA Table 3.3.2-7, which summarizes the results of AMR evaluations for the IA system component groups.

The staff determines that all AMR evaluation results in LRA Table 3.3.2-7 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.8 Fire Protection - Water System Summary of Aging Management Evaluation-LRA Table 3.3.2-8

The staff reviewed LRA Table 3.3.2-8, which summarizes the results of AMR evaluations for the fire protection-water system component groups.

In LRA Table 3.3.2-8, the applicant proposed to manage cracking of stainless steel valve bodies exposed to treated water using the Fire Protection-Fire Protection Program.

The staff reviewed the applicant's Fire Protection Program, which includes a fire barrier inspection and a diesel-driven fire pump inspection. The staff's evaluation is documented in SER Section 3.0.3.2.11. The Fire Protection Program includes periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire rated doors to ensure that their operability is maintained. The diesel-driven fire pump inspection requires that the pump be periodically tested to ensure that the fuel supply line can perform its intended function. On this basis, the staff finds that cracking of stainless steel valve bodies exposed to treated water is adequately managed using the Fire Protection Program.

In LRA Table 3.3.2-8, the applicant proposed to manage fatigue damage to carbon steel piping, silencer, and turbocharger as well as a stainless steel expansion joint exposed to exhaust gases and copper-alloy heat exchanger tubes as well as carbon steel heat exchanger (bonnet) and piping exposed to lubricating oil using the Fire Protection-Fire Protection Program.

The staff reviewed the applicant's Fire Protection Program, which includes a fire barrier inspection and a diesel-driven fire pump inspection. The stafff's evaluation is documented in SER Section 3.0.3.2.11. The Fire Protection Program requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire rated doors to ensure that their operability is maintained. The diesel-driven fire pump inspection requires that the pump be periodically tested to ensure that the fuel supply line can perform its intended function. On this basis, the staff determines that cracking due to fatigue of carbon steel piping, silencer, and turbocharger as well as a stainless steel expansion joint exposed to exhaust gases and copper-alloy heat exchanger tubes as well as carbon steel heat exchanger (bonnet) and piping exposed to lubricating oil isadequately managed using the Fire Protection Program. On this basis, the staff finds that management of cracking in the fire protection water system is acceptable.

In LRA Table 3.3.2-8, the applicant proposed to manage fouling of copper-alloy heat exchanger tubes exposed to treated water using the Fire Protection-Fire Protection Program.

The staff reviewed the applicant's Fire Protection Program, which includes a fire barrier inspection and a diesel-driven fire pump inspection. The staff's evaluation is documented in SER Section 3.0.3.2.11. The Fire Protection Program requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire rated doors to ensure that their operability is maintained. The diesel-driven fire pump inspection requires that the pump be periodically tested to ensure that the fuel supply line can perform its intended function. On this basis, the staff finds that fouling of the copper-alloy heat exchanger tubes exposed to treated water is adequately managed using the Fire Protection Program.

On this basis, the staff finds that management of fouling in the fire protection system is acceptable.

In LRA Table 3.3.2-8, the applicant proposed to manage loss of material from aluminum heater housing; carbon steel filter housing, heat exchanger shell, piping, pump casing, and valve bodies; copper-alloy heat exchanger tubes, tubing, and valve bodies; as well as stainless steel valve bodies exposed to treated water using the Fire Protection-Fire Protection Program.

The staff reviewed the applicant's Fire Protection-Fire Protection Program, which includes a fire barrier inspection and a diesel-driven fire pump inspection. The staff's evaluation is documented in SER Section 3.0.3.2.11. The Fire Protection Program requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire rated doors to ensure that their operability is maintained. The diesel-driven fire pump inspection requires that the pump be periodically tested to ensure that the fuel supply line can perform its intended function. On this basis, the staff finds that loss of material from aluminum heater housing; carbon steel filter housing, heat exchanger shell, piping, pump casing, and valve bodies; copper-alloy heat exchanger tubes, tubing, and valve bodies; as well as stainless steel valve bodies exposed to treated water is adequately managed using the Fire Protection Program.

In LRA Table 3.3.2-8, the applicant proposed to manage loss of material from carbon steel flow nozzle, piping, tank, and valve bodies; copper-alloy flow nozzles and valve bodies; as well as gray cast iron valve bodies exposed to fire protection foam using the Fire Protection-Fire Water System Program.

The staff reviewed the applicant's Fire Water System Program and its evaluation is documented in SER Section 3.0.3.2.12. The Fire Water System Program applies to water-based fire protection systems that consist of sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, and aboveground and underground piping and components that are tested in accordance with applicable NFPA codes and standards. On this basis, the staff finds that loss of material from carbon steel flow nozzle, piping, tank, and valve bodies; copper-alloy flow nozzles and valve bodies; as well as gray cast iron valve bodies exposed to fire protection foam is adequately managed using the Fire Protection-Fire Water System Program.

In LRA Table 3.3.2-8, the applicant proposed to manage selective leaching of copper-alloy flow nozzles and valve bodies and gray cast iron valve bodies exposed to fire protection foam using the Selective Leaching Program.

The staff reviewed the applicant's Selective Leaching Program, which ensures the integrity of components made of cast iron, bronze, brass, and other alloys exposed to raw water, treated water, or groundwater that may lead to selective leaching. The staff's evaluation is documented in SER Section 3.0.3.1.7. The Selective Leaching Program is consistent with GALL AMP XI.M33, "Selective Leaching of Materials." On this basis, the staff finds the selective leaching of material from copper-alloy flow nozzles and valve bodies and gray cast iron valve bodies exposed to fire protection foam is adequately managed using the Selective Leaching Program.

In LRA Table 3.3.2-8, the applicant proposed to manage loss of material from stainless steel bolting and copper alloy nozzles exposed to outdoor air using the System Walkdown Program.

The staff reviewed the applicant's System Walkdown Program, which entails inspections of external surfaces of components subject to an AMR. The staff's evaluation is documented in

SER Section 3.0.3.1.9. The System Walkdown Program is consistent with the staff team determines the loss of material from stainless steel bolting and copper alloy nozzles exposed to outdoor air is adequately managed using the System Walkdown Program. On this basis, the staff finds that management of loss of material in the fire protection water system is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.9 Fire Protection - CO_2 System Summary of Aging Management Evaluation – LRA Table 3.3.2-9

The staff reviewed LRA Table 3.3.2-9, which summarizes the results of AMR evaluations for the fire protection - CO_2 system component groups.

In LRA Table 3.3.2-9, the applicant proposed to manage loss of material from copper alloy piping, tubing, and valve bodies and stainless steel bolting, orifices, tubing, and valve bodies exposed to outdoor air using the System Walkdown Program.

The staff reviewed the applicant’s System Walkdown Program, which entails inspections of external surfaces of components subject to an AMR. The staff’s evaluation evaluation is documented in SER Section 3.0.3.1.9. The System Walkdown Program includes inspections of external surfaces of components subject to an AMR. On this basis, the staff finds the loss of material from copper alloy piping, tubing, and valve bodies and stainless steel bolting, orifices, tubing, and valve bodies exposed to outdoor air is adequately managed using the System Walkdown Program. On this basis, the staff finds that management of loss of material in the fire protection CO_2 system is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.10 Heating, Ventilation, and Air Conditioning Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-10

The staff reviewed LRA Table 3.3.2-10, which summarizes the results of AMR evaluations for the HVAC systems component groups.

In LRA Table 3.3.2-10, the applicant proposed to manage fouling of copper alloy heat exchanger tubes exposed to condensation using the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the applicant’s Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. This Program includes periodic inspections and tests that manage aging effects not managed by other AMP s. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. On this basis, the staff finds fouling of copper alloy heat exchanger tubes exposed to condensation is adequately managed using the Periodic Surveillance and Preventive Maintenance Program.

In LRA Table 3.3.2-10, the applicant proposed to manage fouling of aluminum heat exchanger fins and fouling of copper-alloy heat exchanger tubes exposed to condensation using the Service Water Integrity Program.

The staff reviewed the applicant’s Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.16. The Service Water Integrity Program relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the SWSs will be managed for the period of extended operation. On this basis, the staff finds fouling of aluminum heat exchanger fins as well as fouling of copper-alloy heat exchanger tubes exposed to condensation is adequately managed using the Service Water Integrity Program. On this basis, the staff finds that management of fouling in the HVAC system is acceptable.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material due to wear of copper alloy heat exchanger tubes exposed to condensation or treated water using the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the applicant’s Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. This program includes periodic inspections and tests that manage aging effects not managed by other AMPs. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. On this basis, the staff finds loss of material due to wear of copper alloy heat exchanger tubes exposed to condensation or treated water is adequately managed using the Periodic Surveillance and Preventive Maintenance Program.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material due to wear of copper-alloy heat exchanger tubes exposed to condensation using the Service Water Integrity Program.

The staff reviewed the applicant’s Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.16. The Service Water Integrity Program relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the SWSs will be managed for the period of extended operation. On this basis, the staff finds loss of material due to wear of copper-alloy heat exchanger tubes exposed to condensation is adequately managed using the Service Water Integrity Program.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material from aluminum damper, fan, and louver housings; copper-alloy tubing and valve bodies; and stainless steel bolting exposed to outdoor air using the System Walkdown Program.

The staff reviewed the applicant’s System Walkdown Program and its evaluation is documented in SER Section 3.0.3.1.9. The System Walkdown Program includes inspections of external surfaces of components subject to an AMR. The program is also credited with managing loss of material from internal surfaces, for situations in which internal and external material and environment combinations are the same such that external surface condition is representative of internal surface condition. On this basis, the staff finds the loss of material from the interior and exterior of aluminum damper, fan, and louver housings exposed to outdoor air. The staff also finds the loss of material from the exterior of copper-alloy tubing and valve bodies as well as from stainless steel bolting exposed to outdoor air is adequately managed using the System Walkdown Program.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material from copper-alloy heat exchanger tubes exposed to steam using the Water Chemistry Control-Auxiliary Systems Program. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the VYNPS LRA is revised to state the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control-Auxiliary Systems Program.

The staff reviewed the applicant’s Water Chemistry Control Program for auxiliary systems and the One-Time Inspection Program, which confirms the effectiveness of the Water Chemistry Control Program. The staff’s evaluation is documented in SER Sections 3.0.3.3.7 and 3.0.3.1.6, respectively. The Water Chemistry Control Program controls contaminants at the lowest practical levels and provides corrosion protection for major systems and components. On this basis, the staff finds that loss of material from the interior of copper-alloy heat exchanger tubes exposed to steam is adequately managed using the Water Chemistry Control-Auxiliary Systems Program augmented by the One-Time Inspection Program. On this basis, the staff finds that management of loss of material in the HVAC system is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.11 Primary Containment Atmosphere Control and Containment Atmosphere Dilution Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-11

The staff reviewed LRA Table 3.3.2-11, which summarizes the results of AMR evaluations for the primary CAC and containment atmosphere dilution systems component groups.

In LRA Table 3.3.2-11, the applicant proposed to manage fouling of stainless steel heat exchangers exposed to indoor air using the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the Periodic Surveillance and Preventive Maintenance Program and. Its evaluation is documented in SER Section 3.0.3.3.5.The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. This program includes periodic inspections and tests that manage aging effects not managed by other AMPs.The Periodic Surveillance and Preventive Maintenance Program visually inspect external surfaces of the hydrogen analyzer pre-cooler (heat exchanger) to manage fouling. On this basis, the staff finds fouling of stainless steel heat exchangers exposed to indoor air is adequately managed using the Periodic Surveillance and Preventive Maintenance Program. On this basis, the staff finds that management of fouling in the primary CAC and containment atmosphere dilution systems is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.12 John Deere Diesel Summary of Aging Management Evaluation-LRA Table 3.3.2-12

The staff reviewed LRA Table 3.3.2-12, which summarizes the results of AMR evaluations for the John Deere diesel component groups.

In LRA Table 3.3.2-12, the applicant proposed to manage cracking due to fatigue of stainless steel expansion joints and the carbon steel piping, silencer, and turbocharger exposed to exhaust gases using the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the applicant’s Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. This program includes periodic inspections and tests that manage aging effects not managed by other AMP s. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. Because the program has been demonstrated to detect and control cracking due to fatigue, the staff finds cracking of stainless steel expansion joints and the carbon steel piping, silencer, and turbocharger exposed to exhaust gases is adequately managed using the Periodic Surveillance and Preventive Maintenance Program.

On this basis, the staff finds that management of cracking in the John Deere Diesel is acceptable.

In LRA Table 3.3.2-12, the applicant proposed to manage fouling of a copper-alloy radiator exposed to indoor air using the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the applicant’s Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1.This program includes periodic inspections and tests that manage aging effects not managed by other AMPs. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. The staff also reviewed the applicant’s operating history and industry-wide operating experience. Because the program has been demonstrated to detect and control fouling, the staff finds fouling of a copper-alloy radiator exposed to indoor air is adequately managed using the Periodic Surveillance and Preventive Maintenance Program.

In LRA Table 3.3.2-12, the applicant proposed to manage fouling of a copper-alloy radiator and heat exchanger tubes exposed to treated water using the Water Chemistry Control-Auxiliary Systems Program. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control-Auxiliary Systems Program.

The staff reviewed the applicant's Water Chemistry Control Program for auxiliary systems, which manages aging effects for components exposed to treated water. The staff also reviewed the applicant's One-Time Inspection Program, which confirms the effectiveness of the Water Chemistry Control Program. The staff's evaluation is documented in SER Sections 3.0.3.3.7 and 3.0.3.1.6, respectively. In addition, the staff reviewed the applicant's operating history and industry-wide operating experience. The Water Chemistry Control Program controls contaminants at the lowest practical levels and provides corrosion protection for major systems and components. On this basis, the staff finds that fouling of copper-alloy radiator and heat exchanger tubes exposed to treated water is adequately managed using the Water Chemistry Control Program-Auxiliary Systems Program augmented by the One-Time Inspection Program. On this basis, the staff determines that management of fouling in the John Deere Diesel is acceptable.

In LRA Table 3.3.2-12, the applicant proposed to manage loss of material from copper-alloy radiator and heat exchanger tubes and the carbon steel heater housings, piping, and pump casings exposed to treated water using the Water Chemistry Control-Auxiliary Systems Program, and the One-Time Inspection Program.

The staff reviewed the applicant's Water Chemistry Control Program for auxiliary systems, which manages aging effects for components exposed to treated water. The staff also reviewed the applicant's One-Time Inspection Program, which confirms the effectiveness of the Water Chemistry Control Program. Its evaluation is documented in SER Sections 3.0.3.3.7 and 3.0.3.1.6, respectively. The Water Chemistry Control Program controls contaminants at the lowest practical levels and provides corrosion protection for major systems and components. On this basis, the staff determines that loss of material from copper-alloy radiator and heat exchanger tubes and carbon steel heater housings, piping and pump casings exposed to treated water is adequately managed using the Water Chemistry Control Program-Auxiliary Systems Program augmented by the One-Time Inspection Program.

In LRA Table 3.3.2-12, the applicant proposed to manage loss of material due to wear of the copper-alloy radiator in air and the copper-alloy heat exchanger tubes in lubricating oil using the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program. Its evaluation is documented in SER Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. This program includes periodic inspections and tests that manage aging effects not managed by other AM s. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. This program uses visual or other NDE techniques to manage loss of material. On this basis, the staff finds loss of material due to wear is adequately managed using the Periodic Surveillance and Preventive Maintenance Program. On this basis, the staff finds that management of loss of material in the John Deere Diesel is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.13 Augmented Offgas System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-1

The staff reviewed LRA Table 3.3.2-13-1, which summarizes the results of AMR evaluations for the AOG component groups.

The staff reviewed LRA Table 3.3.2-13-1, which summarized the results of AMR evaluations for the AOG system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-1 are consistent with the GALL Reports.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.14 Condensate System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-2

The staff reviewed LRA Table 3.3.2-13-2, which summarizes the results of AMR evaluations for the condensate system component groups.

The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-2 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.15 Containment Air Dilution, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-3

The staff reviewed LRA Table 3.3.2-13-3, which summarized the results of AMR evaluations for the containment air dilution component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-3 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL

Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.16 Condensate Demineralizer System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-4

The staff reviewed LRA Table 3.3.2-13-4, which summarized the results of AMR evaluations for the condensate demineralizer system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-4 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.17 Control Rod Drive System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-5

The staff reviewed LRA Table 3.3.2-13-5, which summarized the results of AMR evaluations for the CRD system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-5 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.18 Core Spray System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-6

The staff reviewed LRA Table 3.3.2-13-6, which summarized the results of AMR evaluations for the CSS component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-6 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.19 Condensate Storage and Transfer System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-7

The staff reviewed LRA Table 3.3.2-13-7, which summarizes the results of AMR evaluations for the condensate storage and transfer system component groups.

In LRA Table 3.3.2-13-7, the applicant proposed to manage loss of material from copper-alloy tubing and stainless steel bolting exposed to outdoor air using the System Walkdown Program.

The staff reviewed the applicant's System Walkdown Program and its evaluation is documented in SER Section 3.0.3.1.9. The System Walkdown Program include inspections of external surfaces of components subject to an AMR. The program is also credited with managing loss of material from internal surfaces, for situations in which internal and external material and environment combinations are the same such that external surface condition is representative of internal surface condition. On this basis, the staff finds the loss of material from the exterior of copper-alloy tubing as well as from stainless steel bolting exposed to outdoor air is adequately managed using the System Walkdown Program. On this basis, the staff finds that management of loss of material in the condensate storage and transfer system is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.20 RWCU Filter Demineralizer System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-8

The staff reviewed LRA Table 3.3.2-13-8, which summarized the results of AMR evaluations for the RWCU filter demineralizer system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-8 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.21 Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-9

The staff reviewed LRA Table 3.3.2-13-9, which summarized the results of AMR evaluations for the CW system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-9 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.22 Diesel Generator and Auxiliaries, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-10

The staff reviewed LRA Table 3.3.2-13-10, which summarized the results of AMR evaluations for the diesel generator and auxiliaries component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-10 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.23 Diesel Lube Oil System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-13-11

The staff reviewed LRA Table 3.3.2-13-12, which summarized the results of AMR evaluations for the demineralized water system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-12 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.24 Demineralized Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-12

The staff reviewed LRA Table 3.3.2-13-12, which summarized the results of AMR evaluations for the demineralized water system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-12 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.25 Feedwater System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-13

The staff reviewed LRA Table 3.3.2-13-13, which summarized the results of AMR evaluations for the FW system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13 are either not applicable to VYNPS or consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.26 Fuel Oil System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-14

The staff reviewed LRA Table 3.3.2-13-14, which summarized the results of AMR evaluations for the fuel oil system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.27 Fire Protection System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-15

The staff reviewed LRA Table 3.3.2-13-15, which summarized the results of AMR evaluations for the fire protection system component groups.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material from copper-alloy tubing and stainless steel bolting exposed to outdoor air using the System Walkdown Program.

The staff reviewed the applicant's System Walkdown Program, which entails inspections of external surfaces of components subject to an AMR. The staff's evaluation is documented in SER Section 3.0.3.1.9. The program is also credited with managing loss of material from internal surfaces, for situations in which internal and external material and environment combinations are the same such that external surface condition is representative of internal surface condition. The staff also reviewed the applicant's operating history and industry-wide operating experience. The System Walkdown Program includes visual inspections of copper-alloying tubing. On this basis, the staff finds the loss of material from the exterior of copper-alloy tubing and stainless steel bolting exposed to outdoor air is adequately managed using the System Walkdown Program. On this basis, the staff finds that management of loss of material in the fire protection system is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.28 Fuel Pool Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-16

The staff reviewed LRA Table 3.3.2-13-16, which summarized the results of AMR evaluations for the fuel pool cooling system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-16 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.29 Fuel Pool Cooling Filter Demineralizer System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-17

The staff reviewed LRA Table 3.3.2-13-17, which summarized the results of AMR evaluations for the fuel pool cooling filter demineralizer system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-17 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.30 House Heating Boiler System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-18

The staff reviewed LRA Table 3.3.2-13-18, which summarized the results of AMR evaluations for the house heating boiler system component groups.

In LRA Table 3.3.2-13-18, the applicant proposed to manage loss of material from carbon steel piping, steam traps, and valve bodies exposed to steam using the Water Chemistry Control-Auxiliary Systems Program. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state the One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control-Auxiliary Systems Program.

The staff reviewed the applicant’s Water Chemistry Control Program for auxiliary systems, which manages aging effects for components exposed to treated water. The staff also reviewed the applicant’s One-Time Inspection Program, which confirms the effectiveness of the Water Chemistry Control Program. The staff’s evaluation of these program is documented in SER Sections 3.0.3.3.7 and 3.0.3.1.6, respectively. The Water Chemistry Control Program controls contaminants at the lowest practical levels and provides corrosion protection for major systems and components. On this basis, the staff finds that loss of material from carbon steel piping, steam traps and valve bodies exposed to steam is adequately managed using the Water Chemistry Control Program-Auxiliary Systems Program augmented by the One-Time Inspection Program.

On this basis, the staff finds that management of loss of material in the house heating boiler system is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.31 Hydraulic Control Units, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-19

The staff reviewed LRA Table 3.3.2-13-19, which summarized the results of AMR evaluations for the hydraulic control units component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-19 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.32 High Pressure Coolant Injection System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-20

The staff reviewed LRA Table 3.3.2-13-20, which summarized the results of AMR evaluations for the HPCIS component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-20 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.33 Heating, Ventilation, and Air Conditioning Systems, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-21

The staff reviewed LRA Table 3.3.2-13-21, which summarized the results of AMR evaluations for the heating, ventilation and air conditioning systems component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-21 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.34 Instrument Air System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-22

The staff reviewed LRA Table 3.3.2-13-22, which summarized the results of AMR evaluations for the IA system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-22 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.35 MG Lube Oil System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-23

The staff reviewed LRA Table 3.3.2-13-23, which summarized the results of AMR evaluations for the MG lube oil system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-23 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.36 Nitrogen System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-24

The staff reviewed LRA Table 3.3.2-13-24, which summarized the results of AMR evaluations for the nitrogen system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-24 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.37 Nuclear Boiler System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-25

The staff reviewed LRA Table 3.3.2-13-25, which summarized the results of AMR evaluations for the nuclear boiler system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-25 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.38 Neutron Monitoring System, Nonsafety-related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-26

The staff reviewed LRA Table 3.3.2-13-26, which summarized the results of AMR evaluations for the neutron monitoring system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-26 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.39 Post-Accident Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-27

The staff reviewed LRA Table 3.3.2-13-27, which summarized the results of AMR evaluations for the post-accident sampling system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-27 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.40 Primary Containment Atmosphere Control System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRATable 3.3.2-13-28

The staff reviewed LRA Table 3.3.2-13-28, which summarized the results of AMR evaluations for the primary CAC system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-28 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.41 Potable Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-29

The staff reviewed LRA Table 3.3.2-13-29, which summarized the results of AMR evaluations for the potable water system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-29 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.42 Reactor Building Closed Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-30

The staff reviewed LRA Table 3.3.2-13-30, which summarized the results of AMR evaluations for the reactor building CCWS component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-30 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.43 Reactor Core Isolation Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-31

The staff reviewed LRA Table 3.3.2-13-31, which summarized the results of AMR evaluations for the RCICS component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-31 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.44 Radwaste, Liquid and Solid, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-32

The staff reviewed LRA Table 3.3.2-13-32, which summarized the results of AMR evaluations for the radwaste, liquid and solid component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-32 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.45 Residual Heat Removal System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-33

The staff reviewed LRA Table 3.3.2-13-33, which summarized the results of AMR evaluations for the RHRS component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-33 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.46 RHR Service Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-34

The staff reviewed LRA Table 3.3.2-13-34, which summarized the results of AMR evaluations for the RHRSW system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-34 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.47 Equipment Retired in Place, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-35

The staff reviewed LRA Table 3.3.2-13-35, which summarized the results of AMR evaluations for the equipment retired in place component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-35 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.48 Reactor Water Clean-Up System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-36

The staff reviewed LRA Table 3.3.2-13-36, which summarized the results of AMR evaluations for the reactor water clean-up system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-36 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.49 Standby Fuel Pool Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-37

The staff reviewed LRA Table 3.3.2-13-37, which summarized the results of AMR evaluations for the standby fuel pool cooling system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-37 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.50 Standby Gas Treatment System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-38

The staff reviewed LRA Table 3.3.2-13-38, which summarized the results of AMR evaluations for the SGTS component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-38 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.51 Stator Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-39

The staff reviewed LRA Table 3.3.2-13-39, which summarized the results of AMR evaluations for the stator cooling system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-39 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.52 Standby Liquid Control System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-40

The staff reviewed LRA Table 3.3.2-13-40, which summarized the results of AMR evaluations for the SLC system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-40 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.53 Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-41

The staff reviewed LRA Table 3.3.2-13-41, which summarized the results of AMR evaluations for the sampling system component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-41 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.54 Service Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation-LRA Table 3.3.2-13-42

The staff reviewed LRA Table 3.3.2-13-42, which summarized the results of AMR evaluations for the SWS component groups. The staff finds that all AMR evaluation results in LRA Table 3.3.2-13-42 are consistent with the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.55 Aging Effect/Mechanism in Table 3.3.1 That are Not Applicable for VYNPS

The staff reviewed LRA Table 3.3.1, which provides a summary of aging management evaluations for the auxiliary systems evaluated in the GALL Report.

In LRA Table 3.3.1, Item 3.3.1-10 discussion column, the applicant stated that high strength steel bolting is not used in the auxiliary systems.

The staff confirmed that there is no high strength steel bolting in the VYNPS auxiliary systems.

On the basis that there is no high strength steel bolting in the auxiliary systems at VYNPS, the staff finds that this aging effect is not applicable at VYNPS.

In LRA Table 3.3.1, Item 3.3.1-36, the applicant stated that the reduction of neutron-absorbing capacity of Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated water due to Boraflex degradation is not applicable at VYNPS.

The staff confirmed that Boraflex is not used at VYNPS. On the basis that there is no Boraflex in the auxiliary systems at VYNPS, the staff finds that this aging effect is not applicable to VYNPS.

In LRA Table 3.3.1, Item 3.3.1-39, the applicant stated that the cracking of stainless steel BWR spent fuel storage racks exposed to treated water greater than 60°C (greater than140°F) due to SCC is not applicable at VYNPS.

The staff confirmed that the temperature of the water to which spent fuel racks are exposed is limited at VYNPS. On the basis that there are no stainless steel spent fuel storage racks exposed to treated water greater than140°F, the staff finds that this aging effect is not applicable at VYNPS.

In LRA Table 3.3.1, Item 3.3.1-41, the applicant stated that the cracking of high-strength steel closure bolting exposed to air with steam or water leakage due to cyclic loading and SCC is not applicable at VYNPS.

The staff confirmed that VYNPS auxiliary systems uses no high-strength steel closure bolting. On the basis that there is no high-strength steel bolting in the auxiliary systems at VYNPS, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.3.1, Item 3.3.1-42, the applicant stated that this line item was not used because the loss of material of steel closure bolting due to general corrosion was addressed by other line items.

For loss of material due to general corrosion of steel closure bolting exposed to air with steam or water leakage, the GALL Report recommends a program consistent with GALL AMP XI.M18, "Bolting Integrity."

During the audit and review, the staff asked the applicant to clarify how aging of steel closure bolting would be managed in the absence of a Bolting Integrity Program. In a letter dated July 6, 2006, the applicant agreed to prepare and submit an AMP consistent with GALL

AMP XI.M18, “Bolting Integrity,” for approval. In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Bolting Integrity Program. The staff’s evaluation of this program is documented in SER Section 3.0.3.2.19. The staff finds that the applicant’s Bolting Integrity Program conformed to the recommendations of the GALL Report and encompass all safety-related bolting as delineated in NUREG-1339, which includes the criteria established in the 1995 Edition through the 1996 Addenda of ASME Code, Section XI. With this change, the applicant’s management of steel closure bolting will be consistent with the GALL Report and therefore acceptable.

In LRA Table 3.3.1, Item 3.3.1-44, the applicant stated that this line item was not used because the loss of material due to general, pitting, and crevice corrosion of steel compressed air system closure bolting exposed to condensation was addressed by other line items.

For loss of material due to general, pitting, and crevice corrosion of steel compressed air system closure bolting exposed to condensation, the GALL Report recommends a program consistent with GALL AMP XI.M18, “Bolting Integrity.”

During the audit and review, the staff confirmed that all auxiliary system bolting within the scope of license renewal is addressed using other LRA Table 3.3.1 items. During discussions with the applicant’s technical personnel, the applicant staff stated that a Bolting Integrity Program is in development that will address the aging management of bolting within the scope of license renewal. In a letter dated July 6, 2006, the applicant committed to implement a Bolting Integrity Program which is consistent with GALL AMP XI.M18, “Bolting Integrity.” In a letter dated October 17, 2006, the applicant revised its LRA. The applicant submitted its Bolting Integrity Program. The staff’s evaluation of this program is documented in SER Section 3.0.3.2.19. The staff finds that the applicant’s Bolting Integrity Program conformed to the recommendations of the GALL Report and encompass all safety-related bolting as delineated in NUREG-1339, which includes the criteria established in the 1995 Edition through the 1996 Addenda of ASME Code, Section XI. With this change, the applicant’s management of bolting within the scope of license renewal will be consistent with the GALL Report and therefore acceptable.

On the basis that loss of material from steel bolting will be managed in a manner consistent with the recommendations of the GALL Report, the staff finds management of this aging effect to be acceptable even if LRA 3.3.1, Item 3.3.1-44 is not referenced.

In LRA Table 3.3.1, Item 3.3.1-45, the applicant stated that loss of preload of steel closure bolting exposed to air due to thermal effects, gasket creep, and self-loosening is not applicable at VYNPS.

During the audit and review, the staff confirmed that no auxiliary system closure bolting is subjected to temperature or pressure high enough to require aging management for this aging effect. On the basis that no VYNPS auxiliary system closure bolting is subjected to temperature or pressure high enough to require aging management for this aging effect, the staff finds that, for this component type, loss of preload is not applicable at VYNPS.

In LRA Table 3.3.1, Item 3.3.1-62, the applicant stated that loss of material due to pitting and crevice corrosion of aluminum piping, piping components, and piping elements exposed to raw water is not applicable at VYNPS because there are no aluminum components with intended functions exposed to raw water in the auxiliary systems.

The staff confirmed that aluminum is not used for auxiliary systems SCs within the scope of license renewal at VYNPS. On the basis that aluminum is not used in the auxiliary systems SCs within the scope of license renewal at VYNPS, the staff finds that this aging effect is not applicable.

In LRA Table 3.3.1, Item 3.3.1-64, the applicant stated that this line item was not used because loss of material from steel components exposed to fuel oil was addressed by other line items.

During the audit and review, the staff confirmed that loss of material from steel components exposed to fuel oil was addressed by other line items. The staff's review of those items is documented in SER Sections 3.3.2.2.9 and 3.3.2.2.12, respectively. On the basis that loss of material from steel components exposed to fuel oil is adequately managed, the staff finds that assignment of components in this category to other items in LRA Table 3.3.1 is acceptable.

In LRA Table 3.3.1, Item 3.3.1-65, the applicant stated that this line item was not used because concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates of reinforced concrete structural fire barriers are evaluated as structural components in LRA Section 3.5.

On the basis that reinforced concrete structural fire barriers are evaluated in LRA Section 3.5, the staff finds that assignment of components in this category to other items in LRA Table 3.5.1 is acceptable.

In LRA Table 3.3.1, Item 3.3.1-66, the applicant stated that this line item was not used because concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates of reinforced concrete structural fire barriers are evaluated as structural components in LRA Section 3.5.

On the basis that reinforced concrete structural fire barriers are evaluated in LRA Section 3.5, the staff finds that assignment of components in this category to other items in LRA Table 3.5.1 is acceptable.

In LRA Table 3.3.1, Item 3.3.1-67, the applicant stated that this line item was not used because loss of material due to corrosion of embedded steel of reinforced concrete structural fire barriers are evaluated as structural components in LRA Section 3.5.

On the basis that reinforced concrete structural fire barriers are evaluated in LRA Section 3.5, the staff finds that assignment of components in this category to other items in LRA Table 3.5.1 is acceptable.

In LRA Table 3.3.1, Item 3.3.1-74, the applicant stated that this line item was not used because loss of material due to wear of steel crane rails is evaluated in accordance with structural components in
LRA Section 3.5.

During the audit and review, the staff noted that steel crane structural girders are evaluated as structural components in LRA Section 3.5, however, loss of material due to wear is not explicitly addressed. The applicant's technical personnel stated that reactor building steel crane structural girders used in load handling are inspected in accordance with the Periodic Surveillance and Preventive Maintenance Program identified in (LRA Appendix B). Process facility crane rails and girders are inspected in accordance with the Structures Monitoring Program as identified in (LRA Appendix B). The Structures Monitoring Program will be enhanced, as identified in Appendix B, to address crane rails and girders. Aging management activities for crane rails and girders in accordance with these two programs are consistent with the program elements described for the GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." The staff finds this consistent with the GALL Report and is therefore acceptable.

On the basis that loss of material due to wear of crane rails will be managed in a manner consistent with the recommendations of the GALL Report, the staff finds management of this aging effect acceptable.

In LRA Table 3.3.1, Item 3.3.1-75, the applicant stated that the hardening and loss of strength due to elastomer degradation and loss of material due to erosion of elastomer seals and components exposed to raw water is not applicable at VYNPS.

The staff confirmed that there are no elastomeric components exposed to raw or untreated water in the auxiliary systems that require aging management. On the basis that there are no elastomeric components in the auxiliary systems at VYNPS that require aging management, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.3.1, Item 3.3.1-78, the applicant stated that loss of material due to pitting and crevice corrosion of stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water are managed in accordance with other items from LRA Table 3.3.1 or in the case of nickel-alloy components, need not be managed because there is no such material within the scope of license renewal for VYNPS auxiliary systems.

During the audit and review, the staff confirmed that nickel alloy is not used for auxiliary SSCs within the scope of license renewal at VYNPS. The staff also confirmed that loss of material due to pitting and crevice corrosion of stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water is managed in accordance with other items from LRA Table 3.3.1. The staff's review of those items is documented in SER Section 3.3.2.1. On the basis that pitting and crevice corrosion of stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water is adequately managed, the staff finds that assignment of components in this category to other items in LRA Table 3.3.1 is acceptable.

In LRA Table 3.3.1, Item 3.3.1-80, the applicant stated that the loss of material of stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water due to pitting, crevice, and MIC is not applicable at VYNPS.

The staff confirmed that at VYNPS, EDG system piping, piping components, and piping elements are not exposed to raw water. On the basis that there are no EDG piping components subject to aging management at VYNPS exposed to raw water, the staff finds that, for this component type, this aging effect is not applicable to VYNPS. (Heat exchanger components exposed to raw water are addressed in accordance with other items of LRA Table 3.3.1-1.)

In LRA Table 3.3.1, Item 3.3.1-86, the applicant stated that this line item was not used because loss of material due to general, pitting, and crevice corrosion of new fuel storage rack assemblies is evaluated with structural components in LRA Section 3.5.

On the basis that reinforced concrete structural steel are evaluated in LRA Section 3.5, the staff finds that assignment of components in this category to other items in LRA Table 3.5.1 is acceptable.

In LRA Table 3.3.1, Item 3.3.1-92, the applicant stated that galvanized steel surfaces are evaluated as steel for the auxiliary systems at VYNPS.

On the basis that galvanized steel surfaces are evaluated as steel for the auxiliary systems, the staff finds the managed of galvanized steel acceptable.

In LRA Table 3.3.1, Item 3.3.1-95, the applicant stated that there are no auxiliary system components exposed to controlled indoor air at VYNPS.

On the basis that there is no auxiliary system components exposed to controlled indoor air in the auxiliary systems at VYNPS, the staff finds that this aging effect is not applicable at VYNPS.

In LRA Table 3.3.1, Item 3.3.1-98, the applicant stated that dried (treated) air is maintained as an environment as a result of the Instrument Air Quality Program, so aging effects may occur without that program.

Because this program is in place, this environment is maintained at VYNPS. On this basis, steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air does not need to be managed at VYNPS.

3.3.2.3.56 Auxiliary Systems AMR Line Items That Have No Aging Effects (LRA Tables 3.3.2-1 through 3.3.2-13-42)

In LRA Tables 3.3.2-1 through 3.3.2-13-42, the applicant identified line items where no aging effects were identified as a result of its aging review process.

In LRA Tables 3.3.2-1 through 3.3.2-13-42, the applicant identified no aging effects for component types of various materials exposed to indoor air. This includes a flame arrestor in the fuel oil system fabricated from aluminum; tubing in the fire protection water system made of copper alloy; and nozzles, piping, tubing, siren or valve bodies in the fire protection system made of copper alloy exposed to air. Similarly, the applicant finds no aging effects for stainless steel nozzles, tubing, and valve bodies of the fire protection system; valve bodies of the SWS; as well as diaphragms, dryers, filter housings, heat exchangers, orifices, piping, pump casings, traps, tubing, and valve bodies of the primary containment atmospheric control and containment air dilution system exposed to indoor air.

The GALL Report identified that aluminum in an indoor uncontrolled air environment exhibits no aging effect and that the component or structure will therefore remain capable of performing its intended functions consistent with the CLB for the period of extended operation. Aluminum has an excellent resistance to corrosion when exposed to humid air (an uncontrolled indoor environment). The aluminum oxide film is bonded strongly to its surface and that film, if damaged, reforms immediately in most environments. On a surface freshly abraded and then exposed to air, the oxide film is only 5 to 10 nanometers thick but is highly effective in protecting the aluminum from further corrosion. For this reason, the staff finds that aluminum exposed to indoor uncontrolled air environment does not require aging management.

The GALL Report identified that copper alloy in an indoor, uncontrolled air environment exhibits no aging effect and that the component or structure will therefore remain capable of performing its intended functions consistent with the CLB for the period of extended operation. This conclusion is based on the fact that comprehensive tests conducted over a 20-year period in accordance with the supervision of ASTM have confirmed the suitability of copper and copper alloys for atmospheric exposure. For this reason, the staff finds that copper alloy exposed to indoor uncontrolled air environment does not require aging management.

Finally, the GALL Report identified that stainless steel in an indoor, uncontrolled air environment exhibits no aging effect and that the component or structure will therefore remain capable of performing its intended functions consistent with the CLB for the period of extended operation. This conclusion is based on the fact that stainless steels are highly resistant to corrosion in dry atmospheres in the absence of corrosive species, (which would be reflective of indoor uncontrolled air). Components are not subject to moisture in a dry air environment (and indoor uncontrolled air would have limited humidity and condensation). For this reason, the staff finds that stainless steel exposed to indoor uncontrolled air environment does not require aging management.

The staff finds that no aging effects are considered to be applicable to components fabricated from aluminum, copper alloy, or stainless steel exposed to air.

The applicant identified no aging effects for a PACCAD system stainless steel diaphragms exposed to silicone.

The GALL Report identified that stainless steels are highly resistant to corrosion in dry atmospheres in the absence of corrosive species.

On this basis, and considering that silicone does not react with stainless steel, the staff finds that there are no AERM for stainless steel diaphragms of the PACCAD system exposed to silicone.

The applicant also identified no aging effects for stainless steel bolting in the CW system exposed to outdoor air. During the audit and review, the staff asked the applicant to provide the location of the CW system bolting components at VYNPS and clarify how they are protected from constant wetting and drying conditions. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to state for stainless steel bolting exposed to outdoor air, the loss of material is to be managed by the System Walkdown Program.

The staff reviewed the System Walkdown Program, which entails inspections of external surfaces of components subject to an AMR. The staff's evaluation is documented in SER Section 3.0.3.1.9. The program is also credited with managing loss of material from internal surfaces, for situations in which internal and external material and environment combinations are the same such that external surface condition is representative of internal surface condition. On this basis, the staff finds the loss of stainless steel from bolting exposed to air is adequately managed using the System Walkdown Program.

The applicant also identified no aging effects for an HVAC system sight glass exposed to condensation.

The GALL Report identified that glass in a raw water environment exhibits no aging effect and the component or structure will therefore remain capable of performing its intended functions consistent with the CLB for the period of extended operation. This conclusion is based on the fact that silicate glasses are highly inert and operating experience has demonstrated that there are no aging related failures of glass in this environment. For this reason, the staff finds that glass exposed to condensation does not require aging management.

The staff finds that no aging effects are considered to be applicable to an HVAC system sight glass exposed to condensation.

The applicant also identified no aging effects for an SLC system sight glass exposed to sodium pentaborate solution.

The GALL Report identified that glass in a borated water environment exhibits no aging effect and the component or structure will therefore remain capable of performing its intended functions consistent with the CLB for the period of extended operation. This conclusion is based on the fact that silicate glasses are highly inert and operating experience has demonstrated that there are no aging related failures of glass in this environment. For this reason, the staff finds that glass exposed to condensation does not require aging management.

The staff finds that no aging effects are considered to be applicable to an SLC system sight glass exposed to sodium pentaborate solution.

The applicant also identified no aging effects for fiberglass piping and tanks exposed to fuel oil.

The GALL Report identified that glass in a fuel oil environment exhibits no aging effect, and found that components of glass exposed to fuel oil will remain capable of performing their intended functions consistent with the CLB for the period of extended operation.

On the basis that fiberglass (comprising glass and polymers) is similarly resistant to chemical attack by fuel oil, the staff finds that fiberglass piping and tanks exposed to fuel oil will exhibit no aging effect requiring aging management.

The applicant also identified no aging effects for fiberglass piping and tanks exposed to soil.

The GALL Report identified that glass in a raw water environment exhibits no aging effect, and found that components of glass exposed to raw water will remain capable of performing their intended functions consistent with the CLB for the period of extended operation.

On the basis that a soil environment is no more aggressive than raw water and that fiberglass (comprising glass and polymers) is similarly resistant to chemical attack, the staff finds that fiberglass piping and tanks buried in soil will exhibit no aging effect requiring aging management.

The applicant also identified no aging effects for fiberglass tanks exposed to interstitial fluid (brine).

During the audit and review, the applicant was asked to clarify the nature of the interstitial fluid. The applicant’s technical personnel explained that the interstitial fluid (brine) environment is colored water, treated with antifreeze and located between the inner and outer walls of a double-walled fiberglass fuel oil tank. The fluid is used for leak detection and is provided by the manufacturer of the tank.

The GALL Report identifies no aging effect for glass in a treated water environment. The aging effects/mechanisms identified for other non-metallics are not relevant to the function of the fiberglass fuel tank.

On this basis, the staff finds no aging effect requiring aging management for fiberglass exposed to interstitial fluid.

The applicant also identified no aging effects for fiberglass flexible duct connections exposed to indoor air.

For other non-metallic components, the applicant considered degradation from sustained vibratory loading and from wear. During the audit and review, the staff asked the applicant's technical personnel to clarify the basis for concluding that these aging mechanisms are not applicable to flexible duct connections of fiberglass. The applicant stated that wear is the loss of surface layers due to relative motion between two surfaces and that at in the auxiliary systems VYNPS, this specific aging effect is not applicable because the heating, ventilation, and air conditioning elastomer coated fiberglass duct flexible connections are fixed at both ends, precluding wear. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant revised LRA Section 3.3.2.2.13 to state:

> Wear is the removal of surface layers due to relative motion between two surfaces. At VYNPS, in the auxiliary systems, this specific aging effect is not applicable because the heating, ventilation, and air conditioning elastomer coated fiberglass duct flexible connections are fixed at both ends, precluding wear. This item is not applicable to VYNPS auxiliary systems.

On the basis of its review, the staff finds that wear is precluded by the system design feature and that this aging effect/mechanism is not applicable to VYNPS auxiliary systems. On this basis, the staff finds no AERM for fiberglass duct flexible connections exposed to indoor air.

Conclusion. On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERM, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the auxiliary systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4 Aging Management of Steam and Power Conversion Systems

This section of the SER documents the staff's review of the applicant's AMR results for the steam and power conversion systems components and component groups of:

- auxiliary steam
- condensate
- main steam
- 101 (main steam, extraction steam, and auxiliary steam instruments)

3.4.1 Summary of Technical Information in the Application

LRA Section 3.4 provides AMR results for the steam and power conversion systems components and component groups. LRA Table 3.4.1, "Summary of Aging Management Evaluations for the Steam and Power Conversion System," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the steam and power conversion systems components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.4.2 Staff Evaluation

The staff reviewed LRA Section 3.4 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the steam and power conversion systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.4.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.4.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.4.2.2.

The staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.4.2.3.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the steam and power conversion systems components.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Table 3.4-1 summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.4 and addressed in the GALL Report.

Table 3.4-1 Staff Evaluation for Steam and Power Conversion Systems Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to steam or treated water (3.4.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	Fatigue is a TLAA (See SER Section 3.4.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to steam (3.4.1-2)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.2)
Steel heat exchanger components exposed to treated water (3.4.1-3)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	None	Not applicable to BWRs
Steel piping, piping components, and piping elements exposed to treated water (3.4.1-4)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.2)
Steel heat exchanger components exposed to treated water (3.4.1-5)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	None	Not applicable (See SER Section 3.4.2.2.9)
Steel and stainless steel tanks exposed to treated water (3.4.1-6)	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	None	Not applicable (See SER Section 3.4.2.2.2)
Steel piping, piping components, and piping elements exposed to lubricating oil (3.4.1-7)	Loss of material due to general, pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	None	Not applicable (See SER Section 3.4.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to raw water (3.4.1-8)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Plant-specific	None	Not applicable (See SER Section 3.4.2.2.3)
Stainless steel and copper alloy heat exchanger tubes exposed to treated water (3.4.1-9)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.4)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil (3.4.1-10)	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	None	Not applicable (See SER Section 3.4.2.2.4)
Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil (3.4.1-11)	Loss of material due to general, pitting, crevice, and MIC	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	None	Not applicable (See SER Section 3.4.2.2.5)
Steel heat exchanger components exposed to lubricating oil (3.4.1-12)	Loss of material due to general, pitting, crevice, and MIC	Lubricating Oil Analysis and One-Time Inspection	None	Not applicable (See SER Section 3.4.2.2.5)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, piping elements exposed to steam (3.4.1-13)	Cracking due to SCC	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.6)
Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water > 60°C (> 140°F) (3.4.1-14)	Cracking due to SCC	Water Chemistry and One-Time Inspection	None	Not applicable. (There are no stainless steel components exposed to treated water with intended functions in the steam and power conversion systems.) (See SER Section 3.4.2.2.6)
Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water (3.4.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR Program (B.1.30.2); One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.7)
Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water (3.4.1-16)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	None	Not applicable. (There are no stainless steel components exposed to treated water with intended functions in the steam and power conversion systems.) (See SER Section 3.4.2.2.7)
Stainless steel piping, piping components, and piping elements exposed to soil (3.4.1-17)	Loss of material due to pitting and crevice corrosion	Plant-specific	None	Not applicable (See SER Section 3.4.2.2.7)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.4.1-18)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	None	Not applicable (See SER Section 3.4.2.2.7)
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil (3.4.1-19)	Loss of material due to pitting, crevice, and MIC	Lubricating Oil Analysis and One-Time Inspection	None	Not applicable (See SER Section 3.4.2.2.8)
Steel tanks exposed to air - outdoor (external) (3.4.1-20)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	None	Not applicable. (There are no steel tanks exposed to outdoor air with intended functions in the steam and power conversion systems.) (See SER Section 3.4.2.3.2)
High-strength steel closure bolting exposed to air with steam or water leakage (3.4.1-21)	Cracking due to cyclic loading, SCC	Bolting Integrity	None	Not applicable. (High-strength steel closure bolting is not used in the steam and power conversion systems.) (See SER Section 3.4.2.3.2)
Steel bolting and closure bolting exposed to air with steam or water leakage, air-outdoor (external), or air-indoor uncontrolled (external); (3.4.1-22)	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	Bolting Integrity Program	Consistent with GALL Report. (See SER Section 3.4.2.1.6)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water > 60°C (> 140°F) (3.4.1-23)	Cracking due to SCC	Closed-Cycle Cooling Water System	None	Not applicable. (There are no stainless steel components exposed to closed-cycle cooling water in the steam and power conversion systems.)
Steel heat exchanger components exposed to closed-cycle cooling water (3.4.1-24)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	None	Not applicable. (There are no steel heat exchanger components exposed to closed-cycle cooling water in the steam and power conversion systems.) (See SER Section 3.4.2.3.2)
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water (3.4.1-25)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water Program (B.1.30.3)	Consistent with GALL Report. (See SER Section 3.4.2.1)
Copper alloy piping, piping components, and piping elements exposed to closed-cycle cooling water (3.4.1-26)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	None	Not applicable. (There are no copper alloy components exposed to closed-cycle cooling water in the steam and power conversion systems.) (See SER Section 3.4.2.3.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed-cycle cooling water (3.4.1-27)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	None	Not applicable. (There are no heat exchanger tubes exposed to closed-cycle cooling water in the steam and power conversion systems.)
Steel external surfaces exposed to air-indoor uncontrolled (external), condensation (external), or air-outdoor (external) (3.4.1-28)	Loss of material due to general corrosion	External Surfaces Monitoring	System Walkdown Program (B.1.28)	Consistent with GALL Report(See SER Section 3.4.2.1.7)
Steel piping, piping components, and piping elements exposed to steam or treated water (3.4.1-29)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion Program (B.1.13)	Consistent with GALL Report (See SER Section 3.4.2.1.8)
Steel piping, piping components, and piping elements exposed to air-outdoor (internal) or condensation (internal) (3.4.1-30)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	System Walkdown Program (B.1.28)	Consistent with GALL Report (See SER Section 3.4.2.1.9)
Steel heat exchanger components exposed to raw water (3.4.1-31)	Loss of material due to general, pitting, crevice, galvanic, and MIC, and fouling	Open-Cycle Cooling Water System	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with GALL Report (See SER Section 3.4.2.1.10)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.4.1-32)	Loss of material due to pitting, crevice, and MIC	Open-Cycle Cooling Water System	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with GALL Report,(See SER Section 3.4.2.1.11)
Stainless steel heat exchanger components exposed to raw water (3.4.1-33)	Loss of material due to pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	None	Not applicable. (There are no stainless steel heat exchanger components exposed to raw water in the steam and power conversion systems.) (See SER Section 3.4.2.3.2)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water (3.4.1-34)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	None	Not applicable. There are no heat exchanger tubes exposed to raw water with an intended function of heat transfer in the steam and power conversion systems.) (See SER Section 3.4.2.3.2)
Copper alloy > 15 percent Zn piping, piping components, and piping elements exposed to closed-cycle cooling water, raw water, or treated water (3.4.1-35)	Loss of material due to selective leaching	Selective Leaching of Materials	None	Not applicable. (There are no copper alloy components subject to selective leaching in the steam and power conversion systems.) (See SER Section 3.4.2.3.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Gray cast iron piping, piping components, and piping elements exposed to soil, treated water, or raw water (3.4.1-36)	Loss of material due to selective leaching	Selective Leaching of Materials	None	Not applicable. (There are no gray cast iron components exposed to raw water with intended functions in the steam and power conversion systems.) (See SER Section 3.4.2.3.2)
Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam (3.4.1-37)	Loss of material due to pitting and crevice corrosion	Water Chemistry	Water Chemistry Control-BWR Program (B.1.30.2); Water Chemistry Control-Auxiliary Systems Program (B.1.30.1)	Consistent with GALL Report (See SER Section 3.4.2.1.12)
Steel bolting and external surfaces exposed to air with borated water leakage (3.4.1-38)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	None	Not applicable to BWRs
Stainless steel piping, piping components, and piping elements exposed to steam (3.4.1-39)	Cracking due to SCC	Water Chemistry	None	Not applicable to BWRs
Glass piping elements exposed to air, lubricating oil, raw water, and treated water (3.4.1-40)	None	None	None	Not applicable. (There are no glass components with intended functions in the steam and power conversion systems.)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air-indoor uncontrolled (external) (3.4.1-41)	None	None	None	Consistent with GALL Report. (See SER Section 3.4.2.1)
Steel piping, piping components, and piping elements exposed to air-indoor controlled (external) (3.4.1-42)	None	None	None	Not applicable. (There are no steel components exposed to air-indoor controlled in the steam and power conversion systems.)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.4.1-43)	None	None	None	Not applicable. (There are no steel or stainless steel components exposed to concrete in the steam and power conversion systems.)
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.4.1-44)	None	None	None	Not applicable. (There are no steel, stainless steel, aluminum, or copper alloy components exposed to gas in the steam and power conversion systems.)

The staff's review of the steam and power conversion systems component groups followed any one of several approaches. One approach, documented in SER Section 3.4.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.4.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.4.2.3, reviewed AMR results for components that the applicant indicated are not consistent with or not addressed in the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the steam and power conversion systems components is documented in SER Section 3.0.3.

3.4.2.1 AMR Results Consistent with the GALL Report

Summary of Technical Information in the Application. LRA Section 3.4.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the steam and power conversion systems components:

- Flow-Accelerated Corrosion Program
- System Walkdown Program
- Water Chemistry Control - BWR Program
- Water Chemistry Control - Closed Cooling Water Program

LRA Table 3.4.2-1 summarizes AMRs for the steam and power conversion systems components and indicates AMRs claimed to be consistent with the GALL Report.

Staff Evaluation. For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also finds whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also finds whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also finds whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also finds whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation follows.

3.4.2.1.1 Loss of Material Due to General, Pitting, and Crevice Corrosion

In the discussion column of LRA Table 3.4.1, Item 3.4.1-2, the applicant stated that the Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program, to verify program effectiveness, will be used to manage loss of material for steel components exposed to steam in the ESF systems listed in LRA Table 3.2.2 and components in-scope in accordance with 10 CFR 54.4(a)(2) criterion and listed in LRA Tables 3.3.2-13-xx series.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not credited in the system tables (Table 2s), only the Water Chemistry Control-BWR Program was credited. In a letter dated July 14, 2006, the applicant amended the LRA. The applicant revised its Water Chemistry Control-BWR Program to include the sentence: "The One-Time Inspection Program will confirm the effectiveness of the program."

The staff reviewed the applicant's Water Chemistry Control-BWR Program and the One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff finds that the applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The staff also finds that the applicant's One-Time Inspection Program is used to verify the effectiveness of the Water Chemistry Control-BWR Program consistent with the GALL Report and therefore acceptable.

3.4.2.1.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

In the discussion column of LRA Table 3.4.1, Item 3.4.1-4, the applicant stated that the Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program, to verify program effectiveness, will be used to manage loss of material for steel components exposed to treated water and also in the components that are in-scope in accordance with 10 CFR 54.4(a)(2) criterion and listed in LRA Tables 3.3.2-13-xx series.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not credited in the system tables (Table 2s), only the Water Chemistry Control-BWR Program was credited. In a letter dated July 14, 2006, the applicant amended the LRA. The applicant revised its Water Chemistry Control-BWR Program to include the sentence: ”The One-Time Inspection Program will confirm the effectiveness of the program.”

The staff reviewed the applicant's Water Chemistry Control-BWR Program and the One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff finds that the applicant’s Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The staff also finds that the applicant’s One-Time Inspection Program is used to verify the effectiveness of the Water Chemistry Control-BWR Program consistent with the GALL Report and therefore acceptable.

3.4.2.1.3 Reduction of Heat Transfer Due to Fouling

In the discussion column of LRA Table 3.4.1, Item 3.4.1-9, the applicant stated that the Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage the reduction of heat transfer in copper alloy heat exchanger tubes exposed to treated water in the steam and power conversion systems. These programs will also be used to manage reduction of heat transfer in the HPCI and RCICSs as listed in LRA Tables 3.2.2-4 and 3.2.2-5.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not credited in the system tables (Table 2s), only the Water Chemistry Control-BWR Program was credited. In a letter dated July 14, 2006, the applicant amended the LRA. The applicant revised its Water Chemistry Control-BWR Program to include the sentence: ”The One-Time Inspection Program will confirm the effectiveness of the program.”

The staff reviewed the applicant's Water Chemistry Control-BWR Program and the One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff finds that the applicant’s Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The staff also finds that the applicant’s One-Time Inspection Program is used to verify the effectiveness of the Water Chemistry Control-BWR Program consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.4.2.1.4 Cracking Due to Stress Corrosion Cracking

In the discussion column of LRA Table 3.4.1, Item 3.4.1-13, the applicant stated that the Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage cracking due to SCC for stainless steel components exposed to steam.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not credited in the system tables (Table 2s), only the Water Chemistry Control-BWR Program was credited. In a letter dated July 14, 2006, the applicant amended the LRA. The applicant revised its Water Chemistry Control-BWR Program to include the sentence: "The One-Time Inspection Program will confirm the effectiveness of the program."

The staff reviewed the applicant's Water Chemistry Control – BWR Program and the One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff finds that the applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The staff also finds that the applicant's One-Time Inspection Program is used to verify the effectiveness of the Water Chemistry Control-BWR Program consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.4.2.1.5 Loss of Material Due to Pitting and Crevice Corrosion

In the discussion column of LRA Table 3.4.1, Item 3.4.1-15, the applicant stated that the Water Chemistry Control-BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material of aluminum and copper alloy components exposed to treated water and also in the components that are in-scope in accordance with 10 CFR 54.4(a)(2) crterion and listed in LRA Tables 3.3.2-13-xx series. The application also stated that there are no aluminum components with intended functions in the steam and power conversion systems.

During the audit and review, the staff noted that for this aging effect, the One-Time Inspection Program was not credited in the system tables (Table 2s), only the Water Chemistry Control-BWR Program was credited. In a letter dated July 14, 2006, the applicant amended the LRA. The applicant revised its Water Chemistry Control-BWR Program to include the sentence: "The One-Time Inspection Program will confirm the effectiveness of the program."

The staff reviewed the applicant's Water Chemistry Control – BWR Program and the One-Time Inspection Program and its evaluation is documented in SER Sections 3.0.3.1.11 and 3.0.3.1.6, respectively. The staff finds that the applicant's Water Chemistry Control-BWR Program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). The staff also finds that the applicant's One-Time Inspection Program is used to verify the effectiveness of the Water Chemistry Control-BWR Program consistent with the GALL Report and therefore acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.4.2.1.6 Loss of Material Due to General, Pitting, and Crevice Corrosion and Loss of Preload Due to Thermal Effects, Gasket Creep and Self-Loosening

In the discussion column of LRA Table 3.4.1, Item 3.4.1-22, the applicant stated that its System Walkdown Program will manage loss of material for steel bolting through the use of visual inspections performed at least once per refueling cycle. The applicant further stated that loss of preload is not an applicable aging effect. Loss of preload is a design driven effect and not an AERM.

During the audit and review, the staff asked the applicant to clarify the basis for using its System Walkdown Program to manage the loss of material for steel bolting instead the AMP recommended by the GALL Report. In a letter dated July 6, 2006, the applicant stated that it will prepare and submit an AMP consistent with GALL AMP XI.M18, “Bolting Integrity,” for approval.

By letter dated October 17, 2006, the applicant provided its Bolting Integrity Program. The staff reviewed the applicant’s Bolting Integrity Program and its evaluation is documented in SER Section 3.0.3.2.19. The staff finds that the applicant’s Bolting Integrity Program conformed to the recommendations of the GALL Report and encompass all safety-related bolting as delineated in NUREG-1339, which includes the criteria established in the 1995 Edition through the 1996 Addenda of ASME Code, Section XI. On this basis, the staff finds the applicant’s Bolting Integrity Program acceptable for managing loss of material for steel bolting.

In its October 17, 2006 letter, the applicant also stated that this program applies to all bolting exposed to air with aging effects requiring aging management. However, in LRA, the applicant stated that loss of preload is not an applicable aging effect and does not requiring an aging management. The applicant was asked to confirm if loss of preload is an applicable aging effect. The applicant stated that it would provide an LRA amendment that will address loss of preload. By letter dated January 4, 2007, the applicant clarifying that the Bolting Integrity Program applies to bolting and torqueing practices of safety-related and nonsafety-related bolting for pressure retaining components, NSSS support components, and structural joints. On the basis of its review, the staff finds the applicant clarification acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.4.2.1.7 Loss of Material Due to General Corrosion

In the discussion column of LRA Table 3.4.1, Item 3.4.1-28, the applicant stated that this item is consistent with the GALL Report and that its System Walkdown Program will be used to manage loss of material for external surfaces of steel components.

The staff reviewed the applicant's System Walkdown Program and its evaluation is documented in SER Section 3.0.3.1.9. This program entails inspections of external surfaces of components subject to an AMR. The program is also credited with managing loss of material from internal surfaces where internal and external material-environment combinations are the same and external surface conditions represent internal surface conditions. The staff finds that the applicant’s System Walkdown Program is consistent with GALL AMP XI.M36.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.4.2.1.8 Wall Thinning Due to Flow-Accelerated Corrosion

In the discussion column of LRA Table 3.4.1, Item 3.4.1-29, the applicant stated that this item is consistent with the GALL Report and that its Flow-Accelerated Corrosion Program manages loss of material in steel components exposed to steam. The applicant further stated that there are no steel components exposed to treated water with the intended function in the steam and power conversion systems.

The staff reviewed the applicant's Flow-Accelerated Corrosion Program and its evaluation is documented in SER Section 3.0.3.1.2. The staff also confirmed that LRA Table 3.4.2-1 has corresponding AMR line items for carbon steel components exposed to steam greater than 270°F.

Consistent with the GALL Reports recommendations, the applicant credits the Flow-Accelerated Corrosion Program for managing loss of material from carbon steel piping, piping components, and piping elements exposed to steam or treated water. The staff finds this acceptable.

3.4.2.1.9 Loss of Material Due to General, Pitting, and Crevice Corrosion

In the discussion column of LRA Table 3.4.1, Item 3.4.1-30, the applicant stated that this item is consistent with the GALL Report and that its System Walkdown Program will be used to manage loss of material for steel components internally exposed to outdoor air (internal) or condensation (internal). The applicant further stated that for systems where internal carbon steel surfaces are exposed to the same environment as external surfaces, the external surfaces condition will be representative of the internal surfaces; thus, a loss of material on internal carbon steel surfaces can be managed by its System Walkdown Program. The applicant also stated that LRA Table 3.4.1, Item 3.4.1-30 is applicable to component types listed in LRA Table 3.3.2.

During the audit and review, the staff asked the applicant to clarify the basis for using the System Walkdown Program to manage loss of material for steel components internally exposed to outdoor air (internal) or condensation (internal) instead of an AMP consistent with GALL AMP XI.M38, as recommended by the GALL Report.

In a letter dated July 14, 2006, the applicant revised its System Walkdown Program to add enhancements to the program's implementing procedure. Specifically, the applicant committed in Commitment #24 and Commitment #35, to have: (1) the System Walkdown guidance document enhanced to perform periodic system engineer inspections of systems in-scope and subject to an AMR for license renewal in accordance with 10 CFR 54.4(a)(1) and (a)(3). Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject system will include SSCs that are in-scope and subjected to an AMR for license renewal in accordance with 10 CFR 54.4 (a)(2); and (2) to provide within the System Walkdown Training Program a process to document biennial refresher training of Engineers to demonstrate inclusion of the methodology for aging management of plant equipment as described in EPRI Aging Assessment Field Guide or comparable instructional guide.

With this change, the applicant's management of steel components internally exposed to outdoor air or condensation will be consistent with the GALL Report and therefore acceptable to the staff.

The staff reviewed the applicant's System Walkdown Program and its evaluation is documented in SER Section 3.0.3.1.9. This program entails inspections of external surfaces of components subject to an AMR. The program is also credited with managing loss of material from internal surfaces where internal and external material-environment combinations are the same and external surface conditions represent internal surface conditions. During interviews with the applicant's technical personnel, the staff confirmed that the applicant will use its System Walkdown Program and noted that coverage includes all elements as presented in the GALL Report's recommended program and therefore it is acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.4.2.1.10 Loss of Material Due to General, Pitting, Crevice, Galvanic, and Microbiologically-Influenced Corrosion and Fouling

For loss of material due to fouling and general, pitting, crevice, galvanic, and MIC in steel heat exchanger components exposed to raw water; the GALL Report recommends programs consistent with GALL AMP XI.M20, "Open-Cycle Cooling Water System."

In the discussion column of LRA Table 3.4.1, Item 3.4.1-31, the applicant stated that for components of the CW system, its Periodic Surveillance and Preventive Maintenance Program, which is a plant-specific AMP, manages loss of material for steel heat exchanger components exposed to raw water through periodic visual inspections. Moreover, the CW system components to which this GALL Report line item applies are included in-scope for the steam and power conversion systems in accordance with 10 CFR 54.4(a)(2) criterion and listed in accordance with ESF system in LRA Tables 3.3.2-13-xx series.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.5. T The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1.This program includes periodic inspections and tests that manage aging effects not managed by other AMPs. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. On this basis, the staff determines that loss of material for carbon steel piping, pump casing, and valve body adequately managed using the Periodic Surveillance and Preventive Maintenance Program.

The staff also confirmed that the applicant is managing these components in the LRA Tables 3.3.2-13-xx series using the Periodic Surveillance and Preventive Maintenance Program inspection.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.4.2.1.11 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

In the discussion column of LRA Table 3.4.1, Item 3.4.1-32, the applicant stated that its Periodic Surveillance and Preventive Maintenance Program manages loss of material for copper alloy components exposed to raw water through periodic visual inspections. The applicant further stated that there are no stainless steel components exposed to raw water with an intended function of pressure boundary in the steam and power conversion systems. The only components to which this GALL Report line item applies are included in-scope for the steam and power conversion systems in accordance with 10 CFR 54.4(a)(2) criterion and listed in accordance with the ESF system in LRA Tables 3.3.2-13-xx series.

During the audit and review, the staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.5. Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 for loss of material for copper alloy components exposed to raw water through periodic visual inspections. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.4.1, Item 3.4.1-32 in the population that is subject to the Periodic Surveillance and Preventive Maintenance Program inspection. This is consistent with the GALL Report and therefore acceptable to the staff.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.4.2.1.12 Loss of Material Due to Pitting, and Crevice Corrosion

In the discussion column of LRA Table 3.4.1, Item 3.4.1-37, the applicant stated that its Water Chemistry Control – BWR Program will be used to manage loss of material in stainless steel and steel components in its steam and power conversion systems. The applicant further states that there are no nickel alloy components exposed to steam in the steam and power conversion systems.

During the audit and review, the staff noted that for this aging effect, the GALL Report's recommended Water Chemistry Control Program was not explicitly identified in the system tables (Table 2s). The staff reviewed the applicant's Water Chemistry Control – BWR Program and its evaluation is documented in SER Section 3.0.3.1.11. The staff finds that the applicant's Water Chemistry - BWR Program manages aging effects caused by corrosion and cracking mechanisms. The program monitors and controls water chemistry according to EPRI report. During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.4.1, Item 3.4.1-37 in the population that is subject to the Chemistry Control-BWR Program. This is consistent with the GALL Report and therefore acceptable to the staff.

For loss of material due to pitting and crevice corrosion from steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam; the GALL Report recommends programs consistent with GALL AMP XI.M2, "Water Chemistry."

In the discussion column of LRA Table 3.4.1, Item 3.4.1-37, the applicant stated that its Water Chemistry Control-Auxiliary Systems Program will be used to manage loss of material in stainless steel, nickel-based alloy, and steel components in its HVAC system components exposed to steam from the applicant's house heating boiler system.

During the audit and review, the staff noted that for this aging effect, the GALL Report's recommended Water Chemistry Control-Auxiliary Sytems Program was not explicitly identified in the system tables (Table 2s). The staff reviewed the applicant's Water Chemistry Control-Auxiliary Systems Program and its evaluation is documented in SER Section 3.0.3.3.7 The applicant's Water Chemistry Control-Auxiliary Systems Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1.This program manages aging effects for components exposed to treated water. On this basis, the staff finds that loss of material in stainless steel, nickel-based alloy, and steel components in its HVAC system components exposed to steam is adequately managed using the Water Chemistry Control-Auxiliary Systems Program.

During interviews with the applicant's technical personnel, the staff confirmed that the applicant included all components in LRA Table 3.4.1, Item 3.4.1-37 in the population that is subject to the Chemistry Control-Auxiliary Systems Program.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

Conclusion. The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

Summary of Information in the Application. In LRA Section 3.4.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the steam and power conversion systems components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically-induced corrosion, and fouling
- reduction of heat transfer due to fouling
- loss of material due to general, pitting, crevice, and microbiologically-induced corrosion

- cracking due to stress-corrosion cracking
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and microbiologically-induced corrosion
- loss of material due to general, pitting, crevice, and galvanic corrosion
- quality assurance for aging management of nonsafety-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.4.2.2. The staff's review of the applicant's further evaluation follows.

3.4.2.2.1 Cumulative Fatigue Damage

LRA Section 3.4.2.2.1 states that fatigue is a TLAA, as required by 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.4.2.2.2 against the following SRP-LR Section 3.4.2.2.2 criteria:

(1) LRA Section 3.4.2.2.2 addresses the loss of material of carbon steel piping and components exposed to treated water or steam due to general, pitting and crevice corrosion.

SRP-LR Section 3.4.2.2.2 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water and for steel piping, piping components, and piping elements exposed to steam. The existing AMP monitors and controls water chemistry to manage the effects of loss of material due to general, pitting, and crevice corrosion. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of select components and susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated, in the LRA, that loss of material due to general, pitting and crevice corrosion for carbon steel piping and components exposed to treated water or steam is an AERM in the steam and power conversion systems at VYNPS, and is managed by the Water Chemistry Control-BWR Program. The effectiveness of the applicant's Water

Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow. The staff finds that this combination satisfies the criteria of SRP-LR Section 3.4.2.2.2 and is therefore acceptable.

(2) LRA Section 3.4.2.2.2 addresses the loss of material of steel piping and components in steam and power conversion systems exposed to lubricating oil due to general, pitting, and crevice corrosion.
SRP-LR Section 3.4.2.2.2 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lube oil chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff finds that the steam and power conversion systems at VYNPS have no carbon steel components with intended functions that are exposed to lubricating oil, therefore, this item is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.2 criteria. For those line items that apply to LRA Section 3.4.2.2.2, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.3 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion and Fouling

The staff reviewed LRA Section 3.4.2.2.3 against the criteria in SRP-LR Section 3.4.2.2.3.

LRA Section 3.4.2.2.3 addresses the loss of material due to general, pitting, crevice, MIC, and fouling, this aging effect is not applicable to VYNPS. Loss of material due to general, pitting, crevice, MIC, and fouling could occur in steel piping, piping components, and piping elements exposed to raw water.

SRP-LR Section 3.4.2.2.3 states that loss of material due to general, pitting, and crevice corrosion, and MIC and fouling may occur in steel piping, piping components, and piping elements exposed to raw water. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff finds that the steam and power conversion systems at VYNPS have no carbon steel components with intended functions that are exposed to raw water, therefore, this item is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.4.2.2.4 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.4.2.2.4 against the following SRP-LR Section 3.4.2.2.4 criteria:

(1) LRA Section 3.4.2.2.4 addresses the reduction of heat transfer of stainless steel and copper alloy heat exchanger tubes exposed to treated water due to fouling.

SRP-LR Section 3.4.2.2.4 states that reduction of heat transfer due to fouling may occur in stainless steel and copper alloy heat exchanger tubes exposed to treated water. The existing AMP controls water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may not always be fully effective in precluding fouling; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that reduction of heat transfer due to fouling does not occur. A one-time inspection is an acceptable method to ensure that reduction of heat transfer does not occur and that component intended functions will be maintained during the period of extended operation.

The applicant stated in the LRA that reduction of heat transfer due to fouling could occur for stainless steel and copper alloy heat exchanger tubes exposed to treated water. The steam and power conversion systems at VYNPS have no heat exchanger tubes with an intended function of heat transfer and associated aging effect of fouling. However, reduction of heat transfer is managed by the Water Chemistry Control-BWR Program, for copper alloy heat exchanger tubes in the HPCI and RCICSs. The effectiveness of the applicant’s Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow. The staff finds this combination satisfies the criteria of SRP-LR Section 3.4.2.2.4 and is therefore acceptable.

(2) LRA Section 3.4.2.2.4 addresses the reduction of heat transfer of steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil due to fouling.

SRP-LR Section 3.4.2.2.4 states that reduction of heat transfer due to fouling may occur in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The existing AMP monitors and controls lube oil chemistry to mitigate reduction of heat transfer due to fouling. However, control of lube oil chemistry may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that fouling does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of lube oil chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff finds that the steam and power conversion systems at VYNPS have no heat exchanger tubes with an intended function of heat transfer and associated aging effect of fouling, therefore, this item is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.4 criteria. For those line items that apply to LRA Section 3.4.2.2.4, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.5 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.4.2.2.5 against the following SRP-LR Section 3.4.2.2.5 criteria:

(1) LRA Section 3.4.2.2.5 addresses the loss of material due to general, pitting, crevice corrosion, and MIC of carbon steel (with or without coating or wrapping) piping, piping components, piping elements and tanks exposed to soil.

SRP-LR Section 3.4.2.2.5 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, piping elements, and tanks exposed to soil. The buried piping and tanks inspection program relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion, and MIC. The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an applicant's inspection frequency and operating experience with buried components and to ensure that loss of material does not occur.

The staff finds that the steam and power conversion systems at VYNPS have no carbon steel components that are exposed to soil, therefore, this item is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(2) LRA Section 3.4.2.2.5 addresses the loss of material due to general, pitting, crevice corrosion, and MIC of carbon steel heat exchanger components exposed to lubricating oil.

SRP-LR Section 3.4.2.2.5 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lube oil chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff finds that the steam and power conversion systems at VYNPS have no heat exchanger components with intended functions that are exposed to lubricating oil, therefore, this item is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.4.2.2.6 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.4.2.2.6 against the criteria in SRP-LR Section 3.4.2.2.6.

LRA Section 3.4.2.2.6 addresses cracking of stainless steel components exposed to steam due to SCC.

SRP-LR Section 3.4.2.2.6 states that cracking due to SCC may occur in stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water greater than 60 °C (140 °F) and in stainless steel piping, piping components, and piping elements exposed to steam. The existing AMP monitors and controls water chemistry to manage the effects of cracking due to SCC. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause SCC; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that SCC does not occur. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that SCC does not occur and that component intended functions will be maintained during the period of extended operation.

In LRA Table 3.4.1, Item 3.4.1-14 discussion column, the applicant stated that the cracking due to SCC of stainless steel piping, piping components, tanks, and heat exchanger components exposed to treated water greater than 60°C (greater than140°F) is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that there are no stainless steel components exposed treated water with intended functions in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable to VYNPS.

The applicant stated in the LRA that cracking due to SCC in stainless steel components exposed to steam is managed by the Water Chemistry Control-BWR Program. The effectiveness of the applicant's Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow. The staff finds this combination satisfies the criteria of SRP-LR Section 3.4.2.2.6 and is therefore acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.6 criteria. For those line items that apply to LRA Section 3.4.2.2.6, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.7 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.4.2.2.7 against the following SRP-LR Section 3.4.2.2.7 criteria:

(1) LRA Section 3.4.2.2.7 addresses the loss of material of copper alloy components exposed to treated water due to pitting and crevice corrosion.

    SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion may occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements and in stainless steel tanks and heat exchanger components exposed to treated water. The existing AMP monitors and controls water chemistry to manage the effects of loss of material due to pitting and crevice corrosion. However, control of water chemistry may not preclude corrosion at locations with stagnant flow conditions; therefore, the GALL Report recommends that the effectiveness of water chemistry programs should be verified to ensure that corrosion does not occur. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

    The applicant stated in the LRA that loss of material due to pitting and crevice corrosion for copper alloy components exposed to treated water is managed by the Water Chemistry Control-BWR Program. The steam and power conversion systems at VYNPS have no stainless steel components with intended functions that are exposed to treated water (Table 3.4-1, Item 3.4.1-16). There are no aluminum components in the steam and power conversion systems. The effectiveness of the applicant's Water Chemistry

Control-BWR Program will be confirmed by the One-Time Inspection Program, through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow. The staff finds this combination satisfies the criteria of SRP-LR Section 3.4.2.2.7 and is therefore acceptable.

(2) LRA Section 3.4.2.2.7 addresses loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements exposed to soil.

SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff finds that the steam and power conversion systems at VYNPS have no stainless steel components with intended function that are exposed to soil, therefore, this item is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(3) LRA Section 3.4.2.2.7 addresses the loss of material due to pitting and crevice corrosion of copper alloy piping, piping components, and piping elements exposed to lubricating oil.

SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion may occur in copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lube oil chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff finds that the steam and power conversion systems at VYNPS have no copper alloy components with intended functions that are exposed to lubricating oil, therefore, this item is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.7 criteria. For those line items that apply to LRA Section 3.4.2.2.7, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.8 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.4.2.2.8 against the criteria in SRP-LR Section 3.4.2.2.8.

LRA Section 3.4.2.2.8 addresses the loss of material due to pitting, crevice, and MIC of stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil.

SRP-LR Section 3.4.2.2.8 states that loss of material due to pitting and crevice corrosion, and MIC may occur in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lube oil chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff finds that the steam and power conversion systems at VYNPS have no stainless steel components with intended functions that are exposed to lubricating oil, therefore, this item is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.4.2.2.9 Loss of Material Due to General, Pitting, Crevice, and Galvanic Corrosion

The staff reviewed LRA Section 3.4.2.2.9 against the criteria in SRP-LR Section 3.4.2.2.9.

LRA Section 3.4.2.2.9 addresses the loss of material due to general, pitting, crevice, and galvanic corrosion of steel heat exchanger components exposed to treated water.

SRP-LR Section 3.4.2.2.9 states that loss of material due to general, pitting, crevice, and galvanic corrosion may occur in steel heat exchanger components exposed to treated water. The existing AMP monitors and controls water chemistry to manage the effects of loss of material due to general, pitting, and crevice corrosion. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of select components and susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff finds that the steam and power conversion systems at VYNPS have no steel heat exchanger components with intended functions that are exposed to treated water, therefore, this item is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

3.4.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program, which the staff found acceptable.

3.4.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Table 3.4.2-1, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report. These items were reviewed and they are further addressed in SER Section 3.4.2.3.

In LRA Table 3.4.2-1, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.4.2.3.1 Main Condenser and MSIV Leakage Pathway Summary of Aging Management Evaluation-LRA Table 3.4.2-1

The staff reviewed LRA Table 3.4.2-1, which summarizes the results of AMR evaluations for the main condenser and MSIV leakage pathway component groups.

In LRA Table 3.4.2-1, the applicant proposed to manage cracking-fatigue of condenser components (stainless steel heat exchanger tubes, thermowells, tubing, and valve bodies exposed to steam greater than270°F (internal) using a TLAA-metal fatigue.

The staff's review of the TLAA is documented in SER Section 4.3.

3.4.2.3.2 Aging Effect/Mechanism in Table 3.4.1 Which Are Not Applicable for VYNPS

The staff reviewed LRA Table 3.4.1, which provides a summary of aging management evaluations for the steam and power conversion systems evaluated in the GALL Report.

In LRA Table 3.4.1, Item 3.4.1-20 discussion column, the applicant stated that loss of material of steel tanks exposed to air outdoor (external) due to general, pitting, and crevice corrosion is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that there are no steel tanks exposed to outdoor air with intended functions in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable at VYNPS.

In LRA Table 3.4.1, Item 3.4.1-21 discussion column, the applicant stated that cracking of high strength steel closure bolting exposed to air with steam or water leakage due to cyclic loading and SCC is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that high strength steel closure bolting is not used in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.4.1, Item 3.4.1-23 discussion column, the applicant stated that the cracking of stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water greater than60°C (greater than140°F) due to SCC is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that there are no stainless steel components with intended functions exposed to close-cycle cooling water in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.4.1, Item 3.4.1-24 discussion column, the applicant stated that the loss of material of steel heat exchanger components exposed to closed-cycle cooling water due to general, pitting, crevice, and galvanic corrosion is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that there are no steel heat exchanger components with intended functions exposed to closed-cycle cooling water in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable at VYNPS.

In LRA Table 3.4.1, Item 3.4.1-26 discussion column, the applicant stated that the loss of material of copper alloy piping, piping components, and piping elements exposed to closed-cycle cooling water due to pitting, crevice, and galvanic corrosion is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that there are no copper alloy components with intended functions exposed to closed-cycle cooling water in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable at VYNPS.

In LRA Table 3.4.1, Item 3.4.1-27 discussion column, the applicant stated that the reduction of heat transfer of steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed-cycle cooling water due to fouling is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that there are no heat exchanger tubes with intended functions exposed to closed-cycle cooling water in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable at VYNPS.

In LRA Table 3.4.1, Item 3.4.1-33 discussion column, the applicant stated that the loss of material of stainless steel heat exchanger components exposed to raw water due to fouling and pitting, crevice, and MIC is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that there are no stainless steel heat exchanger components with intended functions exposed to raw water in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable at VYNPS.

In LRA Table 3.4.1, Item 3.4.1-34 discussion column, the applicant stated that the reduction of heat transfer of steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water due to fouling is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that there are no heat exchanger tubes with intended functions exposed to raw water in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable at VYNPS.

In LRA Table 3.4.1, Item 3.4.1-35 discussion column, the applicant stated that the loss of material of copper alloy greater than15 percent Zinc piping, piping components, and piping elements exposed to closed-cycle cooling water, raw water, or treated water due to selective leaching is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that the there are no copper alloy with intended functions and subject to selective leaching in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable at VYNPS.

In LRA Table 3.4.1, Item 3.4.1-36 discussion column, the applicant stated that the loss of material of gray cast iron piping, piping components, and piping elements exposed to soil, treated water, or raw water due to selective leaching is not applicable at VYNPS. The staff determined, through discussions with the applicant's technical personnel, that there are no gray cast iron components with intended functions exposed to raw water in the steam and power conversion systems at VYNPS. The staff finds that, for this component type, this aging effect is not applicable at VYNPS.

3.4.2.3.3 Steam and Power Conversion Systems AMR Line Items That Have No Aging Effects-LRA Table 3.4.2-1

The applicant, in LRA Notes for Table 3.4.2-1, Plant-Specific Notes 401, stated:

> Aging management of the main condenser is not based on analysis of materials, environments and aging effects. Condenser integrity required to perform the post-accident intended function (holdup and plateout of MSIV leakage) is continuously confirmed by normal plant operation. This intended function does not require the condenser to be leak-tight, and the post-accident conditions in the condenser will be essentially atmospheric. Since normal plant operation assures adequate condenser pressure boundary integrity, the post-accident intended function to provide holdup volume and plateout surface is assured. Based on past precedence (NUREG-1796, Dresden and Quad Cities SER Section 3.4.2.4.4, and NUREG-1769, Peach Bottom SER Section 3.4.2.3), the staff concludes that main condenser integrity is continually verified during normal plant operation and no AMP is required to assure the post-accident intended function.

The staff reviewed LRA Table 3.4.2-1, which summarizes the results of AMR evaluations for the main condenser and MSIV leakage pathway component groups.

In LRA Table 3.4.2-1, the applicant proposed to verify the integrity of the following condenser components with the specified material/environment combinations during normal plant operations:

- Carbon steel exposed to air (indoor-external)
- Carbon steel exposed to steam greater than 270°F
- Copper alloy greater than15 percent zinc (inhibited) exposed to raw water
- Copper alloy greater than15 percent zinc (inhibited) exposed to steam greater than 270°F
- Stainless steel exposed to raw water
- Stainless steel exposed to steam greater than 270°F

On the basis of its review, the staff finds that above environment and material combinations, if managed during normal plant operations, will not result in aging that would be of concern during the period of extended operation. The staff noted that the plateout function of the condenser will be retained and further concludes that there are no applicable AERM for the above environment and material combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the steam and power conversion systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5 Aging Management of SC Supports

This section of the SER documents the staff's review of the applicant's AMR results for the SC supports components and component groups of:

- primary containment
- reactor building
- intake structure
- process facilities
- yard structures
- bulk commodities

3.5.1 Summary of Technical Information in the Application

LRA Section 3.5 provides AMR results for the SC supports components and component groups. LRA Table 3.5.1, "Summary of Aging Management Evaluations for the Structures and Component Supports," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the SC supports components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.5.2 Staff Evaluation

The staff reviewed LRA Section 3.5 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the SC supports components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.5.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.5.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.5.2.2.

The staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.5.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the structures and component supports components.

Table 3.5-1 summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.5 and addressed in the GALL Report.

Table 3.5-1 Staff Evaluation for SC Supports in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
BWR Concrete and Steel (Mark I, II, and III) Containments				
Concrete elements: walls, dome, basemat, ring girder, buttresses, containment (as applicable). (3.5.1-1)	Aging of accessible and inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	ISI (IWL) and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater if environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	None	Not applicable. (VYNPS containment is a Mark I steel containment.)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Concrete elements; All (3.5.1-2)	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the applicant is to ensure proper functioning of the de-watering system through the period of extended operation.	None	Not applicable. (VYNPS containment is a Mark I steel containment.)
Concrete elements: foundation, subfoundation (3.5.1-3)	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program If a de-watering system is relied upon to control erosion of cement from porous concrete subfoundations, then the applicant is to ensure proper functioning of the de-watering system through the period of extended operation.	None	Not applicable. (VYNPS containment is a Mark I steel containment.)
Concrete elements: dome, wall, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable) (3.5.1-4)	Reduction of strength and modulus of concrete due to elevated temperature	A plant-specific AMP is to be evaluated	None	Not applicable. (VYNPS containment is a Mark I steel containment.)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel elements: Drywell; torus; drywell head; embedded shell and sand pocket regions; drywell support skirt; torus ring girder; downcomers; liner plate, ECCS suction header, support skirt, region shielded by diaphragm floor, suppression chamber (as applicable) (3.5.1-5)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR 50, Appendix J	Containment Inservice Inspection Program (B.1.15.1); Containment Leak Rate Program (B.1.8)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1 under the heading, “Loss of Material Due to General, Pitting and Crevice Corrosion”)
Steel elements: steel liner, liner anchors, integral attachments (3.5.1-6)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR 50, Appendix J	None	Not applicable. (VYNPS containment is a Mark I steel containment.)
Prestressed containment tendons (3.5.1-7)	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA, evaluated in accordance with 10 CFR 54.21(c)	None	Not applicable. (VYNPS containment is a Mark I steel containment.)
Steel and stainless steel elements: vent line, vent header, vent line bellows; downcomers; (3.5.1-8)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	None	Not applicable. (See SER Section 3.5.2.2.1 under the heading, “Cumulative Fatigue Damage”)
Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers (3.5.1-9)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	None	Fatigue is a TLAA. (See Section SER 3.5.2.2.1 under the heading, “Cumulative Fatigue Damage,” and Section and 4.6)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds (3.5.1-10)	Cracking due to SCC	ISI (IWE) and 10 CFR 50, Appendix J, and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds.	None	Not applicable (See Section 3.5.2.2.1 under the heading, “Cracking Due to SCC”)
Stainless steel vent line bellows, (3.5.1-11)	Cracking due to SCC	ISI (IWE) and 10 CFR 50, Appendix J, and additional appropriate examination/ evaluation for bellows assemblies and dissimilar metal welds.	None	Not applicable (See SER Section 3.5.2.2.1 under the heading, “Cracking Due to SCC”)
Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers (3.5.1-12)	Cracking due to cyclic loading	ISI (IWE) and 10 CFR 50, Appendix J, and supplemented to detect fine cracks	Containment Inservice Inspection Program (B.1.15.1); Containment Leak Rate Program (B.1.8)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1 under the heading, “Cracking Due to Cyclic Loading”)
Steel, stainless steel elements, dissimilar metal welds: torus; vent line; vent header; vent line bellows; downcomers (3.5.1-13)	Cracking due to cyclic loading	ISI (IWE) and 10 CFR 50, Appendix J, and supplemented to detect fine cracks	Containment Inservice Inspection Program (B.1.15.1); Containment Leak Rate Program (B.1.8)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1 under the heading, “Cracking Due to Cyclic Loading”)
Concrete elements: dome, wall, basemat ring girder, buttresses, containment (as applicable) (3.5.1-14)	Loss of material (Scaling, cracking, and spalling) due to freeze-thaw	ISI (IWL). Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557).	None	Not applicable. (VYNPS containment is a Mark I steel containment.)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Concrete elements: walls, dome, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable). (3.5.1-15)	Cracking due to expansion and reaction with aggregate; increase in porosity, permeability due to leaching of calcium hydroxide	ISI (IWL) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R.	None	Not applicable. (VYNPS containment is a Mark I steel containment.)
Seals, gaskets, and moisture barriers (3.5.1-16)	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) and 10 CFR 50, Appendix J	Containment Inservice Inspection Program (B.1.15.1); Containment Leak Rate Program (B.1.8)	Consistent with the GALL Report. (See SER Section 3.5.2.1.4)
Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms (3.5.1-17)	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR 50, Appendix J and Plant TSs	None	Not applicable. (See Section 3.5.2.1.5)
Steel penetration sleeves and dissimilar metal welds; personnel airlock, equipment hatch and CRD hatch (3.5.1-18)	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR 50, Appendix J	Containment Inservice Inspection Program (B.1.15.1); Containment Leak Rate Program (B.1.8)	Consistent with GALL Report,(See SER Section 3.5.2.1.6)
Steel elements: stainless steel suppression chamber shell (inner surface) (3.5.1-19)	Cracking due to SCC	ISI (IWE) and 10 CFR 50, Appendix J	None	Not applicable. (The VYNPS suppression chamber is carbon steel.)
Steel elements: suppression chamber liner (interior surface) (3.5.1-20)	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR 50, Appendix J	None	Not applicable. (The VYNPS suppression chamber is carbon steel.)
Steel elements: drywell head and downcomer pipes (3.5.1-21)	Fretting or lock up due to mechanical wear	ISI (IWE)	None	Not applicable (See SER Section 3.5.2.1.7)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Prestressed containment: tendons and anchorage components (3.5.1-22)	Loss of material due to corrosion	ISI (IWL)	None	Not applicable. (VYNPS containment is a Mark I steel containment without prestressed tendons.)
Safety-Related and Other Structures; and Component Supports				
All Groups except Group 6: interior and above grade exterior concrete (3.5.1-23)	Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	Structures Monitoring Program (B.1.27.2)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2 under the heading, “Aging of Structures Not Covered by Structures Monitoring Program,” item 1)
All Groups except Group 6: interior and above grade exterior concrete (3.5.1-24)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.5.2.2.2 under the heading, “Aging of Structures Not Covered by Structures Monitoring Program,” item 2)
All Groups except Group 6: steel components: all structural steel (3.5.1-25)	Loss of material due to corrosion	Structures Monitoring Program. If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include provisions to address protective coating monitoring and maintenance.	Structures Monitoring Program (B.1.27.2); Periodic Surveillance and Preventive Maintenance Program (B.1.22); Fire Protection Program (B.1.12.1)	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.5.2.2.2 under the heading, “Aging of Structures Not Covered by Structures Monitoring Program,” item 3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
All Groups except Group 6: accessible and inaccessible concrete: foundation (3.5.1-26)	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557).	Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.5.2.2.2 under the heading, “Aging of Structures Not Covered by Structures Monitoring Program,” item 4)
All Groups except Group 6: accessible and inaccessible interior/exterior concrete (3.5.1-27)	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.5.2.2.2 under the heading, “Aging of Structures Not Covered by Structures Monitoring Program,” item 5)
Groups 1-3, 5-9: All (3.5.1-28)	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the applicant is to ensure proper functioning of the de-watering system through the period of extended operation.	None	Not applicable. (See SER Section 3.5.2.2.2 under the heading, “Aging of Structures Not Covered by Structures Monitoring Program,” item 6)
Groups 1-3, 5-9: foundation (3.5.1-29)	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the applicant is to ensure proper functioning of the de-watering system through the period of extended operation.	None	Not applicable. (See SER Section 3.5.2.2.2 under the heading, “Aging of Structures Not Covered by Structures Monitoring Program,” item 7)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 4: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; Steam generator supports (3.5.1-30)	Lock-up due to wear	ISI (IWF) or Structures Monitoring Program	Structures Monitoring Program (B.1.27.2)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2 under the heading, “Aging of Structures Not Covered by Structures Monitoring Program,” item 8)
Groups 1-3, 5, 7-9: below-grade concrete components, such as exterior walls below grade and foundation (3.5.1-31)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack; Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures monitoring Program; Examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	Buried Piping Inspection Program (B.1.1); Structures Monitoring Program (B.1.27.2)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2 under the heading, “Aging Management of Inaccessible Areas”)
Groups 1-3, 5, 7-9: exterior above and below grade reinforced concrete foundations (3.5.1-32)	Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide	Structures Monitoring Program for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Structures Monitoring Program (B.1.27.2)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2 under the heading, “Aging Management of Inaccessible Areas”)
Groups 1-5: concrete (3.5.1-33)	Reduction of strength and modulus due to elevated temperature	A plant-specific AMP is to be evaluated	None	(See SER Section 3.5.2.2.2 under the heading, “Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature”)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 6: Concrete; all (3.5.1-34)	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack; cracking, loss of bond, loss of material due to corrosion of embedded steel	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	Buried Piping Inspection Program (B.1.1); Structures Monitoring Program (B.1.27.2)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2 under the heading, "Aging Management of Inaccessible Areas for Group 6 Structures," item 1)
Group 6: exterior above and below grade concrete foundation (3.5.1-35)	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557).	Structures Monitoring Program (B.1.27.2)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2 under the heading, "Aging Management of Inaccessible Areas for Group 6 Structures," item 2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 6: all accessible/ inaccessible reinforced concrete (3.5.1-36)	Cracking due to expansion/reaction with aggregates	Accessible areas: Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.5.2.2.2 under the heading, "Aging Management of Inaccessible Areas for Group 6 Structures," item 3)
Group 6: exterior above and below grade reinforced concrete foundation interior slab (3.5.1-37)	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide	For accessible areas, Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.5.2.2.2 under the heading, "Aging Management of Inaccessible Areas for Group 6 Structures," item 3)
Groups 7, 8: Tank liners (3.5.1-38)	Cracking due to SCC; loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated	None	Not applicable. (See SER Section 3.5.2.2.2 under the heading, "Cracking Due to Stress Corrosion Cracking and Loss of Material Due to Pitting and Crevice Corrosion")
Support members; welds; bolted connections; support anchorage to building structure (3.5.1-39)	Loss of material due to general and pitting corrosion	Structures Monitoring Program	Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.5.2.2.2 under the heading, "Aging of Supports Not Covered by the Structures Monitoring Program")

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Building concrete at locations of expansion and grouted anchors; grout pads for support base plates (3.5.1-40)	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.5.2.2.2 under the heading, “Aging of Supports Not Covered by the Structures Monitoring Program”)
Vibration isolation elements (3.5.1-41)	Reduction or loss of isolation function/radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	None	Not applicable (See SER Section 3.5.2.2.2 under the heading, “Aging of Supports Not Covered by the Structures Monitoring Program”)
Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds (3.5.1-42)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	None	Not applicable. (See SER Section 3.5.2.2.2 under the heading, “Cumulative Fatigue Damage Due to Cyclic Loading”)
Groups 1-3, 5, 6: all masonry block walls (3.5.1-43)	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	Masonry Wall Program (B.1.27.1); Fire Protection Program (B.1.12.1)	Consistent with the GALL Report. (See SER Section 3.5.2.1.9)
Group 6 elastomer seals, gaskets, and moisture barriers (3.5.1-44)	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report. (See SER Section 3.5.2.1.10)
Group 6: exterior above and below grade concrete foundation; interior slab (3.5.1-45)	Loss of material due to abrasion, cavitation	Inspection of Water-Control Structures Associated with Nuclear Power Plants	None	Consistent with the GALL Report. (See SER Section 3.5.2.1.11)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 5: Fuel pool liners (3.5.1-46)	Cracking due to SCC; loss of material due to pitting and crevice corrosion	Water Chemistry and monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	Water Chemistry Control-BWR Program (B.1.30.2) and monitoring of spent fuel pool water level and level of fluid in the leak chase channel	Consistent with the GALL Report. (See SER Section 3.5.2.1)
Group 6: all metal structural members (3.5.1-47)	Loss of material due to general (steel only), pitting and crevice corrosion	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	None	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1.12)
Group 6: earthen water control structures-dams, embankments, reservoirs, channels, canals, and ponds (3.5.1-48)	Loss of material, loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, Seepage	Inspection of Water-Control Structures Associated with Nuclear Power Plants	None	Not applicable. (VYNPS does not have earthen water control structures.)
Support members; welds; bolted connections; support anchorage to building structure (3.5.1-49)	Loss of material/general, pitting, and crevice corrosion	Water Chemistry and ISI (IWF)	Water Chemistry Control-BWR (B.1.30.2); Inservice Inspection Program (B.1.15.2)	Consistent with the GALL Report. (See Section 3.5.2.1.13)
Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-50)	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	Structures Monitoring Program (B.1.27.2)	Consistent with the GALL Report. (See SER Section 3.5.2.1.14)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group B1.1: high strength low-alloy bolts (3.5.1-51)	Cracking due to SCC; loss of material due to general corrosion	Bolting Integrity	None	Not applicable. (High strength bolting is not exposed to a corrosive environment or high tensile stresses.)
Groups B2, and B4: sliding support bearings and sliding support surfaces (3.5.1-52)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program	None	Not applicable. (Loss of mechanical function due to the listed mechanisms is not an aging effect. Such failures typically result from inadequate design or operating events rather than from the effects of aging. Failures due to cyclic thermal loads are rare for structural supports due to their relatively low temperatures.)
Groups B1.1, B1.2, and B1.3: support members: welds; bolted connections; support anchorage to building structure (3.5.1-53)	Loss of material due to general and pitting corrosion	ISI (IWF)	Inservice Inspection Program (B.1.15.2)	Consistent with the GALL Report. (See SER Section 3.5.2.1.15)
Groups B1.1, B1.2, and B1.3: Constant and variable load spring hangers; guides; stops; (3.5.1-54)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	None	Not applicable. (Loss of mechanical function due to distortion, dirt, overload, fatigue due to vibratory, and cyclic thermal loads are not aging effects requiring management. Such failures typically result from inadequate design or events rather than the effects of aging.)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel, galvanized steel, and aluminum support members; welds; bolted connections; support anchorage to building structure (3.5.1-55)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	None	Not applicable to BWRs
Groups B1.1, B1.2, and B1.3: Sliding surfaces (3.5.1-56)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	Inservice Inspection Program (B.1.15.2); Structures Monitoring Program (B.1.27.2)	Not applicable. (No aging effects due to lubrite plate design features. VYNPS will manage aging anyway.)
Groups B1.1, B1.2, and B1.3: Vibration isolation elements (3.5.1-57)	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF)	None	Not applicable. (No supports with vibration isolation elements are in-scope.)
Galvanized steel and aluminum support members; welds; bolted connections; support anchorage to building structure exposed to air-indoor uncontrolled (3.5.1-58)	None	None	None	Consistent with the GALL Report. (See SER Section 3.5.2.1.16)
Stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-59)	None	None	None	Consistent with the GALL Report. (See SER Section 3.5.2.1)

The staff's review of the SC supports component groups followed any one of several approaches. One approach, documented in SER Section 3.5.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.5.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.5.2.3, reviewed AMR results for components that the applicant indicated are not consistent with or not addressed in the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the SC supports components is documented in SER Section 3.0.3.

3.5.2.1 AMR Results Consistent with the GALL Report

Summary of Technical Information in the Application. LRA Section 3.5.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the SC supports components:

- Containment Leak Rate Program
- Fire Protection Program
- Containment Inservice Inspection Program
- Inservice Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Masonry Wall Program
- Structures Monitoring Program
- Vernon Dam Federal Energy Regulatory Commission Inspection
- Water Chemistry Control - BWR Program

LRA Tables 3.5.2-1 through 3.5.2-6 summarize AMRs for the SC supports components and indicate AMRs claimed to be consistent with the GALL Report.

Staff Evaluation. For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also finds whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also finds whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also finds whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also finds whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation follows.

3.5.2.1.1 Loss of Material Due to General, Pitting and Crevice Corrosion

For loss of material due to general, pitting and crevice corrosion of carbon steel for drywell, torus, drywell head, embedded shell and sand pocket regions, drywell support skirt, torus ring girder, downcomers, liner plate, ECCS suction header, support skirt, region shielded by diaphragm floor and suppression chamber exposed to indoor uncontrolled air or treated water, the GALL Report recommends programs consistent with GALL AMP XI.S1, "ASME Section XI, Subsection IWE" and GALL AMP XI.S4, "10 CFR Part 50, Appendix J."

In LRA Table 3.5.1, Item 3.5.1-5, the applicant stated that loss of material due to general, pitting and crevice corrosion of the carbon steel drywell head, drywell shell, drywell sump liner, drywell to torus vent system, torus manway, torus ring girder, torus shell, and torus thermowell is managed using its Containment Inservice Inspection Program and the Containment Leak Rate Program.

During the audit and review, the staff noted that the applicant's Containment Inservice Inspection Program is a plant-specific program.

The staff reviewed the applicant's Containment Inservice Inspection Program. This evaluation is documented in SER Section 3.0.3.3.2. The staff finds that the applicant's Containment Inservice

Inspection Program satisfied criteria of SRP-LR Appendix A.1 and encompasses the ASME Code, Section XI, Subsection IWE requirements for managing the loss of material for the primary containment and its integral attachments. On this basis, the staff concludes that the applicant's Containment Inservice Inspection Program is an acceptable AMP for loss of material of the above components.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.2 Cumulative Fatigue Damage (CLB Fatigue Analysis Exists)

During the audit and review, the staff noted that in LRA Table 3.5.2-1 (page 3.5-53) for the component torus shell with the aging effect of cracking fatigue, the note assigned is E. Note E is consistent with the GALL Report material, environment, and aging effect but a different AMP is credited. The applicant was asked to explain why this note is E when the AMP shown for this line item is TLAA and the referenced GALL Report Line Item II.B1.1-4 also specifies a TLAA.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.2-1 is revised to change NoteE to NoteA for torus shell with an aging effect of cracking-fatigue. The aging effect and associated AMP are unchanged.

The staff reviewed the applicant's response and finds it acceptable. On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.3 Cracking Due to Cyclic Loading

For cracking due to cyclic loading of steel, stainless steel and dissimilar metal welds for penetration sleeves, penetration bellows, suppression pool shell and unbraced downcomers exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S1, "ASME Code, Section XI, Subsection IWE" and GALL AMP XI.S4, "10 CFR Part 50, Appendix J."

In LRA Table 3.5.1, Item 3.5.1-12, the applicant stated that cracking due to cyclic loading of the carbon steel primary containment mechanical penetrations (includes those with bellows) is managed using the Containment Inservice Inspection Program and the Containment Leak Rate Program.

During the audit and review, the staff noted that the applicant's Containment Inservice Inspection Program is a plant-specific program.

The staff reviewed the applicant's Containment Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.2. The staff finds that the applicant's Containment Inservice Inspection Program satisfied criteria of SRP-LR Appendix A.1 and encompasses the ASME Code, Section XI Subsection IWE Code requirements for managing cracking of the primary containment and its integral attachments. On this basis, the staff concludes that the applicant's Containment Inservice Inspection Program is an acceptable AMP for managing cracking of the primary containment mechanical penetrations (includes those with bellows).

For cracking due to cyclic loading of steel, stainless steel and dissimilar metal welds for torus, vent line, vent header, vent line bellows and downcomers exposed to indoor uncontrolled air, the GALL Report recommends programs consistent with GALL AMP XI.S1, “ASME Code, Section XI, Subsection IWE” and GALL AMP XI.S4, “10 CFR Part 50, Appendix J.”

In LRA Table 3.5.1, Item 3.5.1-13, the applicant stated that cracking due to cyclic loading of the stainless steel drywell to torus vent line bellows is managed using the Containment Inservice Inspection Program and the Containment Leak Rate Program.

During the audit and review, the staff noted that the applicant’s Containment Inservice Inspection Program is a plant-specific program.

The staff reviewed the applicant’s Containment Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.2. The staff finds that the applicant’s containment Inservice Inspection Program satisfied criteria of SRP-LR Appendix A.1 and encompasses the ASME Code, Section XI Subsection IWE Code requirements for managing cracking of the primary containment and its integral attachments. On this basis, the staff concludes that the applicant’s plant-specific Containment Inservice Inspection Program is an acceptable AMP for managing cracking of the drywell to torus vent line bellows.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that in LRA Table 3.5.2-1 (page 3.5-50), for component bellows (reactor vessel and drywell), one of the AMPs shown is the Containment Inservice Inspection-IWE Program, which is a plant-specific AMP. A NoteC has been assigned to this AMR line item, the component is different, but consistent with material, environment, aging effect, and AMP for the GALL Report line item. The AMP is consistent with the GALL Report’s AMP description. The applicant was asked to provide drawings showing how the LRA line item bellows are different from the GALL Report Table 1, Line Item 3.5.1-13 bellows. The applicant was also asked to explain how the plant-specific VYNPS Containment Inservice Inspection-IWE AMP is consistent with the GALL Report’s specified AMP.

The applicant’s staff stated that LRA Table 3.5.2-1 (page 3.5-50), for component bellows (reactor vessel and drywell) is not consistent with the referenced GALL Report Volume 2 item. LRA Table 3.5.2-1 line item “Bellows (reactor vessel and drywell)” and the corresponding line item in VYNPS Table 2.4-1 should be deleted. The reactor vessel and drywell bellows perform no license renewal intended function. These components are not safety-related and are not required to demonstrate compliance with the requirements of 10 CFR 54.4(a)(3). Failure of the bellows will not prevent satisfactory accomplishment of a safety function. Leakage, if any, through the bellows is directed to a drain system that prevents the leakage from contacting the outer surface of the drywell shell.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.2-1 is revised to delete line items for “Bellows (reactor vessel and drywell)” and also the corresponding line item in LRA Table 2.4-1.

The staff reviewed the applicant's response and finds it acceptable. On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.4 Loss of Sealing and Leakage Through Containment Due to Deterioration of Joint Seals, Gaskets, and Moisture Barriers (Caulking, Flashing, and Other Sealants)

During the audit and review, the staff noted that in the discussion column of LRA Table 3.5.1, Item 3.5.1-16, the applicant stated that seals and gaskets are not included in the Containment Inservice Inspection Program at VYNPS. One of the components for this item number is moisture barriers. The applicant was asked to explain how VYNPS seals the joint between the containment drywell shell and drywell concrete floor if there is no moisture barrier. The applicant was also asked to explain why the inspection of this joint is not part of the Containment Inservice Inspection Program at VYNPS.

The applicant's staff stated that VYNPS uses a moisture barrier to seal the joint between the containment drywell shell and drywell concrete floor. Moisture barrier is listed in LRA Table 3.5.2-1 as drywell floor liner seal. Aging effects on the drywell moisture barrier will be managed by its Containment Inservice Inspection-IWE Program. For clarity, drywell floor liner seal will be changed to drywell shell to floor seal (moisture barrier).

During the audit and review, the staff noted that in LRA Table 3.5.2-1 (page 3.5-54) for the component drywell floor liner seal, the AMP shown is the Structures Monitoring Program. The applicant was asked to verify that its Containment Inservice Inspection-IWE AMP will not be used instead to manage the aging of the moisture barrier.

The applicant's staff stated that the aging management activity will be the same whether included in accordance with the umbrella of the Structures Monitoring Program or in accordance with the umbrella of the Containment Inservice Inspection-IWE Program. For clarification, the Containment Inservice Inspection-IWE Program will manage the effects of aging on the moisture barrier through the period of extended operation. Note E remains the correct note since the Containment Inservice Inspection-IWE Program is plant-specific.

In a letter dated July 14, 2006, the applicant revised its LRA. Specifically, the applicant stated that aging effects on the drywell moisture barrier will be managed in accordance with the Containment Inservice Inspection Program instead of the Structures Monitoring Program. In support of this, the LRA is revised as follows:

(1) In the LRA Table 3.5.2-1 line item for "Drywell floor liner seal" change the aging management program from "Structures Monitoring" to "CII-IWE." For clarification, change "drywell floor liner seal" to "drywell shell to floor seal (moisture barrier)." The clarification of this terminology also applies to LRA Table 2.4-1 and Section B.1.27.2.

(2) In LRA Table 3.5.1, Line Item 3.5.1-16, the Discussion column is revised to read: "The aging effects cited in the GALL Report item are loss of sealing and leakage. Loss of sealing is a consequence of the aging effects "cracking" and "change in material properties." For VYNPS, the Containment Leak Rate Program manages cracking and changes in material properties for the primary containment seal and gaskets. The Inservice Inspection-IWE Program manages cracking and changes in material properties for the drywell shell to floor seal (moisture barrier)."

(3) In LRA Table 3.5.1, Line Item 3.5.1-5, the Discussion column last paragraph is revised to read "The drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the Containment Inservice Inspection (IWE) Program."

(4) LRA Section 3.5.2.2.1.4 is revised to delete from the end of the first paragraph, the phrase "and Structures Monitoring Program." The drywell to floor moisture barrier will be inspected in accordance with the Containment Inservice Inspection (IWE) Program only. The Structures Monitoring Program is not used.

The staff reviewed the applicant's response and finds it acceptable. On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that in the applicant response above, the applicant stated:

> In LRA Table 3.5.1, Line Item 3.5.1-16, the Discussion column is revised to read: "The aging effects cited in the GALL Report item are loss of sealing and leakage. Loss of sealing is a consequence of the aging effects "cracking" and "change in material properties." For VYNPS, the Containment Leak Rate Program manages cracking and changes in material properties for the primary containment seal and gaskets. The Inservice Inspection-IWE Program manages cracking and changes in material properties for the drywell shell to floor seal (moisture barrier)."

The staff noted that in LRA Table 3.5.2-6 (page 3.5-80), for component seals and gaskets (doors, man-ways and hatches), material rubber in a protected from weather environment; the aging effects are cracking and change in material properties. The GALL Report line item referenced is II.B4-7 and the LRA Table 1 reference is Line Item 3.5.1-16. However, the AMP shown for this line item is Periodic Surveillance and Preventive Maintenance Program. LRA Table 3.5.1, Item 3.5.1-16 relates to primary containment seals and gaskets. The applicant has stated above in the previous paragraph that the Containment Leak Rate Program manages cracking and change in material properties for the primary containment seals and gaskets. The applicant was asked to explain if this Table 2 line item is for containment seals and gaskets and also Class 1 structures seals and gaskets. If it is for both containment seals and gaskets and

Class 1 structures seals and gaskets, the applicant was asked to explain why the line is not broken into two AMPs, two GALL items, two Table 1 items and two notes. The AMP for the containment seals and gaskets would be Containment Leak Rate Program with the GALL Report Item II.B4-7, the LRA Table 1 Line Item 3.5.1-16 and a note A. The AMP for the Class 1 structures seals and gaskets would probably be the Periodic Surveillance and Preventive Maintenance Program.

The applicant's staff stated that LRA Table 3.5.2-6 line item "Seals and gaskets…" on page 3.5-80 is for Class 1 structure seals and gaskets not associated with primary containment boundary. Containment seals and gaskets are addressed in LRA Table 3.5.2-1 line item "Primary containment electrical penetration…" on page 3.5-55. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.1, Item 3.5.1-16 discussion is revised to add the following paragraph:

> "For reactor building seals and gaskets, the Periodic Surveillance and Preventive Maintenance Program manages cracking and change in material properties for the railroad inner and outer lock doors elastomer seals."

The staff finds that since the GALL does not have similar line item to LRA Table 3.5.1 line item for Class 1 structures seals and gaskets other than for Group 6, the applicant has chosen to align the component Class 1 structures seals and gaskets with GALL Report Table 3.5.1, Line Item 3.5.1-16, which is for the primary containment seals and gaskets. The staff's evaluation of the use of the Periodic Surveillance and Preventive Maintenance Program to manage cracking and change in material properties for the railroad inner and outer lock doors elastomer seals is therefore provided in SER Section 3.5.2.3.8, "Bulk Commodities-Summary of Aging Management Evaluation."

For loss of sealing and leakage through containment due to deterioration of elastomer, rubber and other similar material joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants) exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S1, "ASME Code, Section XI, Subsection IWE" and GALL AMP XI.S4, "10 CFR Part 50, Appendix J."

The staff noted that the applicant manages cracking and change in material properties due to deterioration of the elastomer drywell shell to floor seal (moisture barrier) exposed to a protected from weather environment using the Containment Inservice Inspection Program (plant-specific) only. The moisture barrier is a containment internal seal and therefore the requirement of 10 CFR 50, Appendix J, does not apply.

The staff reviewed the applicant's Containment Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.2. The Containment Inservice Inspection Program encompasses the ASME Code, Section XI Subsection IWE Code requirements for managing the deterioration (cracking and change in material properties) of the primary containment moisture barrier through visual inspections.

Because the applicant's plant-specific Containment Inservice Inspection Program includes the same requirements for inspection and detection of deterioration of the VYNPS primary containment moisture barrier through visual inspections as the ASME Code, Section XI Subsection IWE Code, the staff finds it to be an acceptable management program for detecting cracking and change in material properties.

For loss of sealing and leakage through containment due to deterioration of elastomer, rubber and other similar material joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants) exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S1, "ASME Code, Section XI, Subsection IWE" and GALL AMP XI.S4, "10 CFR Part 50, Appendix J."

The staff noted that for cracking and change in material properties due to deterioration of the elastomer primary containment electrical penetration seals and sealant exposed to a protected from weather environment (LRA page 3.5-55) is managed using only the Containment Leak Rate Program instead of both GALL AMP, GALL AMP XI.S1 and GALL AMP XI.S4.

The staff reviewed the applicant's Containment Leak Rate Program. This evaluation is documented in SER Section 3.0.3.2.8. The Containment Leak Rate Program is the only AMP needed to detect deterioration of the containment electrical penetration seals and sealant. Although the GALL Report specifies GALL AMP XI.S1, "ASME Code, Section XI, Subsection IWE" also for this material, environment and aging effect, the 1998 Edition and later editions of ASME Code, Section XI, Subsection IWE do not require the inspection of seals and gaskets. Since the applicant has not assigned two AMPs to manage this aging effect, the applicant has conservatively called the application of only the Containment Leak Rate Program a different program with respect to the GALL Report.

On the basis of its review, the staff finds that the applicant's Containment Leak Rate Program is consistent with the GALL Report (with exceptions) and the 1998 Edition and later editions of the ASME Code, Section XI, Subsection IWE, do not require the inspection of seals and gaskets. The staff concludes that the applicant's Containment Leak Rate Program alone to be an acceptable management program for detecting cracking and change in material properties of containment electrical penetration seals and sealants.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.5 Loss of Leak Tightness in Closed Position Due to Mechanical Wear of Locks, Hinges and Closure Mechanisms

In the LRA Table 3.5.1, Item 3.5.1-17, the applicant stated that locks, hinges, and closure mechanisms are active components and are therefore not subject to an AMR. During the audit and review, the applicant was asked to provide any license renewal regulatory guidance document or previous NRC SER that has ever stated that locks, hinges, and closure mechanisms are active components. If locks, hinges, and closure mechanisms are active components at VYNPS, the applicant was asked to provide an itemized list of these active components with their qualified life or specified time period of replacement. The applicant was also asked to explain how VYNPS tracks the active life of these components before replacement.

The applicant's staff stated that it may be a misnomer to refer to these components as active components since the requirement of 10 CFR 54.21(a)(1)(i) does not refer to active or passive components, but rather excludes from an AMR, components with moving parts or with a change in configuration or properties that perform an intended function in accordance with 10 CFR 54.4. Locks, hinges, and closure mechanisms perform their functions with moving parts. This exception is not based on a qualified life or specified time period of replacement for a component. 10 CFR 54.21(a)(1)(ii) requirements provide a separate exclusion for components that are replaced based on a qualified life. Other precedents for locks, hinges, and closure mechanisms as active components that have received approval by the NRC are found in Peach Bottom (NUREG-1769, Section 3.0.3.14.2, page 3-58) and Millstone (NUREG-1838, Section 3.3A.2.1.4, page 3-245).

The staff reviewed the Peach Bottom and Millstone SERs which verify that locks, hinges, and other closure mechanisms have been accepted as active components and are excluded from an AMR. On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.6 Loss of Material Due to General, Pitting, and Crevice Corrosion

For loss of material due to general, pitting and crevice corrosion of steel (and dissimilar metal welds) penetration sleeves, personnel airlock, equipment hatch and CRD hatch exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S1, "ASME Code, Section XI, Subsection IWE" and GALL AMP XI.S4, "10 CFR Part 50, Appendix J."

The staff noted that loss of material of the carbon steel CRD removal hatch, equipment hatch, personnel airlock, primary containment electrical penetrations, torus electrical penetrations, and torus mechanical penetrations exposed to a protected from weather environment (LRA pages 3.5-50 and 51) is managed using its Containment Inservice Inspection Program, which is a plant-specific AMP, and the Containment Leak Rate Program.

The staff reviewed the applicant's Containment Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.2. The staff finds that the applicant's containment Inservice Inspection Program satisfied criteria of SRP-LR Appendix A.1 and encompasses the ASME Code, Section XI Subsection IWE requirements for managing loss of material for primary containment and its integral attachments.

On this basis, the staff concludes that the applicant's plant-specific Containment Inservice Inspection Program is an acceptable management program for managing loss of material of the above components. The staff finds the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.7 Fretting or Lock Up Due to Mechanical Wear

In LRA Table 3.5.1, Item 3.5.1-21, the applicant stated that VYNPS plant operating experience has not identified fretting or lock up due to mechanical wear for the drywell head and downcomers. During the audit and review, the staff noted that plant operating experience does not find fretting or lock up due to mechanical wear but inspections do. The applicant was asked to explain if VYNPS staff currently inspect for wear of the drywell head and downcomer pipes in accordance with the CLB using the Containment Inservice Inspection Program. If VYNPS currently does inspect these components for wear, justify the basis for not performing these same inspections during an extended license period. If required, provide drawings showing the spacial distance between components such that fretting cannot occur.

The applicant's staff stated condition reports are a primary source of operating experience documentation reviewed for license renewal. Condition reports document negative inspection results. The GALL Report defines neither fretting nor lockup and further confuses the subject by stating that fretting and lockup are caused by mechanical wear which is an aging mechanism resulting in the aging effect loss of material. The definition in GALL AMP IX.E merely states that fretting and lockup is an aging effect along with a cause, but doesn't say what it is or what it looks like. As indicated in the line item for drywell head in LRA Table 3.5.2-1, the Containment Inservice Inspection-IWE Program and the Containment Leak Rate Program manage loss of material. Loss of material is the aging effect caused by mechanical wear. VYNPS inspects the drywell head and downcomers (torus vent system) per the requirements of ASME Code, Section XI. In addition, the drywell head and downcomers are stationary, well-braced components and the spacial distance between connecting components make it unlikely for fretting and lockup to occur.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.8 Loss of Material Due to General and Pitting Corrosion

For loss of material due to general, pitting and crevice corrosion of steel support members, welds, bolted connections; and support anchorage to building structure exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S6, "Structures Monitoring Program."

During the audit and review, the staff noted that loss of material of carbon steel damper framing exposed to a protected from weather environment is managed using the Fire Protection-Fire Protection Program (with exceptions to the GALL Report and enhancements).

The staff reviewed the applicant's Fire Protection-Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The Fire Protection-Fire Protection Program will be enhanced in accordance with the parameters monitored/inspected element to specify that fire damper frames in fire barriers shall be inspected for corrosion (loss of material). This requirement will also be added to field procedures.

In a letter dated July 6, 2006, the applicant revised its LRA. The applicant revised the VYNPS License Renewal Commitments List to state that procedures will be enhanced to specify that fire damper frames in fire barriers will be inspected for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion. The implementation schedule is before March 21, 2012.

On the basis that the applicant's Fire Protection-Fire Protection Program will be enhanced to include in accordance with parameters monitored/inspected that fire damper frames in fire barriers be inspected for corrosion (loss of material), the staff finds that it is an acceptable management program for managing loss of material of the damper framing in lieu of the recommended GALL AMP XI.S6.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

For loss of material due to general, pitting and crevice corrosion of steel support members, welds, bolted connections; and support anchorage to building structure exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S6, "Structures Monitoring Program."

During the audit and review, the staff noted that loss of material of carbon steel fire hose reels exposed to a protected from weather environment is managed using the Fire Protection-Fire Water System Program (with exceptions to the GALL Report and enhancements).

The staff reviewed the applicant's Fire Protection-Fire Water System Program evaluation is documented in SER Section 3.0.3.2.12. The Fire Protection-Fire Water System Program applies to water-based fire protection systems that consist of sprinklers, nozzles, fittings, valves, hydrants, hose stations (including Fire hose reels), standpipes, and aboveground and underground piping and components. Components are tested in accordance with applicable NFPA codes and standards. Such testing assures that carbon steel Fire hose reels will be inspected for corrosion (loss of material).

On the basis that the applicant's Fire Protection-Fire Water System Program includes hose stations (including fire hose reels) which are tested in accordance with NFPA codes and standards which will detect corrosion, the staff finds that it is an acceptable AMP for managing loss of material of fire hose reels in lieu of the recommended GALL AMP XI.S6.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.9 Cracking Due to Restraint Shrinkage, Creep, and Aggressive Environment

For cracking due to restraint shrinkage, creep and aggressive environment of concrete block masonry walls exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S5, "Masonry Wall Program."

In LRA Table 3.5.2-5 (page 3.5-67), the applicant stated that cracking of concrete brick for Vernon Dam masonry walls exposed to a weather environment is managed using the Vernon Dam FERC Inspection Program.

During the audit and review, the staff finds that inspections of the Vernon Dam are not part of a VYNPS AMP but inspections are conducted by the owner of the dam in accordance with FERC oversight. In the response to RAI 3.6.2.2-N-08-1, the applicant deleted its Structures Monitoring - Vernon Dam FERC Inspection AMP from the LRA. The deletion is acceptable to the staff.

On the basis that the inspection and maintenance of the Vernon Dam is in accordance with the regulatory jurisdiction and are conducted by FERC or the US Army Corp of Engineers, the staff finds the aging management of the dam is adequate. The staff's evaluation is documented in SER Section 3.0.3.3.6. The staff finds that FERC Inspection will adequately manage the aging effects for the Vernon Dam and that the management of cracking of concrete brick for Vernon Dam masonry walls exposed to a weather environment is acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.10 Loss of Sealing Due to Deterioration of Seals, Gaskets, and Moisture Barriers (Caulking, Flashing, and Other Sealants)

During the audit and review, the staff noted that in LRA Table 3.5.2-6 (page 3.5-80), for component seals and gaskets (doors, manways and hatches), material rubber in a protected from weather environment; the aging effects are cracking and change in material properties. One of the AMP s shown is the Structures Monitoring Program. The GALL Report line item referenced is III.A6-12 and the LRA Table 1 reference is Line Item 3.5.1-44. The note shown is E, different AMP than shown in the GALL Report. However, the GALL Report Line Item III.A6-12 and LRA Table 1 Line Item 3.5.1-44 both specify the Structures Monitoring Program. The applicant was asked to explain why the note shown is not A instead of E for the lower half of this AMR line item.

During the audit and review, the applicant's staff stated that LRA Table 3.5.2-6 (page 3.5-80), for component seals and gaskets (doors, manways and hatches), material rubber in a protected from weather environment; the aging effects are cracking and change in material properties. The LRA will be clarified to indicate that note "A" applies to the line for SMP.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.2-6 is revised to indicate that note A applies to component seals and gaskets (doors, man-ways and hatches) with the Structures Monitoring Program.

The staff reviewed the applicant's response and finds it acceptable. On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.11 Loss of Material Due to Abrasion, Cavitation

For loss of material due to abrasion and cavitation of reinforced concrete exterior above and below grade foundation and interior slab exposed to flowing water, the GALL Report recommends programs consistent with GALL AMP XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.”

During the audit and review, the staff noted that loss of material of reinforced concrete exterior walls below grade (SW area), exterior walls below grade (CWS area), foundation, interior walls below grade, exterior walls above grade, exterior walls below grade and foundation (cooling tower) exposed to a fluid environment is managed using the Structures Monitoring Program (with enhancements) instead of the recommended GALL AMP XI.S7.

The staff reviewed the applicant’s Structures Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.17. VYNPS is not committed to RG 1.127. GALL AMP XI.S7 states that for plants not committed to RG 1.127, Revision 1, aging management of water-control structures may be included in the Structures Monitoring Program. The program elements of GALL AMP XI.S7 applicable to the water control structures at VYNPS have been incorporated into the VYNPS Structures Monitoring Program.

On the basis that the applicant’s Structures Monitoring Program includes the program elements of GALL AMP XI.S7 applicable to the water control structures at VYNPS as recommended by the GALL Report, the staff finds it to be an acceptable AMP for loss of material of the components listed above.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

In LRA Table 3.5.2-5 (page 3.5-67), the applicant stated that loss of material of concrete for the Vernon Dam external walls above/below grade exposed to fluid environment is managed by its Vernon Dam FERC Inspection Program.

The referenced GALL Report line item is III.A6-7. The GALL Report Line Item III.A6-7 states the following in accordance with AMP: 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. Since one of the AMPs in accordance with this GALL Report line item is FERC dam inspections, the applicant was asked to explain why the note assigned to the LRA AMR line item is E instead of A, where note A is consistent with the GALL Report.

During the audit and review, the staff finds that inspections of the Vernon Dam are not part of a VYNPS AMP but inspections are conducted by the owner of the dam in accordance with FERC oversight. In the response to RAI 3.6.2.2-N-08-1, the applicant deleted its Structures Monitoring-Vernon Dam FERC Inspection AMP from the LRA. The deletion is acceptable to the staff.

On the basis that the inspection and maintenance of the Vernon Dam is in accordance with the regulatory jurisdiction and are conducted by FERC or the US Army Corp of Engineers, the staff finds the aging management of the dam is adequate. The staff's evaluation is documented in SER Section 3.0.3.3.6. The staff finds that FERC Inspection will adequately manage the aging effects for the Vernon Dam and that the loss of material of concrete for the Vernon Dam external walls above/below grade exposed to fluid environment is acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.12 Loss of Material Due to General (Steel Only), Pitting and Crevice Corrosion

For loss of material due to general, pitting and crevice corrosion of group six metal structural members exposed to indoor uncontrolled air, outdoor air, flowing water, or standing water the GALL Report recommends programs consistent with GALL AMP XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

During the audit and review, the staff noted that loss of material of metal Structural steel: beams, columns, plates exposed to a protected from weather or fluid environment; metal anchorage/embedments exposed to a fluid environment; metal manway hatches and hatch covers exposed to a protected from weather or weather environment; and structural bolting exposed to a fluid environment is managed using the Structures Monitoring Program (with enhancements) instead of the recommended GALL AMP XI.S7.

The staff reviewed the applicant's Structures Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.17. VYNPS is not committed to RG 1.127. GALL AMP XI.S7 states that for plants not committed to RG 1.127, Revision 1, aging management of water-control structures may be included in the Structures Monitoring Program. The program elements of GALL AMP XI.S7 applicable to the water control structures at VYNPS have been incorporated into the VYNPS Structures Monitoring Program.

On the basis that the applicant's Structures Monitoring Program includes the program elements of GALL AMP XI.S7 applicable to the water control structures at VYNPS as recommended by the GALL Report, the staff finds it is an acceptable management program for managing loss of material of the components listed above.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

In LRA Table 3.5.2-5 (page 3.5-66), the applicant stated that loss of material of carbon steel for the Vernon Dam structural steel protected from weather or exposed to weather or fluid environments is managed by Vernon Dam FERC Inspection Program.

The referenced GALL Report line item for all three environments is III.A6-11. The GALL Report Line Item III.A6-11 states the following in accordance with AMP: 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. Since one of the AMPs in accordance with this GALL Report line item is FERC dam inspections, the applicant was asked to explain why the note assigned to the three LRA AMR line items is E instead of A, where note A is consistent with the GALL Report.

During the audit and review, the staff finds that inspections of the Vernon Dam are not part of a VYNPS AMP but inspections are conducted by the owner of the dam in accordance with FERC oversight. In the response to RAI 3.6.2.2-N-08-1, the applicant deleted its Structures Monitoring-Vernon Dam FERC Inspection AMP from the LRA. The deletion is acceptable to the staff.

On the basis that the inspection and maintenance of the Vernon Dam is in accordance with the regulatory jurisdiction and are conducted by FERC or the US Army Corp of Engineers, the staff finds the aging management of the dam is adequate. The staff's evaluation is documented in SER Section 3.0.3.3.6. The staff finds that FERC Inspection will adequately manage the aging effects for the Vernon Dam and that loss of material of carbon steel for the Vernon Dam structural steel protected from weather or exposed to weather or fluid environments is acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.13 Loss of Material/General, Pitting and Crevice Corrosion

For loss of material due to general, pitting and crevice corrosion of stainless steel and steel support members; bolted connections; support anchorage to building structure exposed to treated water (less than140°F) the GALL Report recommends programs consistent with GALL AMP XI.M2, "Water Chemistry," for BWR water, and GALL AMP XI.S3, "ASME Code, Section XI, Subsection IWF."

During the audit and review, the staff noted that loss of material of carbon steel and stainless steel anchorage/embedments exposed to a fluid environment is managed using the Water Chemistry Control-BWR Program and the Inservice Inspection Program, which is a plant-specific AMP instead of the GALL AMP XI.S3.

The staff reviewed the applicant's Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.3. The applicant's Inservice Inspection Program encompasses the ASME Code, Section XI Subsection IWF requirements for managing the loss of material for ASME Code Class 1, 2, and 3 steel piping supports and steel component supports within containment.

On the basis that the applicant's plant-specific Inservice Inspection Program includes the same requirements for inspection and detection of loss of material for ASME Code Class 1, 2, and 3 steel piping supports and steel component supports within containment as the ASME Code, Section XI Subsection IWF, the staff finds it to be an acceptable management program for loss of material of carbon steel and stainless steel anchorage/embedments.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.14 Loss of Material Due to Pitting and Crevice Corrosion

In LRA Table 3.5.1, Item 3.5.1-50, the applicant stated that loss of material due to pitting and crevice corrosion of Groups B2 and B4 galvanized steel, aluminum, and stainless steel components in an outdoor air environment is not applicable at VYNPS. During the audit and review, the staff noted that NUREG-1833, “Technical Bases for Revision to the License Renewal Guidance Documents,” on page 93 for Item TP-6 states:

> An approved precedent exists for adding this material, environment, aging effect, and program combination to the GALL Report. As shown in RNP [Robinson Nuclear Plant] SER Section 3.5.2.4.3.2, galvanized steel and stainless steel in an outdoor air environment could result in loss of material due to constant wetting and drying conditions. Aluminum would also be susceptible to a similar kind of aging effect in the outdoor environment.

The applicant was asked to provide a discussion of the actual Group B2 and B4 galvanized steel, aluminum, and stainless steel VYNPS components which are within the scope of license renewal and exposed to an outdoor air environment. In addition, the applicant was asked to discuss the location of these components at VYNPS and how they are protected from constant wetting and drying conditions.

The applicant’s technical personnel stated that loss of material due to pitting and crevice corrosion of aluminum and stainless steel components in an outdoor environment is not applicable if the atmospheric environment is non-aggressive. The ambient environment at VYNPS is not chemically polluted by vapors of sulfur dioxide (SO_2) or other similar substances and the external environment does not contain saltwater or high chloride content. In this non-aggressive environment, the occasional wetting and drying from normal outdoor weather does not result in any significant loss of material in aluminum or stainless steel components. The conclusion that no aging effects require management for these materials in an outdoor air environment is supported by operating experience and by previously approved staff positions documented in the Joseph M. Farley SER (NUREG-1825, page 3-314).

The applicant stated that the components that may be considered in the B2 and B4 grouping consists of those line items in LRA Table 3.5.2-6 including the plant-specific Note 503. Note 503 provides the basis for concluding the environment is non-aggressive and the conclusion that there are no aging effects requiring management.

The applicant stated that loss of material is not an applicable aging effect for stainless steel or aluminum components in outdoor air. The ambient environment at VYNPS is not chemically polluted by vapors of SO_2 or other similar substances and the external environment does not contain saltwater or high chlorides. Therefore, loss of material due to pitting and crevice corrosion is not an AERM for aluminum and stainless steel components exposed to the external environment.

The applicant stated that the AMR results for galvanized steel components in outdoor air should indicate loss of material as an aging effect with structures monitoring as the AMP . In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.1, Item 3.5.1-50 is revised to include the following in the discussion column: “Consistent with NUREG-1801 for galvanized steel components in outdoor air. The Structures Monitoring Program will manage loss of material.”

The staff reviewed the applicant’s Structures Monitoring Program. This evaluation is documented in SER Section 3.0.3.2.17. On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that in LRA Table 3.5.2-5 (page 3.5-65), for component transmission towers, material galvanized steel in an exposed to weather environment; the aging effect is none. The staff referenced the first question above and asked the applicant to explain how this component is protected from constant wetting and drying conditions.

During interviews with the applicant’s technical personnel, the applicant’s staff stated that as identified in the response to the first question above, loss of material is the AERM and the Structures Monitoring Program is the AMP. This is consistent with the GALL Report, Volume 2, Item III.B4-7, summarized in LRA Table 3.5.1, Item 3.5.1-50, and note C applies. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to indicate loss of material as an AERM with the Structures Monitoring Program as the AMP and the GALL Report Volume 2 item as III.B4-7 with a Note C in LRA Table 3.5.2-5 for transmission towers with a material of galvanized steel in an exposed to weather environment. The staff review the applicant’s response and finds it acceptable.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that in LRA Table 3.5.2-6 (page 3.5-71), for component conduit, material galvanized steel in an exposed to weather environment; the aging effect is none. The staff referenced the first question above and asked the applicant to explain how this component is protected from constant wetting and drying conditions.

During interviews with the applicant’s technical personnel, the applicant’s staff stated that as identified in the response to the first question above, loss of material is the AERM and the Structures Monitoring Program is the AMP. This is consistent with the GALL Report, Volume 2, Item III.B4-7, summarized in LRA Table 3.5.1, Item 3.5.1-50, and note C applies. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to indicate loss of material as an AERM with the Structures Monitoring Program as the AMP and the GALL Report Volume 2 item as III.B4-7 with a Note C in LRA Table 3.5.2-6 for conduit with a material of galvanized steel in an exposed to weather environment.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that in LRA Table 3.5.2-6 (page 3.5-71), for component conduit support, material galvanized steel in an exposed to weather environment; the aging effect is none. The staff referenced the first question above and asked the applicant to explain how this component is protected from constant wetting and drying conditions.

During interviews with the applicant's technical personnel, the applicant's staff stated that as identified in the response to the first question above, loss of material is the AERM and the Structures Monitoring Program is the AMP. This is consistent with the GALL Report, Volume 2, Item III.B4-7, summarized in LRA Table 3.5.1, Item 3.5.1-50, and Note C applies. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to indicate loss of material as an AERM with the Structures Monitoring Program as the AMP and the GALL Report Volume 2 item as III.B4-7 with a Note C in LRA Table 3.5.2-6 for conduit support with a material of galvanized steel in an exposed to weather environment.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that in LRA Table 3.5.2-6 (page 3.5-72), for component electrical and instrument panels and enclosures, material galvanized steel in an exposed to weather environment; the aging effect is none. The staff referenced the first question above and asked the applicant to explain how this component is protected from constant wetting and drying conditions.

During interviews with the applicant's technical personnel, the applicant's staff stated that as identified in the response to the first question above, loss of material is the AERM and the Structures Monitoring Program is the AMP. This is consistent with the GALL Report, Volume 2, Item III.B4-7, summarized in LRA Table 3.5.1, Item 3.5.1-50, and note C applies. In a letter dated July 14, 2006, the applicant stated amended its LRA. The applicant stated that the LRA is revised to indicate loss of material as an AERM with the Structures Monitoring Program as the AMP and the GALL Report Volume 2 item as III.B4-7 with a Note C in LRA Table 3.5.2-6 for electrical and instrument panels and enclosures with a material of galvanized steel in an exposed to weather environment.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that in LRA Table 3.5.2-6 (page 3.5-78), for component structural bolting, material galvanized steel in an exposed to weather environment; the aging effect is none. The staff referenced the first question above and asked the applicant to explain how this component is protected from constant wetting and drying conditions.

During interviews with the applicant's technical personnel, the applicant's staff stated that as identified in the response to the first question above, loss of material is the AERM and the Structures Monitoring Program is the AMP. This is consistent with the GALL Report, Volume 2, Item III.B4-7, summarized in LRA Table 3.5.1, Item 3.5.1-50, and Note C applies. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA is revised to indicate loss of material as an AERM with the Structures Monitoring Program as the AMP and the GALL Report Volume 2 item as III.B4-7 with a Note C in LRA Table 3.5.2-6 for structural bolting with a material of galvanized steel in an exposed to weather environment.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.15 Loss of Material Due to General and Pitting Corrosion

For loss of material due to general and pitting corrosion of steel support members; welds, bolted connections; support anchorage to building structure exposed to indoor uncontrolled air or outdoor air the GALL Report recommends programs consistent with GALL AMP XI.S3, "ASME Code, Section XI, Subsection IWF."

During the audit and review, the staff noted that loss of material of steel reactor vessel support assembly, reactor vessel stabilizer supports, torus external supports (columns, saddles), anchorage/embedments, base plates, component and piping supports ASME Code Class 1, 2, 3 and MC, anchor bolts, and ASME Code Class 1, 2, 3 and MC supports bolting exposed to a protected from weather environment and anchorage/embedments, base plates, component and piping supports ASME Code Class 1, 2, 3 and MC, anchor bolts, ASME Code Class 1, 2, 3 and MC supports bolting exposed to a weather environment is managed using the Inservice Inspection Program, which is a plant-specific program instead of the recommended GALL AMP XI.S3.

The staff reviewed the applicant's Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.3. The staff finds that the applicant's Inservice Inspection Program satisfied criteria of SRP-LR Appendix A.1 and encompasses the ASME Code, Section XI Subsection IWF requirements for managing the loss of material for ASME Code Class 1, 2, and 3 steel piping supports and steel component supports within containment.

On the basis that the applicant's plant-specific Inservice Inspection Program includes the same requirements for inspection and detection of loss of material for ASME Code, Class 1, 2, and 3 steel piping supports and steel component supports within containment as the ASME Code, Section XI Subsection IWF, the staff finds it to be an acceptable management program for loss of material of the components listed above.

For loss of material due to general and pitting corrosion of carbon steel vent header support exposed to fluid environment (LRA page 3.5-54), the GALL Report line item shown is III.B1.1-13, LRA Table 1, Item 3.5.1-53 is referenced, and the AMP shown is the Inservice Inspection-IWF Program. The staff noted that GALL Report Line Item III.B1.1-13 is for an indoor uncontrolled air or outdoor air environment. In RAI 3.5.1-53-W-1, the staff asked the applicant to explain why GALL Report Line Item III.B1.1-11 (treated water environment), LRA Table 1, Item 3.5.1-49, and the Water Chemistry Control – BWR Program are not included in this AMR line item.

By letter dated September 5, 2006 the applicant provided its response. The applicant stated that since portions of the carbon steel vent header supports are below the water level in the torus, application of GALL Report Line Item III.B1.1-11 is appropriate for the vent header supports. The applicant has also revised this AMR line item to reflect this change. The staff reviewed the applicant's response and determined it acceptable. Therefore, the staff's concern described in RAI 3.5.1-53-W-1 is resolved.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

3.5.2.1.16 None (Galvanized Steel and Aluminum Support Members; Welds; Bolted Connections; Support Anchorage to Building Structure)

During the audit and review, the staff noted that in LRA Table 3.5.2-6 (page 3.5-72), for component electrical and instrument panels and enclosures, material galvanized steel in a protected from weather environment, the aging effect is none. The GALL Report line item referenced is III.B3-3, which is for the following components: support members; welds; bolted connections; support anchorage to building structure. The applicant was asked to explain why the LRA AMR line item has a Note A shown instead of a Note C, different component with respect to the GALL Report line item. Or as an alternative, a letter note A with a number note explaining that the component is different.

During interviews with the applicant's technical personnel, the applicant's staff stated that the GALL Report does not mention every type of component that may be subject to AMR (e.g., panel is not in the GALL Report) nor does the terminology used at a specific plant always align with that used in the GALL Report. Consequently, matching plant components to the GALL Report components is occasionally subjective. In this particular case, panels, which have no specific function other than to support and protect electrical equipment, was considered a support member and note A was applied. The use of either note A or C has no real impact on the AMR results.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA Table 3.5.2-6 is revised to change note A to note C for electrical and instrument panels and enclosures with a material of galvanized steel in a protected from weather environment. Aging effect and associated AMPare unchanged.

On the basis of its review of the applicant's response, the staff finds the response acceptable and the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that in LRA Table 3.5.2-6 (page 3.5-73), for component flood curb, material galvanized steel in a protected from weather environment, the aging effect is none. The GALL Report line item referenced is III.B5-3, which is for the following components: Support members; welds; bolted connections; support anchorage to building structure. The applicant was asked to explain why the LRA AMR line item has a Note A shown instead of a Note C, different component with respect to the GALL Report line item. Or as an alternative, a letter note A with a number note explaining that the component is different.

During interviews with the applicant's technical personnel, the applicant's staff stated that unlike the conduits and panels compared to supports in other questions, the component flood curb should not have been considered a match. Note C should be applied here; although the use of either note A or C has no real impact on the AMR results. In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.2-6 is revised to change note A to note C for flood curb with a material of galvanized steel in a protected from weather environment. Aging effect and associated AMPare unchanged.

On the basis of its review of the applicant's response, the staff finds the response acceptable and the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

Conclusion. The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

Summary of Information in the Application. In LRA Section 3.5.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the SC supports components and provides information concerning how it will manage the following effects of aging:

(1) PWR and BWR containments:

- aging of inaccessible concrete areas
- cracks and distortion due to increased stress levels from settlement; reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations if not covered by the structures monitoring program
- reduction of strength and modulus of concrete structures due to elevated temperature
- loss of material due to general, pitting, and crevice corrosion
- loss of prestress due to relaxation, shrinkage, creep, and elevated temperature
- cumulative fatigue damage
- cracking due to stress-corrosion cracking
- cracking due to cyclic loading
- loss of material (scaling, cracking, and spalling) due to freeze-thaw
- cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide

(2) safety-related and other structures and components supports:

- aging of structures not covered by the structures monitoring program
- aging management of inaccessible areas
- reduction of strength and modulus of concrete structures due to elevated temperature
- aging management of inaccessible areas for Group 6 structures
- cracking due to stress-corrosion cracking and loss of material due to pitting and crevice corrosion
- aging of supports not covered by the structures monitoring program
- cumulative fatigue damage due to cyclic loading

(3) quality assurance for aging management of nonsafety-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.5.2.2. The staff's review of the applicant's further evaluation follows.

3.5.2.2.1 PWR and BWR Containments

The staff reviewed LRA Section 3.5.2.2.1 against SRP-LR Section 3.5.2.2.1 criteria, which address several areas:

Aging of Inaccessible Concrete Areas. The staff reviewed LRA Section 3.5.2.2.1.1 against the criteria in SRP-LR Section 3.5.2.2.1.1.

In LRA Section 3.5.2.2.1.1, the applicant addressed increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel.

SRP-LR Section 3.5.2.2.1.1 states that increases in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel may occur in inaccessible areas of PWR and BWR concrete and steel containments. The existing program relies on ASME Code, Section XI, Subsection IWL to manage these aging effects; however, the GALL Report recommends further evaluation of plant-specific programs to manage the aging effects for inaccessible areas in aggressive environments.

The applicant stated, in the LRA, that VYNPS has a Mark I free standing steel containment located within the reactor building. Inaccessible and accessible concrete areas are designed in accordance with ACI specification ACI 318-63, “Building Code Requirements for Reinforced Concrete,” which results in low permeability and resistance to aggressive chemical solutions by requiring the following:

- high cement content
- low water-to-cement ratio
- proper curing
- adequate air entrainment

In addition, as stated in the LRA, VYNPS concrete also meets requirements of later ACI guide ACI 201.2R-77, “Guide to Durable Concrete,” since both documents use the same ASTM standards for selection, application and testing of concrete.

Furthermore, as stated in the LRA, the below-grade environment is not aggressive (pH greater than 5.5, chlorides less than 500 ppm, and sulfates less than 1,500 ppm). Concrete was provided with air content between 3 percent and 5 percent and a water/cement ratio between 0.44 and 0.60. Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not applicable for concrete in inaccessible areas. The absence of concrete aging effects is confirmed in accordance with the Structures Monitoring Program.

The staff finds that these aging effects are not applicable to the VYNPS Mark I free standing steel containment. The listed possible aging effects apply to concrete elements of PWR containments and concrete BWR containments. The VYNPS Mark I steel containment is located within the concrete reactor building and the previous applicant discussion is for that concrete structure.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.5.2.2.1.1 criteria. For those line items that apply to LRA Section 3.5.2.2.1.1, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cracks and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, Cracking, and Differential Settlement Due to Erosion of Porous Concrete Subfoundations, If Not Covered by the Structures Monitoring Program. The staff reviewed LRA Section 3.5.2.2.1.2 against the criteria in SRP-LR Section 3.5.2.2.1.2.

In LRA Section 3.5.2.2.1.2, the applicant stated that for the crack and distortion due to increased stress levels from settlement; reduction of foundation strength, cracking and differential settlement due to erosion of porous concrete subfoundations, if not covered by the Structures Monitoring Program, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.5.2.2.1.2 states that cracks and distortion due to increased stress levels from settlement may occur in PWR and BWR concrete and steel containments. Also, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations may occur in all types of PWR and BWR containments. The existing program relies on structures monitoring 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 within the scope of the applicant’s structures monitoring program.

In addition, as stated in the LRA, VYNPS has a Mark I free standing steel containment located within the reactor building and supported by the reactor building foundation. VYNPS does not rely on a de-watering system for control of settlement. Category 1 structures are founded on sound bedrock which prevents significant settlement. Additionally, concrete within five feet of the highest known ground water level is protected by membrane waterproofing. This membrane protects the reactor building concrete against exposure to groundwater. VYNPS was not identified in IN 97-11 as a plant susceptible to erosion of porous concrete subfoundations. Groundwater was not aggressive during plant construction and there is no indication that groundwater chemistry has significantly changed. No changes in groundwater conditions have been observed at VYNPS. As a result, cracking and distortion due to increased stress levels from settlement; reduction of foundation strength, cracking and differential settlement due to erosion of porous concrete subfoundations are not applicable to VYNPS concrete structures.

During the audit and review, the applicant stated that the crack and distortion due to increased stress levels from settlement; reduction of foundation strength, cracking and differential settlement due to erosion of porous concrete subfoundations, if not covered by the Structures Monitoring Program are not plausible aging effects due to the nonexistence of these aging mechanisms. The applicant stated that the aging effects due to settlement are not expected at VYNPS for the Mark I steel containment since it is located within the reactor building and supported by the reactor building foundation. The reactor building is founded on sound bedrock which prevents significant settlement. In addition, there is no porous concrete subfoundation below the reactor building of concern.

On the basis of its audit and review, the staff determined that crack and distortion due to increased stress levels from settlement; reduction of foundation strength, cracking and differential settlement due to erosion of porous concrete subfoundations are not plausible aging effects due to the nonexistence of these aging mechanisms at VYNPS. The staff finds that these aging effects and aging effect mechanisms are not applicable to the VYNPS Mark I free standing steel containment.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.1.2 criteria. For those line items that apply to LRA Section 3.5.2.2.1.2, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature</u>. The staff reviewed LRA Section 3.5.2.2.1.3 against the criteria in SRP-LR Section 3.5.2.2.1.3.

In LRA Section 3.5.2.2.1.3, the applicant stated that for the reduction of strength of modulus of concrete structures due to elevated temperature, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.5.2.2.1.3 states that reduction of strength and modulus of concrete due to elevated temperatures may occur in PWR and BWR concrete and steel containments. The implementation of the requirements of 10 CFR 50.55a and ASME Code, Section XI, Subsection IWL would not be able to identify the reduction of strength and modulus of concrete due to elevated temperature. ASME Code, Section III, Division 2, Subsection CC-3400, specifies the concrete temperature limits for normal operation or any other long-term period. The GALL Report recommends further evaluation of plant-specific AMPs if any portion of the concrete containment components exceeds specified temperature limits (i.e., general area temperature greater than 60 °C (150 °F) and local area temperature greater than 93 °C (200 °F)).

The VYNPS UFSAR states that the ambient temperature in the drywell is maintained between 135 °F and 165 °F. With a two inch air gap between the drywell shell and the concrete containment, there will be a sufficient temperature drop across the gap so that the concrete will remain well below the 150 °F limit specified in the ASME Code. Transfer of heat across an air gap relies on radiant heat transfer, which is very inefficient. As a result, there will be no reduction in the strength and modulus of the concrete due to elevated temperature as a result of the temperature in the drywell.

In addition, the applicant stated, that ASME Code, Section III, Division 2, Subsection CC indicates that aging due to elevated temperature exposure is not significant as long as concrete general area temperatures do not exceed 150°F and local area temperatures do not exceed 200°F. During normal operation, areas within primary containment are within these temperature limits. Therefore, reduction of strength and modulus of concrete structures due to elevated temperature is not an AERM for VYNPS containment concrete.

On the basis of its audit and review, the staff determined that the reduction of strength and modulus for concrete structures due to elevated temperature are not plausible aging effects due to the nonexistence of these aging mechanisms. The staff also finds that these aging effects and aging effect mechanisms are not applicable to the VYNPS Mark I free standing steel containment. The aging effects due to elevated temperature are not expected at VYNPS for the concrete associated with the Mark I steel containment since general areas temperatures within the primary containment do not exceed 150°F and local area temperatures do not exceed 200°F. On this basis, the staff concludes that these aging effects are not applicable to the VYNPS containment.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.1.3 criteria. For those line items that apply to LRA Section 3.5.2.2.1.3, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Loss of Material Due to General, Pitting and Crevice Corrosion</u>. The staff reviewed LRA Section 3.5.2.2.1.4 against the criteria in SRP-LR Section 3.5.2.2.1.4.

In LRA Section 3.5.2.2.1.4, the applicant addressed the loss of material of steel elements of accessible and inaccessible areas for all types of PWR and BWR containments due to general, pitting and crevice corrosion.

SRP-LR Section 3.5.2.2.1.4 states that loss of material due to general, pitting, and crevice corrosion may occur in steel elements of accessible and inaccessible areas for all types of PWR and BWR containments. The existing program relies on requirements of ASME Code, 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 for inaccessible areas if corrosion is significant.

In LRA Section 3.5.2.2.1.4, the applicant addressed loss of material of steel elements of accessible and inaccessible areas for all types of PWR and BWR containments due to general, pitting and crevice corrosion. The applicant stated, in the LRA, that VYNPS's containment is a Mark I steel containment located within the reactor building. VYNPS reactor building concrete in contact with the drywell shell is designed in accordance with specification ACI 318-63. The concrete meets the recommendations of later ACI guide 201.2R-77, since both documents use the same ASTM standards for selection, application and testing of concrete. Concrete is monitored for cracks in accordance with the Structures Monitoring Program. The drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the Containment Inservice Inspection (IWE) Program.

The applicant also stated that to prevent corrosion of the lower part of the drywell shell, the interior and exterior surfaces are protected from any contact with the atmosphere by complete concrete encasement. It is not credible for ground water to reach the drywell shell, assuming a crack in the concrete, since the concrete at this location is greater than 8 feet thick and poured in multiple separate horizontal planes. The exterior surface of the drywell shell at the sand cushion interface is effectively drained and protected from condensation or water that might enter the air gap from above. Therefore, significant corrosion of the drywell shell is not expected.

On the basis of its audit and review, the staff determined that corrosion is not significant for inaccessible areas of the VYNPS containment. In the LRA, the applicant stated that the reactor building concrete in contact with the drywell shell is designed in accordance with ACI 318-63, and meets the recommendations of guideline ACI 201.2R-77. Accessible concrete of the reactor building is monitored for penetrating cracks in accordance with the VYNPS Structures Monitoring Program. In addition, the applicant stated that the accessible portions of the steel drywell and moisture barrier where the drywell shell becomes embedded in the concrete floor are inspected in accordance with the Containment Inservice Inspection (IWE) Program and Structures Monitoring Program. During interviews with the applicant's technical personnel, the applicant's staff stated that operating experience has demonstrated that the aging effect of loss of material due to corrosion has not been significant for the VYNPS containment. The staff finds that no additional plant-specific AMP was required to manage inaccessible areas of the containment drywell shell and associated components.

In the last paragraph of the discussion column of LRA Table 3.5.1, Item 3.5.1-5, the applicant stated that:

> The drywell steel where the drywell shell is embedded is inspected in accordance with the Containment Inservice Inspection (IWE) Program and Structures Monitoring Program.

The staff noted that this is an impossible inspection. During the audit and review, the staff asked the applicant to explain if this statement should have agreed with LRA Section 3.5.2.2.1.4 that stated:

> The drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the Containment Inservice Inspection (IWE) Program and Structures Monitoring.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.1, Item 3.5.1-5, the discussion column last paragraph is revised to read:

> The drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the Containment Inservice Inspection (IWE) Program.

Also, LRA Section 3.5.2.2.1.4 is revised to delete from the end of the first paragraph, the phrase "and Structures Monitoring Program." The drywell to floor moisture barrier will be inspected in accordance with the Containment Inservice Inspection (IWE) Program only. The Structures Monitoring Program is not used.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

Based on the programs identified above, the staff concludes that the applicant's meet SRP-LR Section 3.5.2.2.1.4 criteria.

For those line items that apply to LRA Section 3.5.2.2.1.4, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature.

LRA Section 3.5.2.2.1.5 states that loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature is a TLAA as required by 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.5 documents the staff's review of the applicant's evaluation of this TLAA.

SRP-LR Section 3.5.2.2.1.5, stated that 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 TLAA as required by 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c).

The applicant stated, in the LRA, that for the loss of prestress due to relaxation, shrinkage, creep, and elevated temperature, this aging effect is not applicable to VYNPS. VYNPS is a Mark I containment structure and does not incorporate prestress concrete in its design. Therefore, loss of prestress due to relaxation, shrinkage, creep, and elevated temperature is not an applicable aging effect. The staff finds that because VYNPS is a BWR with a Mark I containment, the aging effect loss of prestress due to relaxation, shrinkage, creep, and elevated temperature is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Cumulative Fatigue Damage. LRA Section 3.5.2.2.1.6 states fatigue analyses of suppression pool steel shells (including welded joints) and penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) are TLAAs as required by 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.6 documents the staff's review of the applicant's evaluation of this TLAA.

In the discussion column of LRA Table 3.5.1, Item 3.5.1-9, the applicant stated: "Not applicable. See Section 3.5.2.2.1.6." However, during the audit and review, the staff noted the following statement was made in LRA Section 3.5.2.2.1.6:

> Fatigue TLAAs for the steel drywell, torus, and associated penetrations are evaluated and documented in Section 4.6.

The components associated with LRA Table 3.5.1, Item 3.5.1-9 are:

> penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers.

The applicant was asked to explain how LRA Table 3.5.1, Item 3.5.1-9 was not applicable when a fatigue TLAA has been performed for the torus and penetrations. Also the applicant was asked to explain why the vent line, vent header and vent line bellows are not listed in LRA Sections 3.5.2.2.1.6 and 4.6 as referenced in LRA Table 3.5.1, Item 3.5.1-8.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.2-1 is revised to add the following line:

> torus mechanical penetrations, PB, SSR carbon steel, protected from weather, cracking (fatigue), TLAA-metal fatigue, II.B4-4 (C-13), 3.5.1-9, note A.

The staff finds that the evaluation of the drywell to torus vent system fatigue analysis finds that it was not a TLAA. The significant contributor to fatigue of the vent system is post-LOCA chugging, a once in plant-life event. As there will still be only one design basis LOCA for the life of the plant, including the period of extended operation, this analysis is not based on a time-limited assumption and is not a TLAA.

Since fatigue for the vent system is event driven and is not an age related effect, in a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.2-1 is revised to delete the following line:

> Drywell to torus vent system, PB, SSR, carbon steel, protected from weather, cracking (fatigue), TLAA-metal fatigue, II.B1.1-4 (C-21), 3.5.1-8, A.

Also, the discussion column entry for LRA Table 3.5.1, Item 3.5.1-8 is revised to read as follows:

> Fatigue analysis is a TLAA for the torus shell. Fatigue of the torus to drywell vent system is event driven and the analysis is not a TLAA. See Section 3.5.2.2.1.6.

In addition the discussion column entry of LRA Table 3.5.1, Item 3.5.1-9 is revised to read as follows:

> Fatigue analysis is a TLAA for the torus penetrations. See Section 3.5.2.2.1.6.

Also, the discussion of LRA Section 3.5.2.2.1.6 is revised to read as follows:

> TLAA are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. Fatigue TLAAs for the torus and associated penetrations are evaluated and documented in Section 4.6.

LRA Section 3.5.2.3, Time-Limited Aging Analyses, is revised to read as follows:

> TLAA identified for structural components and commodities include fatigue analyses for the torus and torus penetrations. These topics are discussed in Section 4.6.

On the basis of its review, the staff finds that the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

Cracking Due to SCC. The staff reviewed LRA Section 3.5.2.2.1.7 against the criteria in SRP-LR Section 3.5.2.2.1.7.

In LRA Section 3.5.2.2.1.7, the applicant stated that for cracking due to SCC, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.5.2.2.1.7 states that cracking due to SCC of stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds may occur in all types of PWR and BWR containments. Cracking due to SCC also may occur in stainless steel vent line bellows for BWR containments. The existing program relies on the requirements of ASME Code, 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 sleeves, penetration bellows and dissimilar metal welds, and stainless steel vent line bellows.

The applicant stated, in the LRA, that for the cracking due to SCC, this aging effect is not applicable to VYNPS. The GALL Report recommends further evaluation of inspection methods to detect cracking due to SCC, since visual VT-3 examinations may be unable to detect this aging effect. Potentially susceptible components at VYNPS are penetration sleeves and bellows.

The applicant also stated that SCC becomes significant for stainless steel if tensile stresses and a corrosive environment exist. The stresses may be applied (external) or residual (internal). The normal environment inside the drywell is dry. The penetration components are not exposed to corrosive environments. Therefore, SCC is not an AERM for the penetration sleeves and bellows, since the conditions necessary for SCC do not exist.

On the basis of its review, the staff finds that cracking due to SCC for penetration sleeves and bellows is not applicable to VYNPS since the conditions necessary for SCC do not exist.

In LRA Table 3.5.1, Item 3.5.1-10, the applicant stated that cracking due to SCC for stainless steel penetration sleeves and penetration bellows is not applicable. Also, in LRA Table 3.5.1, Item 3.5.1-11, the applicant stated that cracking due to SCC for stainless steel vent line bellows is not applicable.

During the audit and review, the applicant was asked to explain if the VYNPS Containment Inservice Inspection Program and Containment Leak Rate Program are used currently to detect cracking of stainless steel penetration sleeves, penetration bellows and vent line bellows by inspection and testing. The applicant was also asked to explain why it is not more appropriate to take credit for these two programs to detect cracking without the need for additional enhanced examinations then to say not applicable.

The applicant staff stated that the GALL Report's referenced programs involve visual inspections and leak testing which are not optimum methods for managing SCC. Therefore, when possible, it is more appropriate to assess the conditions and identify whether the applicable aging effects require management. As stated in LRA Section 3.5.2.2.1.7, SCC is not an AERM for the penetration sleeves and bellows, since the conditions necessary for SCC do not exist. However, these components are evaluated for aging effects (such as cracking) requiring management as shown in LRA Table 3.5.2-1.

On the basis that VYNPS does not have the conditions necessary for this aging effect, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.1.7 criteria. For those line items that apply to LRA Section 3.5.2.2.1.7, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cracking Due to Cyclic Loading. The staff reviewed LRA Section 3.5.2.2.1.8 against the criteria in SRP-LR Section 3.5.2.2.1.8.

In LRA Section 3.5.2.2.1.8, the applicant addressed cracking of penetration sleeves, penetration bellows, and torus pool steel due to cyclic loading.

SRP-LR Section 3.5.2.2.1.8 states that cracking due to cyclic loading of suppression pool steel and stainless steel shells (including welded joints) and penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) may occur in all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers. The existing program relies on the requirements of ASME Code, Section XI, Subsection IWE and 10 CFR Part 50, Appendix J, to manage this aging effect; however, visual examination (VT-3) may not detect fine cracks. The GALL Report recommends further evaluation for detection of this aging effect.

The applicant stated, in the LRA, that cyclic loading can lead to cracking of penetration sleeves, penetration bellows, and torus pool steel. If a CLB analysis does not exist, further evaluation is recommended of inspection methods to detect cracking due to cyclic loading since visual VT-3 examinations may be unable to detect this aging effect.

The analysis of cracking due to cyclic loading of the drywell, torus, and associated penetrations is a TLAA which is evaluated as documented in LRA Section 4.6.

In the discussion column of LRA Table 3.5.1, Items 3.5.1-12 and 3.5.1-13, the applicant did not make reference to LRA Section 3.5.2.2.1.8 for further evaluation. During the audit and review, the applicant was asked to explain why this link was not made to the further evaluation section. Also the applicant was asked to explain the need for augmented ultrasonic exams to detect fine cracks since a CLB fatigue analysis does exist.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA is revised as follows:

(1) For clarification, the discussion column of VYNPS Table 3.5.1, Line Items 3.5.1-12 and 3.5.1-13 is revised to add the following statement at the end of the existing information. "See Section 3.5.2.2.1.8."

(2) LRA Section 3.5.2.2.1.8 is revised to read as follows:

> Cyclic loading can lead to cracking of steel and stainless steel penetration bellows, and dissimilar metal welds of BWR containments and BWR suppression pool shell and downcomers. Cracking due to cyclic loading is not expected to occur in the drywell, torus and associated penetration bellows, penetration sleeves, unbraced downcomers, and dissimilar metal welds. A review of plant operating experience did not identify cracking of the components, and primary containment leakage has not been identified as a concern. Nonetheless the existing Containment Leak Rate Program with augmented ultrasonic exams and Containment Inservice Inspection-IWE, will continue to be used to detect cracking. Observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process. The Containment Inservice Inspection-IWE and Containment Leak Rate programs are described in Appendix B.

Based on the programs identified above, staff concludes that the applicant's programs meet the SRP-LR Section 3.5.2.2.1.8 criteria.

For those line items that apply to LRA Section 3.5.2.2.1.8, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Loss of Material (Scaling, Cracking, and Spalling) Due to Freeze-Thaw</u>. The staff reviewed LRA Section 3.5.2.2.1.9 against the criteria in SRP-LR Section 3.5.2.2.1.9.

In LRA Section 3.5.2.2.1.9, the applicant stated that for the loss of material (scaling, cracking, and spalling) due to freeze-thaw, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.5.2.2.1.9 states that loss of material (scaling, cracking, and spalling) due to freeze-thaw may occur in PWR and BWR concrete containments. The existing program relies on ASME Code, Section XI, Subsection IWL to manage this aging effect. The GALL Report recommends further evaluation of this aging effect for plants located in moderate to severe weather conditions.

The applicant stated, in the LRA, that for the loss of material (scaling, cracking, and spalling) due to freeze-thaw, this aging effect is not applicable to VYNPS. VYNPS has a Mark I free standing steel containment located within the reactor building. Loss of material (scaling, cracking, and spalling) due to freeze-thaw is applicable only to concrete containments. Therefore, loss of material and cracking due to freeze-thaw do not apply. The staff finds that since VYNPS is a BWR with a Mark I containment, the aging effect loss of material (scaling, cracking, and spalling) due to freeze-thaw is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.1.9 criteria. For those line items that apply to LRA Section 3.5.2.2.1.9, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cracking Due to Expansion and Reaction with Aggregate and Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide. The staff reviewed LRA Section 3.5.2.2.1.10 against the criteria in SRP-LR Section 3.5.2.2.1.10.

In LRA Section 3.5.2.2.1.10, the applicant stated that for the cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.5.2.2.1.10 states that cracking due to expansion and reaction with aggregate and increase in porosity and permeability due to leaching of calcium hydroxide may occur in concrete elements of PWR and BWR concrete and steel containments. The existing program relies on ASME Code, Section XI, Subsection IWL to manage these aging effects. The GALL Report recommends further evaluation if concrete was not constructed in accordance with ACI 201.2R-77 recommendations.

The applicant stated, in the LRA, that for the cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide, this aging effect is not applicable to VYNPS. VYNPS has a Mark I free standing steel containment located within the reactor building. In accordance with the GALL Report, aging management is not required because VYNPS containment concrete (basemat) is designed in accordance with specification ACI 318-63, which requires that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM C-289 and C-295. The staff finds that since VYNPS is a BWR with a Mark I containment, the aging effect cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide is not applicable to VYNPS.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.1.10 criteria. For those line items that apply to LRA Section 3.5.2.2.1.10, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2 Safety-Related and Other SC Supports

The staff reviewed LRA Section 3.5.2.2.2 against SRP-LR Section 3.5.2.2.2 criteria, which address several areas:

<u>Aging of Structures Not Covered by Structures Monitoring Program</u>. The staff reviewed LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

In LRA Section 3.5.2.2.2.1, the applicant addresses the aging of structures not covered by the Structures Monitoring Program.

SRP-LR Section 3.5.2.2.2.1 states that the GALL Report recommends further evaluation of certain structure-aging effect combinations not covered by structures monitoring programs, including: (1) cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for Groups 1-5, 7, and 9 structures, (2) increase in porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attack for Groups 1-5, 7, and 9 structures, (3) loss of material due to corrosion for Groups 1-5, 7, and 8 structures, (4) loss of material (spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, and 7-9 structures, (5) cracking due to expansion and reaction with aggregates for Groups 1-5 and 7-9 structures, (6) cracks and distortion due to increased stress levels from settlement for Groups 1-3 and 5-9 structures, and (7) reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation for Groups 1-3 and 5-9 structures. The GALL Report recommends further evaluation only for structure-aging effect combinations not within structures monitoring programs. In addition, lock-up due to wear may occur in Lubrite radial beam seats in BWR drywells, RPV support shoes for PWR with nozzle supports, steam generator supports, and other sliding support bearings and sliding support surfaces. The existing program relies on structures monitoring or ASME Code, Section XI, Subsection IWF, to manage this aging effect. The GALL Report recommends further evaluation only for structure-aging effect combinations not within the ISI (IWF) or structures monitoring programs.

The staff finds that the applicant has included the eight SRP-LR Section 3.5.2.2.2.1 structure/aging effect combinations in its Structures Monitoring Program and no further evaluation is required as recommended by the GALL Report. However, although not required, the applicant has elected to provide further evaluation for each of the eight aging effects. The staff finds this additional evaluation acceptable.

The staff's review of the eight aging effects follows.

(1) Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling) Due to Corrosion of Embedded Steel for Groups 1-5, 7, 9 Structures

The staff reviewed item 1 in LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

The applicant stated in the LRA this aging effect is not applicable to VYNPS. The aging mechanisms associated with cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are applicable only to below-grade concrete/grout structures owing to the slightly acidic pH of groundwater. The below-grade environment for VYNPS is not aggressive and concrete is designed in accordance with specification ACI 318-63, "Building Code Requirements for Reinforced Concrete," which results in low permeability and resistance to aggressive chemical solutions by providing a high cement, low water/cement ratio (between 0.44 and 0.60), proper curing and adequate air content between 3 percent and 5 percent. Therefore, cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not aging effects requiring management for VYNPS Groups 1-5, 7, 9 structures.

The staff finds that the cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for Groups 1-5, 7, 9 structures are not plausible aging effects at VYNPS due to the lack of aggressive groundwater and the concrete being designed in accordance with ACI 318-63 with a high cement, low water/cement ratio and adequate air content between 3 and 5 percent. Since corrosion of the embedded steel could become significant if exposed to an aggressive environment, components in these groups are included in the Structures Monitoring Program.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.1 for further evaluation.

(2) Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling) Due to Aggressive Chemical Attack for Groups 1-5, 7, 9 Structures

The staff reviewed item 2 in LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

The applicant stated, in the LRA, that this aging effect is not applicable to VYNPS. Aggressive chemical attack becomes significant to concrete exposed to an aggressive environment. Resistance to mild acid attack is enhanced by using a dense concrete with low permeability and a low water-to-cement ratio of less than 0.50. These groups of structures at VYNPS use a dense, low permeable concrete with an average water-to-cement ratio of 0.48, which provides an acceptable degree of protection against aggressive chemical attack. Water chemical analysis results confirm that the site groundwater is considered to be non-aggressive. VYNPS concrete is constructed in accordance with the recommendations in ACI 201.2R-77 for durability. VYNPS below-grade environment is not aggressive. Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack are AERMs requiring management for VYNPS Groups 1-5, 7, 9 concrete structures.

The staff finds that the increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for Groups 1-5, 7, 9 structures are not plausible aging effects at VYNPS due to the lack of aggressive groundwater and the concrete being constructed in accordance with the recommendations in ACI 201.2R-77 for durability with a high cement, low water/cement ratio. Since aggressive chemical attack could become significant for concrete exposed to an aggressive environment, components in these groups are included in the Structures Monitoring Program.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.1 for further evaluation.

(3) Loss of Material Due to Corrosion for Groups 1-5, 7, 8 Structures

The staff reviewed item 3 in LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

The applicant stated, in the LRA, that this aging effect is applicable to VYNPS. The Structures Monitoring Program will be used to manage this AERM for VYNPS Groups 1-5, 7, 8 structures.

The staff finds that the loss of material due to corrosion for Groups 1-5, 7, 8 structures is an aging effect which will be managed by the applicant's Structures Monitoring Program.

The staff finds that, based on the program identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.1 for further evaluation.

(4) Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-Thaw for Groups 1-3, 5, 7-9 Structures

The staff reviewed item 4 in LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

The applicant stated, in the LRA, that this aging effect is not applicable to VYNPS. Aggregates were in accordance with specifications and materials conforming to ACI and ASTM standards. VYNPS structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits in accordance with ACI 318-63, and air entrainment percentages were within the range prescribed in the GALL Report. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not AERMs for VYNPS Groups 1-3, 5, 7-9 structures.

The staff finds that the loss of material (spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, 7-9 structures are not plausible aging effects at VYNPS due to concrete being constructed in accordance with ACI and ASTM standards with a high cement, low water/cement ratio. Since evaluation is needed for plants that are located in moderate to severe weathering conditions, components in these groups are included within the Structures Monitoring Program.

In the discussion column of LRA Table 3.5.1, Item 3.5.1-26, the applicant stated that freeze-thaw is not an applicable aging mechanism for these groups of structures at VYNPS. During the audit and review, the staff asked the applicant to provide documentation showing the weathering conditions (weathering index) for VYNPS and the specification requiring concrete to have an air content of 3 percent to 6 percent and water to cement ratio of 0.35 to 0.45.

During interviews with the applicant's technical personnel, the applicant's staff stated that VYNPS inaccessible and accessible concrete areas are designed in accordance with specification ACI 318-63.

The applicant states that VYNPS concrete also meets recommendations of later guide ACI 201.2R-77, since both documents use the same ASTM standards for selection, application and testing of concrete. VYNPS concrete was provided with air content between 3 percent and 5percent and a water/cement ration between 0.44 and 0.60, as documented in the Audit and Review Report. VYNPS is located in a severe weathering region (weathering index greater than100 day-inch/yr) as indicated in ASTM C33, FIG. 1. Although the water/cement ratio falls outside the listed range of 0.35 to 0.45, given all the parameters associated with a concrete mix design VYNPS concrete meets the quality requirements of ACI to ensure acceptable concrete is obtained. Nonetheless concrete be will managed in accordance with the AMP s identified in the LRA 3.5.2 -1 through 3.5.2-6. tables.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.1.

(5) Cracking Due to Expansion and Reaction with Aggregates for Groups 1-5, 7-9 Structures

The staff reviewed item 5 in LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

The applicant stated, in the LRA, that this aging effect is not applicable to VYNPS. Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction, which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. VYNPS structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits specified in ACI 318-63, and air entrainment percentages were within the range prescribed in the GALL Report. Therefore, cracking due to expansion and reaction with aggregates for Groups 1-3, 5, 7-9 structures is not an AERM for VYNPS concrete.

The staff finds through discussions with the applicant's technical personnel that cracking due to expansion and reaction with aggregates for Groups 1-5, 7-9 structures are not plausible aging effects at VYNPS due to concrete being constructed in accordance with ACI and ASTM standards with a high cement, low water/cement ratio. Since evaluation is needed for concrete not constructed in accordance with ACI 201.2R-77, components in this group are included within the Structures Monitoring Program.

During the audit and review, the staffed asked the applicant to provide documentation showing that inaccessible areas concrete was constructed in accordance with the recommendations in ACI 201.2R-77.

During interviews with the applicant's technical personnel, the applicant's staff stated that for construction of concrete, VYNPS site specification, as documented in the Audit and Review Report, identifies the same ASTM standards for achieving durable concrete as those specified in ACI 201.2R-77.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.1 for further evaluation.

(6) Cracks and Distortion Due to Increased Stress Levels from Settlement for Groups 1-3, 5-9 Structures

The staff reviewed item 6 in LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

The applicant stated, in the LRA, that this aging effect is not applicable to VYNPS. Class 1 structures at VYNPS are founded on sound bedrock or supported by steel pilings which prevent significant settlement. Therefore, cracks and distortion due to increased stress levels from settlement are not aging effects requiring management for VYNPS Groups 1-3, 5-9 structures.

The staff finds that the cracks and distortion due to increased stress levels from settlement for Groups 1-3, 5-9 structures not plausible aging effects due to the nonexistence of these aging mechanisms. The VYNPS Class 1 structures are founded on sound bedrock or supported by steel pilings which prevents significant settlement. The staff finds that these aging effects are not applicable to VYNPS Class 1 structures. Since evaluation to ensure proper functioning of a de-watering is needed if a de-watering system is relied upon to control settlement through the period of extended operation, components in this group are included within the Structures Monitoring Program.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(7) Reduction in Foundation Strength, Cracking, Differential Settlement Due to Erosion of Porous Concrete Subfoundation for Groups 1-3, 5-9 Structures

The staff reviewed item 7 in LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

The applicant stated, in the LRA, that this aging effect is not applicable to VYNPS. Structures at VYNPS are not constructed of porous concrete. Concrete was provided in accordance with ACI 318-63 requirements resulting in dense, well-cured, high-strength concrete with low-permeability. Therefore, reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring management for VYNPS Groups 1-3, 5-9 structures.

The staff finds through discussions with the applicant's technical personnel that the reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation for Groups 1-3, 5-9 structures are not plausible aging effects due to the nonexistence of these aging mechanisms. Since there are no porous concrete subfoundations of concern below these structures, the staff finds that these aging effects are not applicable to VYNPS Groups 1-3 and 5-9 structures.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

(8) Lock Up Due to Wear for Lubrite® Radial Beam Seats in BWR Drywell and Other Sliding Support Surfaces

The staff reviewed item 8 in LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

The applicant stated, in the LRA, that this aging effect is not applicable to VYNPS. Owing to the wear-resistant material used, the low frequency (number of times) of movement, and the slow movement between sliding surfaces, lock-up due to wear is not considered to be an AERM at VYNPS.

The staff finds through discussions with the applicant's technical personnel that the lock up due to wear for Lubrite® radial beam seats in BWR drywell and other sliding support surfaces are not plausible aging effects at VYNPS due to the wear-resistant material used, the low frequency (number of times) of movement, and the slow movement between sliding surfaces. Since the absence of this aging effects needs to be confirmed, components in this group are included within the Structures Monitoring Program and Inservice Inspection (IWF) Program.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.1.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.2.1 criteria. For those line items that apply to LRA Section 3.5.2.2.2.1, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Aging Management of Inaccessible Areas. The staff reviewed LRA Section 3.5.2.2.2.2 against the following SRP-LR Section 3.5.2.2.2.2 criteria:

(1) LRA Section 3.5.2.2.2.2 addresses the same accessible area discussion in SER Section 3.5.2.2.2.1 item 4 above for inaccessible areas.

SRP-LR Section 3.5.2.2.2.2 states that loss of material (spalling, scaling) and cracking due to freeze-thaw may 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 weather conditions.

The staff's evaluation remains the same as provided in SER Section 3.5.2.2.2.1 item 4 for inaccessible areas.

(2) LRA Section 3.5.2.2.2.2 addresses the same accessible area discussion in SER Section 3.5.2.2.2.1 item 5 above for inaccessible areas.

SRP-LR Section 3.5.2.2.2.2 states that cracking due to expansion and reaction with aggregates may 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 ACI 201.2R-77 recommendations.

The staff's evaluation remains the same as provided in SER Section 3.5.2.2.2.1 item 5 for inaccessible areas.

(3) LRA Section 3.5.2.2.2.2 addresses the same accessible area discussion in SER Section 3.5.2.2.2.1 item 7 above for Groups 1-3, 5 and 7-9 inaccessible areas.

SRP-LR Section 3.5.2.2.2.2 states that cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations may occur in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures. The existing program relies on structures monitoring to manage these aging effects. Some plants may rely on de-watering systems to lower site ground water level. If the plant's CLB credits a de-watering system, the GALL Report recommends verification of the system's continued functionality 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.

The staff's evaluation remains the same as provided in SER Section 3.5.2.2.2.1 item 7 for inaccessible areas.

(4) LRA Section 3.5.2.2.2.2 addresses the aging management of inaccessible areas, these aging effects are not applicable to VYNPS.

SRP-LR Section 3.5.2.2.2.2 states that increase in porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attack and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel may occur in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures. The GALL Report recommends further evaluation of plant-specific programs to manage these aging effects in inaccessible areas of these groups of structures in aggressive environments.

The staff's evaluation of the above aging effect is provided below.

(5) LRA Section 3.5.2.2.2.2 addresses the aging management of inaccessible areas, these aging effects are not applicable to VYNPS.

SRP-LR Section 3.5.2.2.2.2 states that increases in porosity and permeability and loss of strength due to leaching of calcium hydroxide may 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 concrete not constructed in accordance with ACI 201.2R-77 recommendations. LRA Section 3.5.2.2.2.2 addresses both items 4 and 5 in SRP-LR Section 3.5.2.2.2.2.

The applicant stated in the LRA, that VYNPS concrete for Group 1-3, 5 and 7-9 inaccessible concrete areas was provided in accordance with specification ACI 318-63, Building Code Requirements for Reinforced Concrete, which requires the following, resulting in low permeability and resistance to aggressive chemical solution.

- high cement content
- low water permeability
- proper curing
- adequate air entrainment

The applicant also stated that VYNPS concrete also meets recommendations of later ACI guide ACI 201.2R-77, since both documents use the same ASTM standards for selection, application and testing of concrete. Inspections of accessible concrete have not revealed degradation related to corrosion of embedded steel. VYNPS below-grade environment is not aggressive (pH greater than 5.5, chlorides less than 500 ppm, and sulfates less than 1,500 ppm). Therefore, corrosion of embedded steel is not an AERM for VYNPS concrete.

The staff finds through discussions with the applicant's technical personnel that the aging management of inaccessible areas due to aggressive chemical attack for Groups 1-5, 7 and 9 structures are not plausible aging effects at VYNPS due to the lack of aggressive groundwater and the concrete being constructed in accordance with the recommendations in ACI 201.2R-77 for durability with a high cement, low water/cement ratio. The applicant will perform opportunistic inspections of below-grade concrete in accordance with the Buried Piping Inspection Program and perform sampling monitoring of groundwater for aggressiveness in accordance with the Structures Monitoring Program.

Based on the programs identified above, the applicant has met the staff concludes that the applicant's programs meet criteria of SRP-LR Section 3.5.2.2.2.2 criteria.

For those line items that apply to LRA Section 3.5.2.2.2.2, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature. The staff reviewed LRA Section 3.5.2.2.2.3 against the criteria in SRP-LR Section 3.5.2.2.2.3.

In LRA Section 3.5.2.2.2.3, the applicant stated that for the reduction of strength and modulus of concrete structures due to elevated temperature, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.5.2.2.2.3 states that reduction of strength and modulus of concrete due to elevated temperatures may occur in PWR and BWR Groups 1-5 concrete structures. For concrete elements that exceed specified temperature limits, further evaluations are recommended. Appendix A to ACI 349-85 specifies the concrete temperature limits for normal operation or any other long-term period. Temperatures shall not exceed 150 °F except for local areas allowed to have temperatures not to exceed 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)).

The applicant stated, in the LRA, that for the reduction of strength and modulus of concrete structures due to elevated temperature, this aging effect is not applicable to VYNPS. Group 1-5 concrete elements do not exceed the temperature limits associated with aging degradation due to elevated temperature. Therefore, reduction of strength and modulus of concrete due to elevated temperatures is not an AERM for VYNPS.

The applicant also stated, during the audit and review, that the aging effects due to elevated temperature are not expected at VYNPS for the concrete associated with Group 1-5 structures since general areas temperatures within the primary containment do not exceed 150°F and local area temperatures do not exceed 200°F. The staff agrees with the applicant that these aging effects are not applicable to the VYNPS Group 1-5 structures concrete.

During the audit and review, the staff asked the applicant to provide the maximum temperatures that concrete experiences in Group 1 through 5 structures. The applicant’s staff stated that the VYNPS concrete is expected to experience average general area temperature of 150°F and local area maximum temperature less than 200°F. The drywell cooling system recirculates the drywell atmosphere through heat exchangers to maintain ambient temperature in the drywell between 135°F and 165°F (average 150°F). (Reference UFSAR Sections 5.2.3.2 and 10.12.3). The concrete around piping penetrations for high temperature lines, such as the steam lines and other reactor system lines is protected by piping insulation and air gaps.

The staff finds that the reduction of strength and modulus of concrete structures due to elevated temperatures are not plausible aging effects due to the nonexistence of these aging mechanisms. A plant-specific AMP will be evaluated if temperature limits are exceeded.

The staff finds that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.3.

For those line items that apply to LRA Section 3.5.2.2.2.3, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Aging Management of Inaccessible Areas for Group 6 Structures. The staff reviewed LRA Section 3.5.2.2.2.4 against the following SRP-LR Section 3.5.2.2.2.4 criteria:

(1) In LRA Section 3.5.2.2.2.4, the applicant stated that for the increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel in below-grade inaccessible concrete areas of Group 6 structures, this aging effect is not applicable to VYNPS.

    SRP-LR Section 3.5.2.2.2.4 states that increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack and cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel may occur in below-grade inaccessible concrete areas of Group 6 structures. The GALL Report recommends further evaluation of plant-specific programs to manage these aging effects in inaccessible areas in aggressive environments.

    The applicant stated, in the LRA, that for the increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel in below-grade inaccessible concrete areas of Group 6 structures, this aging effect is not applicable to VYNPS. Below-grade exterior reinforced concrete at VYNPS is not exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate). Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel are not aging effects requiring management for below-grade inaccessible concrete areas of VYNPS Group 6 structures.

    The staff finds that the increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel in below-grade inaccessible concrete areas of Group 6 structures are not plausible aging effects at VYNPS due to the lack of aggressive groundwater and the concrete being constructed in accordance with the recommendations in ACI 201.2R-77 for durability with a high cement, low water/cement ratio. The applicant will perform opportunistic inspections of below-grade concrete in accordance with the Buried Piping Inspection Program and perform sample monitoring of groundwater for aggressiveness in accordance with the Structures Monitoring Program.

    During the audit and review, the staff noted that in the discussion column of LRA Table 3.5.1, Item 3.5.1-34, the applicant did not make reference to LRA

Section 3.5.2.2.2.4, item 1 for further evaluation. The applicant was asked to explain why this link was not made to the further evaluation section. The applicant's staff stated that SRP-LR, Item 3.5.1-34 indicates that further evaluation is necessary only for aggressive environments. No reference was provided to further evaluation in LRA Section 3.5.2.2.2.4, item 1 since the VYNPS environment is not aggressive as noted in LRA Table 3.5.1, item 3.5.1-34, in accordance with the discussion column.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.1, Line Item 3.5.1-34 discussion column is revised to add "See Section 3.5.2.2.2.4 (1)."

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4 for further evaluation.

(2) In LRA Section 3.5.2.2.2.4, the applicant stated that for the loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Group 6 structures, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.5.2.2.2.4 states that loss of material (spalling, scaling) and cracking due to freeze-thaw may 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 weather conditions.

The applicant stated, in the LRA, that for the loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Group 6 structures, this aging effect is not applicable to VYNPS. Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction. VYNPS structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in the GALL Report. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not aging effects requiring management for VYNPS Group 6 structures below-grade.

The staff finds that the loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Group 6 structures are not plausible aging effects at VYNPS due to concrete being constructed in accordance with ACI and ASTM standards with a high cement, low water/cement ratio. Since evaluation is needed for plants that are located in moderate to severe weathering conditions, components in these groups are included within the Structures Monitoring Program.

During the audit and review, the staff noted that in the discussion column of LRA Table 3.5.1, Item 3.5.1-35, the applicant did not make reference to LRA Section 3.5.2.2.2.4 item 2 for further evaluation. The applicant was asked to explain why this link was not made to the further evaluation section. Also, the applicant was asked to provide a copy of ACI 301 as listed in accordance with the discussion column. The applicant's staff stated that due to an administrative error, the reference to ACI should have been ACI 318-63 and not ACI 301. The applicant stated that the LRA Table 3.5.1, Item 3.5.1-35 discussion column will be revised to refer to ACI 318-63. For clarification, a reference to (LRA Section 3.5.2.2.2.4.2) will also be added to the discussion column.

In a letter dated July 14, 2006, the applicant amended its LRA. The applicant stated that the LRA Table 3.5.1-35 discussion column is revised to replace ACI 301 with ACI 18-63 and add "See Section 3.5.2.2.2.4 (2)" at the end of the existing discussion column.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4.

(3) In LRA Section 3.5.2.2.2.4, the applicant stated that for cracking due to expansion and reaction with aggregates, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide in below-grade inaccessible concrete areas of Group 6 structures, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.5.2.2.2.4 states that cracking due to expansion and reaction with aggregates and increased porosity and permeability and loss of strength due to leaching of calcium hydroxide may occur in below-grade inaccessible reinforced concrete areas of Group 6 structures. The GALL Report recommends further evaluation of inaccessible areas for concrete not constructed in accordance within ACI 201.2R-77 recommendations.

The applicant stated, in the LRA, that for cracking due to expansion and reaction with aggregates, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide in below-grade inaccessible concrete areas of Group 6 structures, this aging effect is not applicable to VYNPS. Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction, which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. VYNPS structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in the GALL Report. VYNPS below-grade environment is not aggressive (pH greater than 5.5, chlorides less than 500 ppm, and sulfates less than 1,500 ppm). Therefore, cracking due to expansion and reaction with aggregates, increase in porosity and permeability due to leaching of calcium hydroxide in below grade inaccessible concrete areas of Group 6 structures is not an aging mechanism for VYNPS concrete.

The staff finds that cracking due to expansion and reaction with aggregates, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide in below-grade inaccessible concrete areas of Group 6 structures are not plausible aging effects at VYNPS due to concrete being constructed in accordance with ACI and ASTM standards with a high cement, low water/cement ratio and the below grade environment non-aggressive. Since evaluation is needed for concrete not constructed in accordance with ACI 201.2R-77, components in this group are included within the Structures

Monitoring Program.

During the audit and review, the staff noted that in the discussion column of LRA Table 3.5.1, Item 3.5.1-36, the applicant did not make reference to LRA Section 3.5.2.2.2.4 item 3 for further evaluation. The applicant was asked to explain why this link is not made to the further evaluation section. Also, the statement: “See Section 3.5.2.2.2.1.5 for additional discussion” needs further clarification that this section is for Groups 1-5, 7-9, however it would apply to accessible Group 6 concrete. Further the applicant was asked to explain why LRA Section 3.5.2.2.2.4 item 3 lists cracking of concrete due to SCC.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA Table 3.5.1, Item 3.5.1-36, discussion column is revised to read as follows:

Reaction with aggregates is not an applicable aging mechanism for VYNPS concrete components. See Section 3.5.2.2.2.1(5) (although for Groups 1-5, 7, 9 this discussion is also applicable for Group 6). See Section 3.5.2.2.2.4(3) additional discussion. Nonetheless, the Structures Monitoring Program will confirm the absence of aging effects requiring management for VYNPS Group 6 concrete components.

Also, to correct an administrative error, the heading of LRA Section 3.5.2.2.2.4(3) is revised to begin with “Cracking Due to Expansion and Reaction with Aggregates.” The term stress corrosion cracking is deleted from the heading as it does not apply to this section.

During the audit and review, the staff noted that in the discussion column of LRA Table 3.5.1, Item 3.5.1-37, the applicant stated not applicable and makes reference to Section 3.5.2.2.2.4 item 3. Section 3.5.2.2.2.4 item 3. This item discusses inaccessible areas only. The staff asked the applicant to explain why the discussion column for LRA Table 3.5.1, Item 3.5.1-37 did not state: “Nonetheless, the Structures Monitoring Program will confirm the absence of aging effects requiring management for VYNPS Group 6 concrete components.” This would apply to above grade concrete, like in LRA Table 3.5.1, Item 3.5.1-36 for accessible concrete.

In a letter dated July 14, 2006, the applicant its amended the LRA. The applicant stated that the LRA Table 3.5.1, Item 3.5.1-37, discussion column is revised to state the following:

> “Not applicable. Nonetheless the Structures Monitoring Program will confirm the absence of aging effects requiring management for VYNPS Group 6 concrete components. See Section 3.5.2.2.2.4(3).”

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.5.2.2.2.4.criteria.

For those line items that apply to LRA Section 3.5.2.2.2.4, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cracking Due to Stress Corrosion Cracking and Loss of Material Due to Pitting and Crevice Corrosion. The staff reviewed LRA Section 3.5.2.2.2.5 against the criteria in SRP-LR Section 3.5.2.2.2.5.

In LRA Section 3.5.2.2.2.5, the applicant stated that for the cracking due to SCC and loss of material due to pitting and crevice corrosion, this aging effect is not applicable to VYNPS. No tanks with stainless steel liners are included in the structural AMRs. Tanks subject to an AMR are evaluated with their respective mechanical systems.

SRP-LR Section 3.5.2.2.2.5 states that cracking due to SCC and loss of material due to pitting and crevice corrosion may occur in Groups 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 staff finds that the cracking due to SCC and loss of material due to pitting and crevice corrosion are not aging effects requiring management at VYNPS since there are no tanks with stainless steel liners included in the structural AMRs. Tanks subject to an AMR are evaluated with their respective mechanical systems.

On the basis that VYNPS does not have any components from this group, the staff finds that this aging effect is not applicable to VYNPS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.2.5 criteria. For those line items that apply to LRA Section 3.5.2.2.2.5, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Aging of Supports Not Covered by the Structures Monitoring Program. The staff reviewed LRA Section 3.5.2.2.2.6 against the criteria in SRP-LR Section 3.5.2.2.2.6.

In LRA Section 3.5.2.2.2.6, the applicant addressed aging of supports not covered by the Structures Monitoring Program.

SRP-LR Section 3.5.2.2.2.6 states that the GALL Report recommends further evaluation of certain component support-aging effect combinations not covered by structures monitoring programs, including: (1) loss of material due to general and pitting corrosion for Groups B2-B5 supports, (2) reduction in concrete anchor capacity due to degradation of the surrounding concrete for Groups B1-B5 supports, and (3) reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports. Further evaluation is necessary only for structure-aging effect combinations not covered by the applicant's structures monitoring program.

The applicant stated, in the LRA, that the GALL Report recommends further evaluation of certain component support/aging effect combinations if they are not covered by the applicant's Structure Monitoring Program. Components supports at VYNPS are included in the Structures Monitoring Program for Groups B2 through B5 and Inservice Inspection (IWF) Program for Group B1.

(1) Reduction in concrete anchor capacity due to degradation of the surrounding concrete for Groups B1 through B5 supports

    VYNPS concrete anchors and surrounding concrete are included in the Structures Monitoring Program (Groups B2 through B5) and Inservice Inspection (IWF) Program (Group B1).

(2) Loss of material due to general and pitting corrosion, for Groups B2-B5 supports

    Loss of material due to corrosion of steel support components is an AERM at VYNPS. This aging effect is managed by the Structures Monitoring Program.

(3) Reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports

    The VYNPS AMR did not identify any component support structure/aging effect combination corresponding to the GALL Report, Volume 2, Item III.B4-12.

The staff finds that the applicant has included the above aging effect/mechanism combinations within the scope of its Structures Monitoring Program or Inservice Inspection (IWF) Program and agreed that no further evaluation is required. The staff finds that reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports is not an AERM at VYNPS since there are no vibration isolation components within the scope of license renewal. The staff reviewed the applicant's Structures Monitoring Program and Inservice Inspection (IWF) Program and its evaluations are documented in SER Sections 3.0.3.2.17 and 3.0.3.3.3, respectively. The staff finds the applicant's Structures Monitoring Program and Inservice Inspection (IWF) Program acceptable for managing the above aging effect/mechanism combinations of component supports for the GALL Report component support Groups B1 through B5, as those combinations are applicable.

During the audit and review, the staff noted that in the discussion column of LRA Table 3.5.1, Item 3.5.1-40, the applicant stated:

> Plant experience has not identified reduction in concrete anchor capacity or other concrete aging mechanisms. Nonetheless, the Structures Monitoring Program will confirm absence of aging effects requiring management for VYNPS concrete components.

The staff was not able to find an AMR line item in Table 2 for this component (Building concrete at locations of expansion and grouted anchors; grout pads for support base plates). During the audit and review, the applicant was asked to provide the Table 2 number, LRA page number, and component for where this AMR line item is evaluated and shown. The applicant stated that building concrete at locations of expansion and grouted anchors; grout pads for support base plates are shown as “foundation” and “Reactor vessel support pedestal” in LRA Table 3.5.2-1 (page 3.5-54), “foundation” in LRA Tables 3.5.2-2 through 3.5.2-5 (pages 3.5-58, 3.5-60, 3.5-62, and 3.5-66), and as “Equipment pads/foundations” in LRA Table 3.5.2-6 (page 3.5-78). Further evaluation is provided in LRA Section 3.5.2.2.2.6.1 (page 3.5-14).

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that the LRA Table 3.5.1, Item 3.5.1-40 discussion column is revised to add “See Section 3.5.2.2.2.6(1).”

During the audit and review, the staff noted that in the discussion column of LRA Table 3.5.1, Item 3.5.1-41, the applicant stated:

> No vibration isolation elements at VYNPS are in-scope and subject to an AMR.

During the audit and review, the applicant was asked to explain the lack of vibration isolation elements for HVAC system components, the EDG and miscellaneous mechanical equipment. The applicant’s staff stated that LRA Table 3.5.1 relates only to structures and structural supports. Thus, the statement that no vibration isolation elements are in-scope and subject to an AMR applies only to structural vibration isolation elements. Vibration isolation elements for mechanical system components are subject to an AMR. For example, LRA Table 3.3.2-4 contains expansion joint in the EDG system and LRA Table 3.3.2-10 contains duct flexible connections and expansion joints in heating, ventilation, and air conditioning systems.

The staff reviewed the applicant response and asked a followup question. The applicant was asked to verify that there are no non-metalic (rubber) vibration isolation elements used to structurally support the EDG, HVAC system equipment, and miscellaneous mechanical equipment and that all vibration isolation to systems attached to these components is by expansion joints and flexible connections. The applicant’s staff stated that as stated in LRA Table 3.5.1, Item 3.5.1-41, there are no non-metallic (rubber) vibration isolation elements used to structurally support the EDG, HVAC system equipment, and miscellaneous mechanical equipment that is within the scope of license renewal. Vibration isolation to systems attached to these components is by expansion joints and flexible connections.

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.5.2.2.2.6. criteria.

For those line items that apply to LRA Section 3.5.2.2.2.6, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Cumulative Fatigue Damage Due to Cyclic Loading</u>. LRA Section 3.5.2.2.2.7 states that 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. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3 documents the staff’s review of the applicant’s evaluation of this TLAA.

The applicant stated, in LRA Section 3.5.2.2.2.7, that for component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3, this aging effect is not applicable to VYNPS. During the process of identifying TLAAs in the VYNPS CLB , no fatigue analyses were identified for these components.

The staff finds that there are no CLB fatigue analyses for component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 and therefore cumulative fatigue damage can not be evaluated as an aging effect for these components.

On the basis that VYNPS does not have any components from this group with fatigue analyses, the staff finds that this aging effect is not applicable to VYNPS.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff finds that the applicant adequately addressed the issues that were further evaluated. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.5.2-1 through 3.5.2-6, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.5.2.3.1 Primary Containment Summary of Aging Management Evaluation-LRA Table 3.5.2-1

The staff reviewed LRA Table 3.5.2-1, which summarizes the results of AMR evaluations for the primary containment component groups.

The staff finds that all AMR evaluation results in LRA Table 3.5.2-1 are consistent with the GALL Report, or if not consistent, previously discussed in SER Sections 3.5.2.1 or 3.5.2.2, respectively.

The staff's review of the applicant's AMR evaluations identified areas in which additional information was necessary to complete the review. The staff identified ten RAIs (3.5-1 through 3.5-10), which were sent them to the applicant. During a teleconference, the applicant indicated that five of the (RAIs 3.5-1, 3.5-3, 3.5-4, 3.5-8, and 3.5-10) had been resolved with the NRC audit team and evidence of their resolutions was provided. The applicant responded to RAIs 3.5-2, 3.5-5, 3.5-6, 3.5-7, and 3.5-9 as discussed below.

In RAI 3.5-2 dated September 28, 2006, the staff stated that LRA Table 3.5.2-1 does not list downcomers as a component; however, downcomers are listed in LRA Table 3.5.1 tem 3.5.1-13. The staff requested that the applicant explain why there is neither an AMP nor an AMR provided for downcomers in LRA Table 3.5.2-1."

In its response dated October 31, 2006, the applicant stated that "downcomers are included in LRA Table 3.5.2-1, line item for the "Drywell to torus vent system," with the Containment Inservice Inspection Program and the Containment Leak Rate Program."

Based on its review, the staff finds the applicant's response to RAI 3.5-2 acceptable because the applicant provided proper AMPs for downcomers. The staff's concern described in RAI 3.5-2 is resolved.

RAI 3.5-5 dated September 16, 2006, the staff stated that LRA Section B.1.15 for Inservice Inspection Program, states that "for containment inservice inspection, including applicable relief requests, general visual and detailed visual examinations are used in addition to visual testing examinations, in accordance with10 CFR 50.55a." The staff requested that the applicant describe the difference between the general visual, detailed visual, and visual testing examinations. The staff also requested that the applicant state the relief requests referenced in LRA Section B.1.15.

In its response dated October 31, 2006, the applicant stated the following:

> General visual examinations are performed either directly or remotely with sufficient illumination and resolution to assess the general condition of the accessible containment surfaces (inside and outside).
>
> Detailed visual examinations are VT-1 visual examinations.
>
> VT-1 visual examinations are conducted with sufficient illumination and access to the containment surface to detect discontinuities and imperfections including such conditions as cracks, wear, corrosion, erosion, or physical damage. As specified

> in 10 CFR 50.55a, dated September 26, 2002, VT-1 examinations will be conducted in lieu of "detailed visual" examinations of ASME Code Section XI, IWE-2310(c) for Examination Category E-C Item E4.11 (augmented examinations).

VT-3 visual examinations are conducted to determine the general mechanical and structural condition of components and their supports, such as verification of clearances, settings, physical displacements, loosed or missing parts, debris, corrosion, wear, erosion, or the loss of integrity at bolted or welded connections. As specified in 10 CFR 50.55a, dated September 26, 2002, VT-3 inspections are conducted in lieu of the "general visual" examinations of ASME Code Section XI, IWE-2310 (b) for Examination Category E-A Items E1.12 (torus below water level) and E1.20 (vent system) and the bolting of Item E1.11 (drywell and torus above water level).

Presently, no relief requests have been implemented for the VYNPS CII Program. Since ASME code relief requests have their own process under 10 CFR 50.55a, reference to relief requests in the LRA is unnecessary. References to relief requests are hereby deleted from LRA Section B.1.15.

Based on its review, the staff finds the applicant’s response to RAI 3.5-5 acceptable because the applicant provided clarifications on the general visual, detailed visual, and visual testing examinations, and stated that relief requests were deleted from LRA Section B.1.15. The staff’s concern described in RAI 3.5-5 is resolved.

In RAI 3.5-6 dated September 28, 2006, the staff stated that the Inservice Inspection Program and the Containment Inservice Inspection Program both state that, "The program includes augmented ultrasonic exams to measure wall thickness of the containment structure." The staff requested that the applicant explain the difference between the augmented portion of the ultrasonic exams performed in these two programs mentioned and that of the ASME Code Section XI, “Inservice Inspection Program.”

In its response dated October 31, 2006, the applicant stated:

> ASME Code, Section XI, IWE-1240 "Surface Areas Requiring Augmented Examination"' establishes criteria for determining the need for augmented examinations. This sentence was included in the description of the Inservice Inspection-Containment Inservice Inspection Program in LRA Sections A.2.1.16 and B.1.15.2 to indicate that the option for augmented examination exists if necessary. There is no difference between the augmented portion of the ultrasonic exams performed in the VYNPS Containment Inservice Inspection Program mentioned and that of the ASME Code, Section XI, “Inservice Inspection Program.” As of May 2006, no surface areas have been determined subject to the requirements of Paragraph IWE-1240. This determination was also provided in letter number BVY 06-043, dated May 15, 2006, from Entergy to USNRC, "Vermont Yankee Nuclear Power Station, License No. DPR-28, License Renewal Application.”

Based on its review, the staff finds the applicant's response to RAI 3.5-6 acceptable because the applicant clarified that its augmented portion of the ultrasonic exams is identical to that of the ASME Code Section XI, "Inservice Inspection Program." The staff's concern described in RAI 3.5-6 is resolved.

In RAI 3.5-7 dated September 28, 2006, the staff stated that LRA Section 3.5.2.2.1.1 states that the below-grade environment is not aggressive. The staff requested that the applicant provide actual values of pH, chlorides, and sulfates in the groundwater/soil adjacent to structures in order to verify the claim of a nonaggressive below-grade environment.

In its response dated December 4, 2006, the applicant revised its response to RAI 3.5-7 dated October 31, 2006. The applicant stated that the December 4, 2006, response supersedes the October 31, 2006 response. In the revised response, the applicant provided sample data from April 2002 through April 2006 in the tables below.

Table 3.5-2 Groundwater and Soil Sample Data from April 2002 Through April 2006

	April 2002		October 2002		April 2003		October 2003	
Parameter	Well 3301	Well 3401	Well 3301	Well 3401	Well 3301	Well 3401	Well 3301	Well 3401
pH	6.4	6.0	6.6	6.0	6.7	6.0	6.8	6.8
chloride (ppm)	237	54.30	237	57.30	225	70.30	260	111

	April 2004		October 2004		April 2005		April 2005	
Parameter	Well 3301	Well 3401	Well 3301	Well 3401	Well 3301	Well 3401	Well 3301	Well 3401
pH	6.4	6.0	6.7	6.9	7.1	7.5	6.6	7.3
chloride (ppm)	399	118	410	78.1	325	92.2	388	103

	April 2006	
Parameter	Well 3301	Well 3401
pH	6.2	6.6
chloride (ppm)	322	145

The applicant stated that the sulfate values are not available because the station's indirect discharge permit does not require measurement of sulfate levels. The applicant further stated that its commitment (Commitment # 33) ensures that groundwater samples will continue to be evaluated on a periodic basis to assess the aggressiveness of groundwater on concrete. The applicant also revised Commitment No. 33 as follows:

> Included within the Structures Monitoring Program are provisions that will ensure an engineering evaluation is made on a periodic basis (at least once every five years) of groundwater samples to assess aggressiveness of groundwater to concrete. Samples will be evaluated for sulfate, pH and chloride levels.

Finally, in its response, the applicant stated that the Vermont Agency of Natural Resources has attributed the difference in chloride levels between Well 3301 and Well 3401 to road salt influence given the close proximity of Well 3301 to a roadway within the plant boundaries.

Based on its review, the staff finds the applicant's response to RAI 3.5-7 acceptable because the measured chloride values at the site are less than 500 ppm, as specified in the GALL Report, and the pH values are greater than 5.5 as required in the GALL Report. The applicant also stated the reason for not having the sulfate value, and made commitment (Commitment # 33) to measure the sulfate value in the future. With this commitment, the staff's concern described in RAI 3.5-7 is resolved.

In RAI 3.5-9 dated September 28, 2006, the staff requested the applicant is to confirm whether the aggregates used for the concrete basemat supporting the steel containment have been tested for reactivity in accordance with ASTM C-289 and C-295.

In its response dated October 31, 2006, the applicant stated that "aggregates used for the concrete foundation that support the steel containment (drywell) have been tested for reactivity in accordance with ASTM C-289 and C-295.

Based on its review, the staff finds the applicant's response to RAI 3.5-9 acceptable because aggregates were tested for reactivity. The staff's concern described in RAI 3.5-9 is resolved.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.2 Reactor Building Summary of Aging Management Evaluation-LRA Table 3.5.2-2

The staff reviewed LRA Table 3.5.2-2, which summarizes the results of AMR evaluations for the reactor building component groups.

In LRA Table 3.5.2-2, the applicant proposed to manage loss of material of stainless materials for component types of spent fuel pool storage racks exposed to a fluid environment using the "Water Chemistry Control-BWR."

During the audit and review, the staff noted that in LRA Table 3.5.2-2, for component spent fuel pool storage racks, material stainless steel in an exposed to fluid environment; the aging effect is loss of material. The applicant was asked to explain by what aging mechanism loss of material occurs and why the aging effect is not cracking. The applicant stated that as shown in LRA Table 3.5.2-2, the aging effect for component spent fuel pool storage racks is loss of material. The specific aging mechanism is pitting and crevice corrosion because stainless steels are susceptible to this aging mechanism when exposed to oxygenated water in a treated water environment. Cracking is not an AERM for stainless steel in the spent fuel pool because cracking due to stress corrosion is dependent on temperature (greater than140°F). The spent fuel pool treated water environment is less than 140°F.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and its evaluation is documented in SER Section 3.0.3.1.11. The objective of the program is to manage aging effects caused by corrosion and cracking mechanisms. The program relies on monitoring and control of water chemistry based on BWRVIP-130. EPRI guidelines in BWRVIP-130 include recommendations for controlling water chemistry in the spent fuel pool. The staff accepted the position that loss of material exhibited by the stainless steel spent fuel pool storage racks exposed to a fluid environment is properly managed by the Water Chemistry Control-BWR Program, which through the addition of chemicals will reduce the amount of dissolved oxygen in the spent fuel pool treated water and reduce pitting and crevice corrosion of stainless steel.

On the basis of its review, the staff finds the aging effect of loss of material of stainless steel material exposed to a fluid environment is adequately managed using the Water Chemistry Control-BWR Program. On this basis, the staff finds that management of loss of material of stainless steel spent fuel pool storage racks in the reactor building acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.3 Intake Structure Summary of Aging Management Evaluation-LRA Table 3.5.2-3

The staff reviewed LRA Table 3.5.2-3, which summarizes the results of AMR evaluations for the intake structure component groups.

The staff finds all AMR evaluation results in LRA Table 3.5.2-3 are consistent with the GALL Report, or if not consistent, previously discussed in SER Sections 3.5.2.1 or 3.5.2.2, respectively.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.4 Process Facilities Summary of Aging Management Evaluation-LRA Table 3.5.2-4

The staff reviewed LRA Table 3.5.2-4, which summarizes the results of AMR evaluations for the process facilities component groups.

In LRA Table 3.5.2-4, the applicant proposed to manage loss of material, cracking and change in material properties of wood materials for component types cooling cell no. 2-1, cooling cell no. 2-2 and pipe supports exposed to a fluid or weather environment using the Structures Monitoring Program.

The staff reviewed the applicant's Structures Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.17. The applicant's Structures Monitoring Program is in accordance with 10 CFR 50.65 (Maintenance Rule) and based on RG 1.160 and NUMARC 93-01. These two documents provided the guidance for development of the Structures Monitoring Program to monitor the condition of structures and structural components within the scope of the Maintenance Rule, such that there is no loss of structure or structural component intended function. The staff finds that loss of material, cracking, and change in material properties exhibited by the wood for cooling cell no. 2-1, cooling cell no. 2-2 and pipe supports exposed to a fluid or weather environment are properly managed by the Structures Monitoring Program, which through an enhancement to program element Detection of Aging Effects will provide guidance for performing structural examinations of wood to identify loss of material, cracking, and change in material properties.

On the basis of its review, the staff finds the aging effects of loss of material, cracking and change in material properties of wood material exposed to a fluid or weather environment are adequately managed using the Structures Monitoring Program. On this basis, the staff finds that management of loss of material, cracking and change in material properties of wood for cooling cell no. 2-1, cooling cell no. 2-2 and pipe supports in Process Facilities acceptable.

In addition, in LRA Table 3.5.2-4, the applicant proposed to manage cracking and change in material properties of PVC materials for component types cooling tower fill exposed to a fluid environment using the Structures Monitoring Program.

The staff reviewed the applicant's Structures Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.17. The Structures Monitoring Program is in accordance with 10 CFR 50.65 (Maintenance Rule) and based on RG 1.160 and NUMARC 93-01. These two documents provided the guidance for development of the Structures Monitoring Program to monitor the condition of structures and structural components within the scope of the Maintenance Rule, such that there is no loss of structure or structural component intended function. The staff finds that cracking and change in material properties exhibited by the PVC for cooling tower fill exposed to a fluid environment are properly managed by the Structures Monitoring Program, which through an enhancement to program element Detection of Aging Effects will provide guidance for performing structural examinations of PVC cooling tower fill to identify cracking and change in material properties. On the basis of its review, the staff finds the aging effect of cracking and change in material properties of PVC material exposed to a fluid environment are adequately managed using the Structures Monitoring Program. On this basis, the staff finds that management of cracking and change in material properties of PVC for cooling tower fill in process facilities acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.5 Yard Structures Summary of Aging Management Evaluation-LRA Table 3.5.2-5

The staff reviewed LRA Table 3.5.2-5, which summarizes the results of AMR evaluations for the yard structures component groups.

The staff finds all AMR evaluation results in LRA Table 3.5.2-5 are consistent with the GALL Report, or if not consistent, previously discussed in SER Sections 3.5.2.1 or 3.5.2.2, respectively.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.6 Bulk Commodities Summary of Aging Management Evaluation – LRA Table 3.5.2-6

The staff reviewed LRA Table 3.5.2-6, which summarizes the results of AMR evaluations for the bulk commodities component groups.

In LRA Table 3.5.2-6, the applicant proposed to manage cracking and delamination separation of cera blanket materials for component types of fire stops exposed to a protected from weather environment using “Fire Protection.”

The staff reviewed the Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The applicant’s Fire Protection Program includes fire barrier inspection and diesel-driven fire pump inspection. The fire barrier inspection requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire rated doors to ensure that their operability is maintained. The diesel-driven fire pump inspection requires that the pump be periodically tested to ensure that the fuel supply line can perform its intended function. The staff finds that cracking and delamination separation exhibited by cera blanket materials for fire stops exposed to a protected from weather environment is properly managed by the Fire Protection Program, which in accordance with program element Detection of Aging Effects will perform examinations of cera blanket fire stops to identify cracking and delamination separation. On the basis of its review, the staff finds the aging effects of cracking and delamination separation of cera blanket material exposed to a protected from weather environment are effectively managed using the Fire Protection Program. On this basis, the staff finds that management of cracking and delamination separation of cera blanket fire stops in bulk commodities is acceptable.

In addition, in LRA Table 3.5.2-6, the applicant proposed to manage loss of material of cerafiber and cera blanket materials for component types of fire wrap exposed to a protected from weather environment using “Fire Protection.”

The staff reviewed the applicant’s Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The Fire Protection Program includes fire barrier inspection and diesel-driven fire pump inspection. The fire barrier inspection requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire rated doors to ensure that their operability is maintained. The diesel-driven fire pump inspection requires that the pump be periodically tested to ensure that the fuel supply line can perform its intended function. The staff finds that loss of material exhibited by cerafiber and cera blanket materials for fire wraps exposed to a protected from weather environment is properly managed by the Fire Protection Program, which in accordance with program element Detection of Aging Effects will perform examinations of cerafiber and cera blanket fire wraps to identify loss of material. On the basis of its review, the staff finds the aging effects of loss of material of cerafiber and cera blanket material exposed to a protected from weather environment are effectively managed using the Fire Protection Program. On this basis, the staff finds that management of loss of material of cerafiber and cera blanket fire wraps in bulk commodities is acceptable.

In LRA Table 3.5.2-6, the applicant proposed to manage cracking and change in material properties for component types seals and gaskets (doors, manways and hatches) of Class I structures other than Group 6 [Note: The actual components are the reactor building railroad inner and outer lock doors elastomer seals] exposed to a protected from weather environment using "Periodic Surveillance and Preventive Maintenance."

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.5. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1 that includes periodic inspections and tests that manage aging effects not managed by other AMPs. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. The staff finds that cracking and change in material properties of seals and gaskets (actual components are the reactor building railroad inner and outer lock doors elastomer seals) exposed to a protected from weather environment is properly managed by the Periodic Surveillance and Preventive Maintenance Program, which in accordance with program element Detection of Aging Effects will perform leakage tests on the reactor building railroad inner and outer doors to verify the absence of significant cracking and change in material properties for the rubber seals. Inspection and testing intervals are dependent on component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations. Each inspection or test occurs at least once every ten years.

On this basis, the staff finds that management of cracking and change in material properties of seals and gaskets (doors, manways and hatches) of Class I structures other than Group 6 in bulk commodities is adequately managed using the Periodic Surveillance and Preventive Maintenance Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.7 Aging Effect/Mechanism in LRA Table 3.5.1 That are Not Applicable for VYNPS

The staff reviewed LRA Table 3.5.1, which provides a summary of aging management evaluations for the structures and component supports evaluated in the GALL Report.

In the LRA Table 3.5.1, Item 3.5.1-19, the applicant stated that cracking of steel elements: stainless steel suppression chamber shell (inner surface) due to SCC is not applicable at VYNPS. The VYNPS suppression chamber is carbon steel.

On the basis that there is no stainless steel suppression chamber shell in the structures and component supports at VYNPS, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.5.1, Item 3.5.1-20, the applicant stated that loss of material of steel elements: suppression chamber liner (interior surface) due to general, pitting, and crevice corrosion is not applicable at VYNPS. The applicant further stated that the GALL Report referencing this item are associated with concrete containment. The VYNPS containment is a Mark I steel containment.

The staff finds that LRA Table 3.5.1, Item 3.5.1-20 is applicable only to concrete containments. On the basis that there is no suppression chamber liner in the structures and component supports at VYNPS, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.5.1, Item 3.5.1-22, the applicant stated that the loss of material of prestressed containment: tendons and anchorage components due to corrosion is not applicable at VYNPS. The applicant further stated that the VYNPS containment is a Mark I steel containment without prestressed tendons.

The staff finds that LRA Table 3.5.1, Item 3.5.1-22 is applicable only to concrete containments. On the basis that there are no tendons and anchorage components in the structures and component supports at VYNPS, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.5.1, Item 3.5.1-48, the applicant stated that the loss of material and loss of form of Group 6: earthen water control structures-dams, embankments, reservoirs, channels, canals, and ponds due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, and seepage is not applicable at VYNPS. The applicant further stated that VYNPS does not have any earthen water control structures.

On the basis that there are no earthen water control structures-dams, embankments, reservoirs, channels, canals, and ponds in the structures and component supports at VYNPS, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.5.1, Item 3.5.1-51, the applicant stated that cracking and loss of material of Group B1.1: high strength low-alloy bolts due to stress corrosion and general corrosion is not applicable at VYNPS. SCC of high strength anchor bolts is not an AERM at VYNPS for two reasons: (1) high strength bolting at VYNPS is not exposed to a corrosive environment or high tensile stresses and (2) high strength structural bolts are installed with friction-type contact surfaces via the turn-of-the-nut method; therefore, for bolts greater than 1" in diameter, a significant preload (in the order of 70percent of ultimate strength) is not practical to develop. The Inservice Inspection (IWF) Program manages loss of material for high strength low-alloy bolts.

The staff finds that cracking of high strength low-alloy bolts due to stress corrosion can occur for Group B1.1 components. In its letter, dated January 4, 2006, the applicant clarified its Bolting Integrity Program to address all bolts. The staff finds managing aging of bolts with the Bolting Integrity Program, in addition to the Inservice Inspection Program, acceptable because it is consistent with the GALL Report.

In LRA Table 3.5.1, Item 3.5.1-52, the applicant addressed loss of mechanical function of Groups B2, and B4: sliding support bearing and sliding support surfaces due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads. The applicant stated that loss of mechanical function due to the listed mechanisms is not an aging effect. Proper design prevents distortion, overload, and fatigue due to vibratory and cyclic thermal loads.

During the audit and review, the staff asked the applicant to:

Explain how loss of mechanical function due to corrosion is not an aging effect which needs to be managed for the period of extended operation.

- If proper design prevents distortion, overload, and fatigue due to vibratory and cyclic thermal loads, explain if there has never been a component failure at VYNPS due to any of these conditions.

- Explain if there has never been a component failure in the nuclear industry due to any of these conditions.

- Explain where sliding support bearing and sliding support surfaces are used in component groups B2 and B4 at VYNPS and provide the environment they are exposed to.

During interviews with the applicant’s technical personnel, the applicant stated that loss of material due to corrosion is an aging effect that can cause a loss of intended function. Loss of mechanical function would be considered a loss of intended function. Loss of mechanical function is not an aging effect, but is the result of aging effects. There have been component failures in the industry due to distortion, overload, and excessive vibration. Such failures typically result from inadequate design or events rather than the effects of aging. Failures due to cyclic thermal loads are very rare for structural supports due to their relatively low temperatures.

The applicant also stated that the sliding surface material used at VYNPS is lubrite, which is a corrosion resistant material. Components are inspected in accordance with ISI-IWF for torus saddle supports and Structures Monitoring Program for the lubrite components of radial beam seats. Plant operating experience has not identified failure of lubrite components used in structural applications. No current industry experience has identified failure associated with lubrite sliding surfaces. Components associated with B2 grouping are limited to the torus radial beam seats and support saddles. There are no sliding support surfaces associated with the B4 component grouping for sliding surfaces at VYNPS.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.1, Item 3.5.1-52 discussion column is revised to read as follows:

> Loss of mechanical function due to the listed mechanisms is not an aging effect. Such failures typically result from inadequate design or operating events rather than from the effects of aging. Failures due to cyclic thermal loads are rare for structural supports due to their relatively low temperatures.

The staff finds that loss of mechanical function due to distortion, dirt, overload, fatigue due to vibratory, and cyclic thermal loads are not aging effects requiring management. Such failures do typically result from inadequate design or events rather than the effects of aging.

On the basis that the mechanisms provided in LRA Table 3.5.1, Item 3.5.1-52, other than corrosion, are not aging mechanisms which cause aging effects for Group B2 and B4 components in the structures and component supports at VYNPS, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.5.1, Item 3.5.1-54, the applicant addressed loss of mechanical function of Groups B1.1, B1.2, and B1.3: constant and variable load spring hangers; guides and stops due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads. The applicant stated that loss of mechanical function due to the listed mechanisms is not an aging effect. Proper design prevents distortion, overload, and fatigue due to vibratory and cyclic thermal loads.

During the audit and review, the staff asked the applicant to:

- Explain how loss of mechanical function due to corrosion is not an aging effect which needs to be managed for the period of extended operation.

- If proper design prevents distortion, overload, and fatigue due to vibratory and cyclic thermal loads, explain if there has never been a component failure at VYNPS due to any of these conditions.

- Explain if there has never been a component failure in the nuclear industry due to any of these conditions.

- Explain what VYNPS inspects for during VT-3 visual examinations of groups B1.1, B1.2 and B1.3 components in accordance with its Inservice Inspection Program during its current license and also anticipated VT-3 visual examinations during its possible extended license period.

During interviews with the applicant's technical personnel, the applicant stated that the discussion for LRA Table 3.5.1, Item 3.5.1-54 was not saying that failures have not occurred, but that loss of mechanical function is not an aging effect. For license renewal, Entergy identifies a number of aging effects that can cause loss of intended function. Loss of intended function includes loss of mechanical function. The loss of function is not considered an aging effect. Aging effects that could cause loss of mechanical function for components in LRA Table 3.5.1, Item 3.5.1-54 are addressed elsewhere in the AMRs. For example, loss of material due to any mechanism is addressed in LRA Table 3.5.2-6 under listings for component and piping supports ASME Code Class 1, 2, 3 and MC (page 3.5-70), and component and piping supports (page 3.5-71). Component failures at VYNPS and in the nuclear industry have certainly occurred due to overload (typically caused by an event such as waterhammer) or vibratory and cyclic thermal loads. Because of the low operating temperatures, failures due to cyclic thermal loads are extremely rare for structural commodities. Failures due to distortion or vibratory loads have also occurred due to inadequate design, but rarely if ever, due to the normal effects of aging.

In a letter dated July 14, 2006, the applicant revised its LRA. The applicant stated that LRA Table 3.5.1, Item 3.5.1-54 discussion is revised to read as follows:

> Loss of mechanical function due to distortion, dirt, overload, fatigue due to vibratory, and cyclic thermal loads are not aging effects requiring management. Such failures typically result from inadequate design or events rather than the effects of aging. Loss of material due to corrosion, which could cause loss of mechanical function, is addressed under LRA Table 3.5.1, Item 3.5.1-53 for Groups B1.1, B1.2, and B1.3 support members.

The staff finds that loss of mechanical function due to distortion, dirt, overload, fatigue due to vibratory, and cyclic thermal loads are not aging effects requiring management. Such failures do typically result from inadequate design or events rather than the effects of aging.

On the basis that the mechanisms provided in LRA Table 3.5.1, Item 3.5.1-54, other than corrosion, are not aging mechanisms which cause aging effects for group B1.1, B1.2, and B1.3 components in the structures and component supports at VYNPS, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

In LRA Table 3.5.1, Item 3.5.1-57, the applicant addressed the reduction or loss of isolation function of Groups B1.1, B1.2, and B1.3: vibration isolation elements due to radiation hardening, temperature, humidity, and sustained vibratory loading. The applicant stated that no supports with vibration isolation elements have been identified in the scope of license renewal for VYNPS.

The staff finds that VYNPS does not have Group B1.1, B1.2, and B1.3 vibration isolation elements in the scope of license renewal.

On the basis that there are no Group B1.1, B1.2, and B1.3 vibration isolation elements in the structures and component supports at VYNPS, the staff finds that, for this component type, this aging effect is not applicable to VYNPS.

3.5.2.3.8 Structures and Component Supports AMR Line Items That Have No Aging Effects (LRA Tables 3.5.2-1 through 3.5.2-6)

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant stated that no aging effects were identified occurred when components fabricated from concrete material are exposed to a protected from weather, weather or fluid environment. In the LRA the applicant states that inaccessible and accessible concrete areas are designed in accordance with ACI 318-63, which results in low permeability and resistance to aggressive chemical solutions by requiring the following:

- high cement content
- low water-to-cement ratio
- proper curing
- adequate air entrainment

The applicant also stated that VYNPS concrete also meets guidelines of later guide ACI 201.2R-77, since both ACI documents use the same ASTM standards for selection, application and testing of concrete. The below-grade environment is not aggressive (pH greater than 5.5, chlorides less than 500 ppm, and sulfates less than 1,500 ppm). Concrete was provided with air content between 3percent and 5percent and in general a water/cement ratio between 0.44 and 0.60. Therefore, increase in porosity and permeability due to leaching of calcium hydroxide, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not applicable for concrete in accessible and inaccessible areas. Aggregates used at VYNPS were in accordance with specifications and materials conforming to ACI and ASTM standards. VYNPS concrete structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw; and cracking due to expansion and reaction with aggregates are not aging effects requiring management for VYNPS structures. ASME Code, Section III, Division 2, Subsection CC, indicates that aging due to elevated temperature exposure is not significant as long as concrete general area temperatures do not exceed 150°F and local area temperatures do not exceed 200°F. During normal operation, areas within the VYNPS primary containment and other structures are within these temperature limits. Therefore, reduction of strength and modulus of concrete structures due to elevated temperature is not an AERM for VYNPS concrete.

The staff finds that the quality of the reinforced concrete used at VYNPS meets the codes and standards referenced in the GALL Report such that concrete is not susceptible to the aging effects listed above. The below-grade environment was finds not to be aggressive at VYNPS with continuing groundwater monitoring to occur during the period of extended license. Therefore, no aging effects are considered to be applicable to components fabricated from concrete material protected from weather, exposed to weather or exposed to fluid environments. Since the absence of this concrete aging effects needs to be confirmed, concrete components and structures are included within the Structures Monitoring Program.

On the basis of its review of current industry research and operating experience, the staff finds that protected from weather, weather or fluid on concrete will not result in aging that will be of concern during the period of extended operation. The staff finds that the applicant's AMR evaluations that concrete protected from weather, exposed to weather or fluid environments will have no identified aging effects that actually occur, acceptable. Therefore, the staff finds that there are no applicable aging effects requiring management for concrete components exposed to protected from weather, exposed to weather or exposed to fluid environments.

During the audit and review, the staff noted that in LRA Table 3.5.2-5 (page 3.5-67), for component Vernon Dam external walls, floor slabs and interior walls, material concrete in a protected from weather environment; the aging effect shown is none with the AMP shown as Vernon Dam FERC Inspection. VYNPS discusses throughout its LRA Section 3.5 further evaluations that VYNPS concrete does not have aging effects because the quality of the concrete used during construction was to the standards of ACI 18-63 and ACI 201.2R-77. Vernon Dam is a very old structure and was not built by the owners of VYNPS. The staff asked the applicant to provide documentation and justification that the quality of the concrete used at Vernon Dam is also to the standards of ACI 318-63 and ACI 2012.R-77, such that the AMR statement "None" for aging effects of the Dam concrete is justified.

During interviews with the applicant's technical personnel, the applicant's staff stated since quality of concrete used at Vernon Dam has not been confirmed, it would have been more appropriate to show the associated aging effects for the line items in question. However, the same aging management activity, the FERC inspection, is still appropriate to manage aging effects associated with the Vernon Dam concrete components.

The staff found that the acceptance of the Vernon Dam FERC Inspection Program along with associated LRA questions are issues that will require further evaluation.The staff issued RAI 3.6.2.2-N-08 to address this concern, which is evaluated in SER Section 3.0.3.3.6.

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant identified line items where no aging effects were identified as a result of its aging review process.

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from lubrite plate material were in a protected from weather environment. The applicant also stated that Lubrite plates are used in the drywell beam seats and the torus support saddles at VYNPS. Lubrite materials for nuclear applications are designed to resist deformation, have a low coefficient of friction, resist softening at elevated temperatures, resist corrosion, withstand high intensities of radiation, and not score or mar; therefore, they are not susceptible to aging effects requiring management. Due to the wear-resistant material used, the low frequency (number of times) of movement, and the slow movement between sliding surfaces, lock-up and loss of mechanical function of lubrite plates from wear, corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads are not considered to be aging effects requiring management at VYNPS. Nonetheless, Lubrite® plates are included within the Structures Monitoring Program and Inservice Inspection (IWF) Program. Industry operating experience and VYNPS ISI inspection reports for slide bearing plates have identified no recordable degradation due to any aging effects. Therefore, no aging effects are considered to be applicable to components fabricated from lubrite plate material exposed to a protected from weather environment.

On the basis of its review of current industry research and operating experience, the staff finds that a protected from weather environment on lubrite plate will not result in aging that will be of concern during the period of extended operation. The staff finds that the applicant's AMR evaluations that lubrite plate in a protected from weather environment will have no identified aging effects that actually occur, acceptable. Therefore, the staff concludes that there are no applicable aging effects requiring management for lubrite plate components exposed to a protected from weather environment.

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from aluminum material were in a exposed to weather environment.

In the LRA the applicant states that the ambient environment at VYNPS is not chemically polluted by vapors of SO_2 or other similar substances and the external environment does not contain saltwater or high chlorides. In this non-aggressive environment, the occasional wetting and drying from normal outdoor weather does not result in any significant loss of material for aluminum components. Therefore, loss of material due to pitting and crevice corrosion is not an AERM for aluminum components exposed to a weather environment. Industry operating experience and previously approved staff positions documented in the Farley SER (NUREG-1825, page 3-314) support the conclusion that there are no aging effects for aluminum in a weather environment. Therefore, no aging effects are considered to be applicable to components fabricated from aluminum material exposed to a weather environment.

On the basis of its review of current industry operating experience and approved staff positions, the staff finds that a weather environment on aluminum at VYNPS will not result in aging that will be of concern during the period of extended operation. The staff finds that the applicant's AMR evaluations that aluminum in a weather environment will have no identified aging effects that actually occur, acceptable. Therefore, the staff finds that there are no applicable aging effects requiring management for aluminum components exposed to a weather environment.

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from stainless steel material were in a exposed to weather environment.

In the LRA the applicant stated that the ambient environment at VYNPS is not chemically polluted by vapors of SO_2 or other similar substances and the external environment does not contain saltwater or high chlorides. In this non-aggressive environment, the occasional wetting and drying from normal outdoor weather does not result in any significant loss of material for stainless steel components. Therefore, loss of material due to pitting and crevice corrosion is not an AERM for stainless steel components exposed to a weather environment. Industry operating experience and previously approved staff positions documented in the Farley SER (NUREG-1825, page 3-314) support the conclusion that there are no aging effects for stainless steel in a weather environment. Therefore, no aging effects are considered to be applicable to components fabricated from stainless steel material exposed to a weather environment.

On the basis of its review of current industry operating experience and approved staff positions, the staff finds that a weather environment on stainless steel at VYNPS will not result in aging that will be of concern during the period of extended operation. The staff finds that the applicant's AMR evaluations that stainless steel in a weather environment will have no identified aging effects that actually occur, acceptable. Therefore, the staff finds that there are no applicable aging effects requiring management for stainless steel components exposed to a weather environment.

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant stated that no aging effects were identified occurred when components fabricated from carbon steel material were exposed to weather environment.

During the audit and review the staff noted that in LRA Table 3.5.2-4 (page 3.5-61), for component steel piles, material carbon steel exposed to weather environment; the aging effect is none. Note 504 discusses steel piles driven into soils (a soil environment, not a weather environment) with no significant effects due to corrosion. The applicant was asked to explain how the soil environment relates to the weather environment to justify no aging effect.

During interviews with the applicant's technical personnel, the applicant's staff stated that as identified in LRA Table 3.5.2-4 (page 3.5-61), for steel piles, material carbon steel exposed to weather environment; the aging effect is none. Although a soil environment is not identified, the listed environment, exposed to weather, is intended to include both an above grade environment and a below grade environment as described in LRA Table 3.0-2. The below grade environment applies to the steel piles. As such the statement made in Note 504 is applicable.

In the LRA, the applicant states that carbon steel piles driven in undisturbed soils show no significant effects due to corrosion, regardless of the soil type or soil properties. Likewise, piles driven in disturbed soil above the water table zone do not reflect any significant corrosion. Therefore, aging management is not required of carbon steel exposed to a weather environment (non-aggressive soil environment). Industry operating experience supports the conclusion that there are no aging effects for carbon steel in a weather environment (non-aggressive soil environment). Therefore, no aging effects are considered to be applicable to components fabricated from carbon steel material exposed to a weather environment (non-aggressive soil environment).

On the basis of current industry research and operating experience, the staff finds that a weather environment (non-aggressive soil environment) on carbon steel at VYNPS will not result in aging that will be of concern during the period of extended operation. The staff finds that the applicant's AMR evaluations that carbon steel in a weather environment (non-aggressive soil environment) will have no identified aging effects that actually occur, acceptable. Therefore, the staff finds that there are no applicable aging effects requiring management for carbon steel components exposed to a weather environment (non-aggressive soil environment).

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant stated that no aging effects were identified occurred when components fabricated from pyrocrete material were in a protected from weather environment.

During the audit and review, the staff noted that in LRA Table 3.5.2-6 (page 3.5-78), for component fire proofing, material Pyrocrete in a protected from weather environment; the aging effect is none. The applicant was asked to provide a technical basis why Pyrocrete does not have any aging effects in the environment listed.

During interviews with the applicant's technical personnel, the applicant's staff stated that Pyrocrete (used for fire proofing) is cement base composite material. Pyrocrete is not identified in the GALL Report. As such, VYNPS's technical evaluation of pyrocrete in determining applicable aging effects was the same as that for concrete which is based on EPRI 1002950, "Aging Effects for Structures And Structural Components (Structural Tools)," Revision 1, Section 5. Accordingly, no aging effects were determined for pyrocrete protected from weather. However, as indicated in LRA Table 3.5.2-6 (page 3.5-78), the Fire Protection Program and Structures Monitoring Program will confirm the absence of significant aging effects throughout the period of extended operation.

The staff finds pyrocrete to be a cementitious material that like concrete in a protected from weather environment will not experience aging effects. Industry operating experience supports the conclusion that there are no aging effects for pyrocrete in a protected from weather environment. Therefore, no aging effects are considered to be applicable to components fabricated from pyrocrete material exposed to a protected from weather environment. Nonetheless, pyrocrete is included within the Fire Protection Program and Structures Monitoring Program to ensure aging effects such as cracking or loss of material are not occurring.

On the basis of current industry research and operating experience, the staff finds that a protected from weather environment on pyrocrete at VYNPS will not result in aging that will be of concern during the period of extended operation. The staff finds that the applicant's AMR evaluations that pyrocrete in a protected from weather environment will have no identified aging effects that actually occur, acceptable. Therefore, the staff concludes that there are no applicable aging effects requiring management for pyrocrete components exposed to a protected from weather environment.

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant stated that no aging effects were identified occurred when components fabricated from fiberglass, calcium silicate or Stratafab material were in a protected from weather environment. In the LRA, the applicant stated that loss of insulating characteristics due to insulation degradation is not an AERM for insulation material. Insulation products, which are made from fiberglass fiber, calcium silicate, stainless steel, and similar materials, that are protected from weather do not experience aging effects that would significantly degrade their ability to insulate as designed. A review of site operating experience identified no aging effects for insulation used at VYNPS. No aging effects are considered to be applicable to components fabricated from fiberglass, calcium silicate or Stratafab material exposed to a protected from weather environment.

On the basis of its review of current industry research and operating experience, the staff finds that a protected from weather environment on fiberglass, calcium silicate or Stratafab will not result in aging that will be of concern during the period of extended operation. Therefore, the staff concludes that there are no applicable aging effects requiring management for fiberglass, calcium silicate or Stratafab components exposed to protected from weather environments.

In LRA Tables 3.5.2-1 through 3.5.2-6, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from PVC material were exposed to a protected from weather environment.

During the audit and review the staff noted that in LRA Table 3.5.2-6 (page 3.5-80), for component water stops, material PVC in a protected from weather environment; the aging effect is none. By definition the component stops water, so it could be exposed to water. In LRA Table 3.5.2-4 (page 3.5-64) for component cooling tower fill, material PVC, environment exposed to fluid environment, the aging effects listed are cracking and change in material properties. The applicant was asked to provide a technical basis why PVC water stops do not have any aging effects which need aging management when they could be exposed to a fluid environment also. The applicant was also asked to provide the specification that called for PVC water stops during construction instead of rubber.

During interviews with the applicant's technical personnel, the applicant's staff stated that the PVC water stops identified in LRA Table 3.5.2-6 (page 3.5-80) are used in the cooling tower reinforced concrete basin and are not exposed to the same environment as the cooling tower fill material. Therefore, the aging effects are not the same. The aging effects attributed to PVC water stops are evaluated based upon EPRI 1002950, Section 7.0, "Structural Tools." Exposure to water for these commodities is insignificant, since the concrete encapsulating the PVC water stop and the protection provided by the surrounding concrete, provides ample protection such that aging management is not required. UFSAR Figure 12.2-33 (G-200357) "Cooling Tower No.2 Basin Plan View" identifies the use of PVC water stops at VYNPS.

On the basis that PVC water stops are almost totally encapsulated in concrete to protect them from a fluid environment and expose them only to a protected from weather environment, the staff finds that a protected from weather environment on PVC will not result in aging that will be of concern during the period of extended operation. Therefore, the staff concludes that there are no applicable aging effects requiring management for PVC components exposed to a protected from weather environment.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the SC supports components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6 Aging Management of Electrical and Instrumentation and Controls System

This section of the SER documents the staff's review of the applicant's AMR results for the electrical and instrumentation and control (I&C) system components and component groups of:

- insulated cables and connections
- transmission conductors
- switchyard bus
- high-voltage insulators

3.6.1 Summary of Technical Information in the Application

LRA Section 3.6 provides AMR results for the electrical and I&C system components and component groups. LRA Table 3.6.1, "Summary of Aging Management Evaluations for the Electrical and I&C Components," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the electrical and I&C system components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.6.2 Staff Evaluation

The staff reviewed LRA Section 3.6 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the electrical and I&C system components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.6.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.6.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.6.2.2.

The staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.6.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Table 3.6-1 summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.6 and addressed in the GALL Report.

Table 3.6-1 Staff Evaluation for Electrical and I&C Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Electrical equipment subject to 10 CFR 50.49 Environmental Qualification requirements (3.6.1-1)	Degradation due to various aging mechanisms	Environmental Qualification of Electric Components	TLAA Environmental Qualification of Electric Components Program (B.1.10)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.6.2.2.1)
Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 Environmental Qualification require ments (3.6.1-2)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requir ements	Non-Environmental Qualification Insulated Cables and Connections Program (B.1.19)	Consistent with GALL Report. (See SER Section 3.6.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Conductor insulation for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 Environmental Qualification require ments that are sensitive to reduction in conductor insulation resistance (IR) (3.6.1-3)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables And Connections Used In Instrumentation Circuits Not Subject To 10 CFR 50.49 Environmental Qualification Requir ements	Non-Environmental Qualification Instrumentation Circuits Test Review Program (B.1.18)	Consistent with GALL Report. (See SER Section 3.6.2.1)
Conductor insulation for inaccessible medium voltage (2 kV to 35 kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 Environmental Qualification require ments (3.6.1-4)	Localized damage and breakdown of insulation leading to electrical failure due to moisture intrusion, water trees	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requir ements	Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program (B.1.17)	Consistent with GALL Report. (See SER Section 3.6.2.1)
Connector contacts for electrical connectors exposed to borated water leakage (3.6.1-5)	Corrosion of connector contact surfaces due to intrusion of borated water	Boric Acid Corrosion	None	Not applicable to BWRs
Fuse Holders (Not Part of a Larger Assembly): Fuse holders - metallic clamp (3.6.1-6)	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse Holders	None	AMR results that are not consistent with the GALL Report or not addressed in the GALL Report. (See SER Section 3.6.2.3)
Metal-Enclosed Bus - Bus/connections (3.6.1-7)	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal-Enclosed Bus	Metal-Enclosed Bus Program	AMR results that are not consistent with the GALL Report or not addressed in the GALL Report. (See SER Section 3.6.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Metal-Enclosed Bus - Insulation/insulators (3.6.1-8)	Embrittlement, cracking, melting, discoloration, swelling, or loss dielectric strength leading to reduced insulation resistance; electrical failure due to thermal/ thermoxidative degradation of organics/ thermoplastics, radiation-induced oxidation; moisture/debris intrusion, and ohmic heating	Metal-Enclosed Bus	Metal-Enclosed Bus Program	AMR results that are not consistent with the GALL Report or not addressed in the GALL Report. (See SER Section 3.6.2.3)
Metal-Enclosed Bus - Enclosure assemblies (3.6.1-9)	Loss of material due to general corrosion	Structures Monitoring Program	Metal-Enclosed Bus Program	AMR results that are not consistent with the GALL Report or not addressed in the GALL Report. (See SER Section 3.6.2.3)
Metal-Enclosed Bus - Enclosure assemblies (3.6.1-10)	Hardening and loss of strength due to elastomers degradation	Structures Monitoring Program	Metal-Enclosed Bus Program	AMR results that are not consistent with the GALL Report or not addressed in the GALL Report. (See SER Section 3.6.2.3)
High-voltage insulators (3.6.1-11)	Degradation of insulation quality due to presence of any salt deposits and surface contamination; Loss of material caused by mechanical wear due to wind blowing on transmission conductors	A plant-specific AMP is to be evaluated	None	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.6.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Transmission conductors and connections; switchyard bus and connections (3.6.1-12)	Loss of material due to wind induced abrasion and fatigue; loss of conductor strength due to corrosion; increased resistance of connection due to oxidation or loss of preload	A plant-specific AMP is to be evaluated	None	Consistent with the GALL Report, which recommends further evaluation. (See SER Section 3.6.2.2.3)
Cable Connections - Metallic parts (3.6.1-13)	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements	None	AMR results that are not consistent with the GALL Report or not addressed in the GALL Report. (See SER Section 3.6.2.3)
Fuse Holders (Not Part of a Larger Assembly) Insulation material (3.6.1-14)	None	None	None	AMR results not consistent with GALL Report or not addressed in GALL Report (See SER Section 3.6.2.3)

The staff's review of the electrical and I&C system component groups followed any one of several approaches. One approach, documented in SER Section 3.6.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.6.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.6.2.3, reviewed AMR results for components that the applicant indicated are not consistent with or not addressed in the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the electrical and I&C system components is documented in SER Section 3.0.3.

3.6.2.1 AMR Results Consistent with the GALL Report

Summary of Technical Information in the Application. LRA Section 3.6.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the electrical and I&C system components:

- Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program
- Non-Environmental Qualification Instrumentation Circuits Test Review Program
- Non-Environmental Qualification Insulated Cables and Connections Program

LRA Table 3.6.2-1 summarizes AMRs for the electrical and I&C system components and indicates AMRs claimed to be consistent with the GALL Report.

Staff Evaluation. For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also finds whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also finds whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also finds whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also finds whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation follows.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

Summary of Information in the Application. In LRA Section 3.6.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the electrical and I&C system components and provides information concerning how it will manage the following aging effects:

- electrical equipment subject to environmental qualification
- degradation of insulator quality due to salt deposits or surface contamination, loss of material due to mechanical wear
- loss of material due to wind induced abrasion and fatigue, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of pre-load
- quality assurance for aging management of nonsafety-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.6.2.2. The staff's review of the applicant's further evaluation follows.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

In LRA Section 3.6.2.2.1, the applicant stated that environmental qualification is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.4 documents the staff's review of the applicant's evaluation of this TLAA.

3.6.2.2.2 Degradation of Insulator Quality Due to Salt Deposits or Surface Contamination, Loss of Material Due to Mechanical Wear

The staff reviewed LRA Section 3.6.2.2.2 against the criteria in SRP-LR Section 3.6.2.2.2.

In LRA Section 3.6.2.2.2, the applicant stated that for the degradation of insulator quality due to presence of any salt deposits and surface contamination, and loss of material due to mechanical wear, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.6.2.2.2 states that degradation of insulator quality due to salt deposits or surface contamination may occur in high-voltage insulators. The GALL Report recommends further evaluation of plant-specific AMPs for plants at locations of potential 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 on transmission conductors may occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The applicant stated, in the LRA, that the insulators evaluated for VYNPS license renewal are those used to support uninsulated, high-voltage electrical components such as transmission conductors and switchyard buses.

The applicant further stated, in the LRA, that various airborne materials such as dust, salt and industrial effluents can contaminate insulator surfaces. The buildup of surface contamination in most areas is washed away by rain. The glazed insulator surface aids this contamination removal. However, a large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. The applicant stated, that VYNPS is not located near the seacoast where salt spray is considered. At VYNPS, contamination build-up on insulators is not a concern. Therefore, surface contamination is not an applicable aging mechanism for high-voltage insulators at VYNPS.

The staff noted that surface contamination can be a problem in areas where there are greater concentration of airborne particles such as near facilities that discharge soot. The staff asked the applicant to clarify why surface contamination is not a concern at VYNPS. In its response, the applicant stated that VYNPS is not located near facilities that discharge soot. At VYNPS, as in most areas of the New England transmission system, contamination buildup on insulators is not a problem. Therefore, the applicant concluded that surface contamination is not an applicable aging mechanism for insulators at VYNPS. The staff finds the applicant's response acceptable because surface contamination can be a problem in areas where there are greater concentration of airborne particles such as near facilities that discharge soot. Since VYNPS is not located near facilities that discharge soot, surface contamination is not an applicable aging effect for high-voltage insulators.

In the LRA, the applicant also stated, that mechanical wear is an aging effect for strain and suspension insulators in that they are subject to movement. Although this mechanism is possible, industry experience has shown that transmission conductors do not normally swing and that when they do, due to a substantial wind, they do not continue to swing for very long once the wind has subsided. Wear has not been apparent during routine inspections. The staff finds tha applicant’s assessment acceptable.

The staff concludes that there are no aging effects requiring management for VYNPS high-voltage insulators. The staff finds that the degradation of insulator quality due to presence of any salt deposits and surface contamination, and loss of material due to mechanical wear is not an applicable AERM.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.6.2.2.2 criteria. For those line items that apply to LRA Section 3.6.2.2.2, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.3 Loss of Material Due to Wind-Induced Abrasion and Fatigue, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Pre-Load

The staff reviewed LRA Section 3.6.2.2.3 against the criteria in SRP-LR Section 3.6.2.2.3.

In LRA Section 3.6.2.2.3, the applicant stated that for the loss of material due to wind induced abrasion and fatigue, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of pre-load, this aging effect is not applicable to VYNPS.

SRP-LR Section 3.6.2.2.3 states that loss of material due to wind-induced abrasion and fatigue, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of pre-load may 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 the aging effect is adequately managed.

The applicant stated, in the LRA, that transmission conductors are uninsulated, stranded electrical cables used outside buildings in high-voltage applications. The transmission conductor commodity group includes the associated fastening hardware, but excludes the high-voltage insulators. Major active equipment assemblies include their associated transmission conductor terminations.

In LRA Table 3.6.2-1, under the transmission conductors, the applicant stated that no aging effects requiring management and no AMP is required. During the audit and review, the staff noted that the most prevalent mechanism contributing to loss of conductor strength of aluminum core steel reinforce (ACSR) transmission conductor is corrosion which includes corrosion of steel core and aluminum strand pitting. Degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend largely on air quality, which includes suspended particle chemistry, SO_2 concentration in air, precipitation, fog chemistry and meteorological conditions. The staff asked the applicant to clarify why loss of conductor strength is not an AERM for transmission conductors at VYNPS. In its response, the applicant stated that the prevalent mechanism contributing to loss of an ACSR transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. Corrosion in the ACSR conductor is a very slow acting mechanism, and the corrosion rates depend on air quality, which includes suspended particles chemistry, SO_2 concentration in air, precipitation, fog chemistry and meteorological conditions. Air quality in rural areas generally contains low concentration of suspended particles and SO_2, which keeps the corrosion rate to a minimum. Tests performed by Ontario Hydro showed a 30 percent loss of composite conductor strength of an 80-year old ACSR conductor due to corrosion. The National Electric Safety Code (NESC) requires that tension on installed conductors be a maximum of 60 percent of the ultimate conductor strength. The acceptance criteria for VYNPS is less than 40 percent loss of composite conductor strength per NESC. Aluminum conductor alloy reinforced (ACAR) conductors are used at VYNPS as well as ACSR conductors. ACAR conductors are more resistant to loss of conductor strength since the core of the conductor is an alloy steel and corrosion resistant metals. Conclusion for ACSR conductors conservatively bound ACAR conductors. Therefore, corrosion of transmission conductor is not an AERM and an AMP is not required. The staff finds the applicant's response acceptable because corrosion of the ACSR conductor is a very slow acting mechanism and the test data from Ontario Hydro has shown why loss of conductor strength is not an AERM at VYNPS.

In addition, the applicant responded that loss of material wear can be an aging effect for strain and suspension insulators that are subject to movement caused by transmission conductor vibration or sway from wind loading. Design and installation standards for transmission conductors consider sway caused by wind loading. Experience has shown that transmission conductors do not normally swing and that when they do, due to a substantial wind, they do not continue to swing for very long once the wind has subsided. Wear has not been identified during routine inspection; therefore, loss of material due wear is not an significant AERM.

In the LRA, the applicant stated that transmission conductors are subject to an AMR if they are necessary for recovery of offsite power following an SBO. At VYNPS, transmission conductors located between switchyard breakers K-1/K-186 and startup transformers T-3-1A/T-3-1B support recovery from an SBO event. Other transmission conductors are not subject to an AMR since they do not perform a license renewal intended function. Switchyard bus is uninsulated, un-enclosed, rigid electrical conductors used in medium and high-voltage applications. Switchyard bus includes the hardware used to secure the bus to high-voltage insulators. Switchyard bus establishes electrical connections to disconnect switches, switchyard breakers, and transformers. Switchyard bus located at the disconnect switches at the VHS switchyard are necessary for connecting the AAC power source from the Vernon Dam to essential station switchgear and are subject to an AMR. Also, switchyard bus located at the switchyard breakers K-1/K-186 and at startup transformers T-3-1A/T-3-1B that support recovery from an SBO event are subject to an AMR. Other switchyard bus does not require an AMR since they do not perform a license renewal intended function.

The applicant further stated, in the LRA, that connection surface oxidation for aluminum switchyard bus is not applicable since switchyard bus connections requiring an AMR are welded connections. For ambient environmental conditions at VYNPS, no aging effects have been identified that could cause a loss of intended function for the period of extended operation. Vibration is not applicable since flexible connectors connect switchyard bus. Therefore, there are no aging effects requiring management for aluminum switchyard bus.

The staff noted that transmission conductor connections and switchyard bus connections may be subject to increased resistance of connection due to oxidation or loss of pro-load. Torque relaxation for bolted connection is a concern for transmission conductor and switchyard bus connections. An electrical connection must be designed to remain tight with good conductivity through a large temperature range. Meeting this design requirement is difficult if the material specified for the bolt and the conductor are different and have different rates of thermal expansion. For example, copper or aluminum bus/conductor materials expand faster than most bolting materials. If thermal stress is added to stresses inherent at assembly, the joint members or fasteners can yield. If plastic deformation occurs during thermal loading (i.e., heat-up) when the connection cools, the joint will be loose. EPRI document TR-104213, “Bolted Joint Maintenance & Application Guide,” recommends inspection of bolted joints for evidence of overheating, signs of burning or discoloration, and indication of loose bolts. The staff asked the applicant to address increased resistance of transmission conductor and switchyard bus connections due to oxidation and loss of pre-load.

In its response, the applicant stated that connection surface oxidation for aluminum switchyard bus is not applicable since all switchyard bus connections requiring an AMR are welded connections. No aging effects have been identified for welded connections on switchyard bus for SBO. Electrical bolted connections may exist in the path used for SBO between the switchyard breaker and the station transformers. These connections may exist at the high-voltage circuit breakers, circuit breaker disconnect switches, switchyard disconnect switches, transmission conductors and transformer high-voltage and low voltage terminations. VYNPS has evaluated plant operating experience for aging of bolted connections and has no indication of aging mechanism due to loose connections. Except for the connectors associated with transformer connections, VYNPS will use its existing thermography program to assure the integrity of bolted connections associated with the path used for SBO between the switchyard breakers in the license renewal scope and the station transformers. Thermography will be performed on switchyard components on a frequency of once every 6 months. Bolted connections associated with transformer are disconnected, inspected and reconnected every operating cycle as part of routine transformer testing and maintenance. VYNPS shall rely on this inspection to assure the integrity of bolted connections associated with the station transformers because thermography can not effectively measure any hot spot temperature within normally enclosed transformer termination enclosures.

The staff finds the applicant's response acceptable because for transmission conductor and switchyard bus connections to transformers, routine transformer testing and maintenance will be used to ensure the integrity of bolted connection and thermography will be used to detect high heat created by increased resistance due to oxidation and loosening of bolted connections associated with other components used for SBO recovery path.

The staff finds that the loss of material due to wind induced abrasion and fatigue, loss of conductor strength due to corrosion are not applicable aging effects requiring management. For potential aging effects of increased resistance of connection due to oxidation or loss of pre-load, the applicant will perform preventive maintenance and thermography to detect the potential aging effects of switchyard bus and transmission conductor bolted connections.

Based on the programs identified above, the staff finds that the applicant’s programs meet SRP-LR Section 3.6.2.2.3 criteria. For those line items that apply to LRA Section 3.6.2.2.3, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff finds that the applicant adequately addressed the issues that were further evaluated. The staff finds that the applicant had demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Table 3.6.2-1, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Table 3.6.2-1, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.6.2.3.1 Electrical and I&C Components Summary of Aging Management Evaluation-LRA Table 3.6.2-1

The staff reviewed LRA Table 3.6.2-1, which summarizes the results of AMR evaluations for the electrical and I&C components and component groups.

In LRA, Table 3.6.2-1, the applicant stated that no aging effects requiring management and no AMP is required for cable connections (metallic parts) in a heat and air outdoor weather environment.

During the audit and review, the staff noted that electrical cable connections are subject to the above aging stressors. GALL AMP XI.E6, "Electrical Cable Connection not Subject to 10 CFR 50.49 Environmental Qualification Requirements," specifies that connections associated with cables within the scope of license renewal are part of this program, regardless of their association with active or passive components.

The staff requested that the applicant provide a basis document including an AMP with the program elements for cable connections or a technical justification for why an AMP was not necessary. In its response, the applicant stated that an evaluation of thermal cycling, ohmic heating, electrical transient, vibration, chemical contamination, corrosion, and oxidation stressors for the metallic parts of electrical cable connections identified no aging effects requiring management. Metallic parts of electrical cable connections potentially exposed to thermal cycling and ohmic heating are those carrying significant current in power supply circuits. Typically, power cables are in a continuous run from the supply to the load. Therefore, the applicant stated that the connections are part of an active component that is controlled by the Maintenance Rule and is not subject to an AMR. The fast action of circuit protective devices at high currents mitigates stresses associated with electrical faults and transients. In addition, mechanical stress associated with electrical faults is not a credible aging mechanism because of the low frequency of occurrence for such faults. Therefore, the applicant stated that electrical transient are not applicable stressors. Metallic parts of electrical cable connections exposed to vibration are those associated with active components that cause vibration. Since active components are controlled by maintenance rule, they are not subject to an AMR. Corrosive chemicals are not stored in most areas of the plant. Routine releases of corrosive chemicals to areas inside plant building do not occur during plant operation. Such a release, and its effects, would be an event, not an effect of aging. The location of electrical connections inside active components protects the metallic parts from contamination. Therefore, the applicant stated that this stressor is not applicable. Oxidation and corrosion usually occur in the presence of moisture or contamination such as industrial pollutants and salt deposits. Enclosures or splice materials protect metal connections from moisture or contamination. Therefore, the applicant stated that oxidation and corrosion are not applicable stressors. Based on the above evaluation, the applicant concluded that there are no aging effects requiring management for metallic components of connections and no AMP is required.

The staff reviewed the applicant’s response. The staff disagrees with the applicant’s determination. Cable connections are passive components and in-scope of license renewal. Loosening of these bolted connections is an aging effect that need to be managed. Thermal cycling, ohmic heating, electrical transients, vibrations, chemical contamination, corrosion, and oxidation are aging mechanisms. Connections associated with cables in-scope of license renewal are part of this program, regardless of their association with active or passive components. Cable lugs are an integral part of cables. The integrity of lugs can be verified by testing connections. GALL AMP XI.E1 is used to manage connections in adverse locations only and inspects insulation degradation. Most connections are not located in adverse locations. Institute of Electrical and Electronics Engineers Std. P1205, SAND 96-0344, “Aging Management Guidelines For Electrical Cable and Terminations,” indicated loose terminations were identified by several plants. EPRI-TR-104213, “Bolted Joint Maintenance & Application Guide,” indicates that it is difficult to maintain tightness of electrical connections and good conductivity through a large temperature range if the materials for the bolt connections and conductors are different and have different rates of thermal expansion. For example, copper and aluminum expand faster than most bolting materials. The staff was not aware of any action taken to mange the aging effects of cable connections. Several licensee event reports indicated loose connections due to corrosion, vibration, thermal cycling, etc. Also, past applicants have used thermography to detect weak/loose connections and corrected them as soon as possible, and provided an AMP consistent with GALL AMP XI.E6 to manage aging effects of bolted connections.

The staff requested in RAI 3.6.2.2-N-01 that the applicant provide basis document including an AMP with its ten program elements for cable connections or technical justification for why an AMP is not necessary. In response to the staff's RAI 3.6.2.2-N-01, in letter dated July 14, 2006, License Renewal Application Amendment 4, the applicant stated that:

> Electrical cable connections at VYNPS are inspected in accordance with the maintenance rule program as directed by Entergy procedures. The maintenance rule program is in compliance with 10 CFR 50.65. The maintenance rule program is based on industry guidance provided in NUMARC 93-01 and RG 1.160. The maintenance rule program scope includes the following: SSCs, nonsafety-related SSCs that mitigate accidents or transients, nonsafety- related SSCs used in emergency operating procedures, nonsafety-related SSCs whose failure could prevent safety-related SSCs from fulfilling their safety function, and nonsafety- related SSCs whose failure could cause a scram or safety system actuation. Electrical cable connections are subcomponents of SSCs that are in the scope of the maintenance rule. The maintenance rule program includes performance monitoring and trending for SSCs that are in-scope. Monitoring and trending is performed frequently enough to detect and correct degrading equipment performance, used to evaluate equipment performance following maintenance or modification, based on manufacturer's recommendations, operational or industry experiences with plant equipment or plant-specific information, subject to the corrective action and work order programs, and subject to management review and oversight. Monitoring and trending includes normal plant maintenance activities. Maintenance includes activities associated with identifying and correcting actual or potential degraded conditions (e.g.,repair, surveillance, diagnostic examinations, and preventive measures) as well as support functions for the conduct of these activities. Thermography is used to detect potential degraded conditions. Thermography can detect "hot spots" in cable connections that are indicative of a high resistance connection. As a part of the maintenance rule program, periodic assessments are performed. A periodic assessment is performed to evaluate the effectiveness of maintenance activities. This assessment is performed at least every operating cycle, not to exceed 24 months. Plant operating experience has shown that the maintenance rule program has been effective at detecting, evaluating and repairing electrical cable connection degradation. Since the maintenance rule program includes scoping, performance monitoring, trending and periodic assessments, this program provides reasonable assurance that electrical cable connections will remain capable of performing their intended functions through the period of extended operation. No AMP for license renewal is required at VYNPS since the regulatory mandated maintenance rule program effectively maintains electrical cable connections.

The staff reviewed the applicant's response and in a follow-up to RAI 3.6.2.2-N-01 stated that the current licensing bases for all power plants require compliance with the requirements of the 10 CFR 50.65, the Maintenance Rule. The Statements of Consideration (SOC) for the License Renewal Rule states: The license renewal rule excludes "active, short-lived structures and components" from an AMR because of the existing regulatory process, existing applicant programs and activities, and the Maintenance Rule. The staff's understanding has been that in accordance with the License Renewal Rule, existing programs are not, without some explanation or modification, automatically considered adequate to manage aging effects for license renewal by virtue of being part of the CLB . The Commission formulated the following two principles of license renewal: (1) With the possible exception of the detrimental effects of aging on the functionality of certain plant systems, structures, and components in the period of extended operation and possibly a few other issues related to safety only during extended operation, the regulatory process is adequate to ensure that the licensing bases of all currently operating plants provides and maintains an acceptable level of safety so that operation will not be inimical to public health and safety or common defense and security; and (2) The plant-specific licensing basis must be maintained during the renewal term in the same manner and to the same extent as during the original licensing term.

In addition,10 CFR 50.24(a)(3) requires an applicant to demonstrate that the effects of aging, of components such as cable connections defined in 10 CFR 50.24(a)(1), will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. To demonstrate that the effects of aging will be adequately managed for license renewal, the staff's view is that an applicant must identify the program relied upon to manage certain aging effects for cable connections. The AMP-for cable connections acceptable to the staff should be consistent with GALL AMP XI.E6. GALL AMP XI.E6 accounts for the following stressors: thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation for electrical cable connections (metallic parts).

Therefore, the staff requested, in RAI 3.6.2.2-N-01, that the applicant either provide a plant-specific AMP that addresses the program elements found in SRP-LR, Section A.1, Section A.1.2.3 and SRP-LR Table A.1-1 or an AMP consistent with GALL AMP XI.E6. If the applicant still insisted an AMP is not required, the staff requested that the applicant provide technical justification that addresses how existing programs will address the above aging effects and provide detailed discussion of how its current program meets the program elements as described in the SRP-LR.

The staff also requested that the applicant provide supporting documentation to show that the AMP program elements, including appropriate tests, are implemented currently and will be continued for the period of extended operation. Without such information, it was not apparent that the staff would be able to present a basis for concluding that actions have been or will be taken to manage the effects of aging to ensure the intended function of these structures and components during the period of extended operation.

In a letter dated January 4, 2007, License Renewal Application, Amendment 23, the applicant provided clarification for RAI 3.6.2.2-N-01. Specifically, the applicant, in its letter, stated:

> Based on a November 30, 2006 NEI meeting with the NRC, the revised or alternate XI.E6 program will be a one-time inspection on representative sample of cable connections subject to an AMR.
>
> The License Renewal Project identified connections to include in the AMP by evaluating the VYNPS non-Environmental qualification bolted cable connections.

Switchyard connections are not addressed in this program. Since these connections operate at a much higher voltage (greater than35kV); they are addressed separately as part of the switchyard commodity types.

Connections for all voltage levels are considered. Bolted connections are the main concern. The stressors thermal cycling, ohmic heating, and electrical transients are potential stressors only for high-load connections.

Thermal cycling, ohmic heating, and electrical transients are not potential stressors for low-load connections. Low-load connections located in a controlled environment are not included in the program, because vibration, chemical contamination, corrosion and oxidation are not of concern. Low-load in-scope connections to field instrumentation such as pressure transmitters, resistant temperature detectors (RTDs), and flow transmitters are not subject to an AMR, because the in-scope instrumentation located in a harsh environment is typically environmental qualification, and the non-Environmental qualification sensitive instrument circuit (high radiation and neutron monitoring) connections are included in the XI.E2 program.

The applicant also revised its LRA by adding LRA Appendices A.2.2.39 and B.1.33 describing its Bolted Cable Connections Program. It also revised Section 3.6.2.1, Aging Effects Requiring Management, Section 3.6.2.1, Aging Management Program, Table 3.6.1, and Table 3.6.2-1. The applicant also included the plant-specific program elements for Bolted Cable Connections Program.

The staff’s evaluation of the applicant’s Bolted Cable Connections Program is documented in SER Section 3.0.3.3.8. In response to NEI’s White Paper on GALL AMP XI.E6, which was submitted on September 5, 2006 for staff’s review, the staff finds that a few operating experience related to failed connections due to aging have been identified and these operating experience can not support a periodic inspection as currently recommended in GALL AMP XI.E6.

On the basis of its review, the staff finds that the applicant's response to RAI 3.6.2.2-N-01 is acceptable. The staff finds that the design of these connections will account for the stress associated with ohmic heating, thermal cycling, and dissimilar connections. The one-time inspection will ensure that either aging of metallic cable connections is not occurring or existing maintenance program is effective such that a periodic inspection is not required. Therefore, the staff's concern described in RAI 3.6.2.2-N-01 is resolved.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.3.2 Aging Effect/Mechanism in Table 3.6.1 That are Not Applicable for VYNPS

The staff reviewed LRA Table 3.6.1, which provides a summary of aging management evaluations for the electrical and I&Cs evaluated in the GALL Report.

The staff noted that electrical and I&C containment penetrations are not addressed in the LRA. The staff asked the applicant if all electrical and I&C containment penetration are Environmental qualification. In its response, the applicant stated that at VYNPS, electrical penetration assemblies are included in the Environmental Qualification Program and are not subject to an AMR. The staff finds that since all electrical and I&C containment assemblies are included in the Environmental Qualification Program, an AMR is not required for electrical and I&C containment assemblies.

For uninsulated ground conductors, the applicant stated in plant basis document that uninsulated ground conductors (e.g., copper and aluminum cable, copper bar, and steel bar) make ground connections for electrical equipment. Uninsulated ground conductors are connected to electrical equipment housing and electrical enclosures as well as metal structural features such as the cable tray system and building structural steel. Uninsulated ground conductors are always isolated or insulated from the electrical operating circuits. Uninsulated ground conductors enhance the capability of the electrical system to withstand electrical system disturbance (e.g., electrical faults, lightning surges) for equipment and personnel protection. Non-insulated ground conductors do not support the functions specified in 10 CFR 54.4.

Further, the applicant stated that it has reviewed the VYNPS UFSAR for reference to uninsulated ground conductors and no mention was made of a safety-related function or intended function for license renewal. VYNPS uninsulated ground conductors including grounding rods, buried ground cables, cathodic protection cables, and lightning arresters, are not utilized to support a license renewal function, and are not necessary for response to recovery from an SBO event. Therefore, the applicant concluded that uninsulated ground conductors are not required an AMR. The staff finds the applicant's assessment and justification that uninsulated ground conductors are not in-scope of license renewal acceptable and therefore not required an AMR.

In LRA Table 3.6.1, Item 3.6.1-6, the applicant stated that the fatigue of fuse holders (not part of a larger assembly) metallic clamp due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation is not applicable at VYNPS. The applicant also stated that a review of VYNPS documents indicated that fuse holder utilizing metallic clamps are either part of an active device or located in circuits that perform no license renewal intended function. Therefore, fuse holder at VYNPS are not subject to an AMR. In its electrical screening document the applicant stated that VYNPS employs two general type of fuse holders. The first type is the bolt-mount fuse holder that uses either a lug or caps-crew to secure the fuse between the clamps. The second type of fuse holder is the metallic clamp fuse holder, which uses the spring tension. Installation date for cables and connections indicated that the only fuse holders installed at VYNPS that utilize metallic clamps to secure the fuse are either part of active assembly or are located in circuits that perform non-license renewal intended functions. The staff asked the applicant to clarify if there was any bolt-mount fuse holder in-scope of license renewal that is not part of an active assembly. In its response, the applicant stated that the two types of fuse holders are all located in active devices.

The staff finds the applicant's response acceptable.

On the basis that fuse holders are either part of an active assembly or located in circuits that perform no license renewal intended function, the staff finds that an AMR is not required for fuse holders (insulation and metallic parts) at VYNPS.

In LRA Table 3.6.1, Items 3.6.1-7, 8, 9, and 10, the applicant stated that the following GALL Report aging effects of metal enclosed bus (MEB) are not applicable to VYNPS

> loosening of bolted connection due to thermal cycling and ohmic heating, embrittlement, cracking, melting, discoloration, swelling, or loss dielectric strength leading to reduced IR; electrical failure due to thermal/thermoxidative degradation of organics/thermoplastic, radiation-induced oxidation; moisture/debris intrusion, ohmic heating, loss of material due to general corrosion, hardening and loss of strength/elastomers degradation.

The applicant finds that VYNPS does not have any MEB that supports a license renewal function. Therefore, MEB at VYNPS is not subject to an AMR.

The staff noted that 10 CFR 54.4(a)(3) requires, in part, that all SSCs relied on in safety analyses or plant evaluation to perform a function that demonstrates compliance with the commission's regulations for SBO (10 CFR 50.63) are within the scope of license renewal. UFSAR Section 8.3.3 for VYNPS stated that electric power is supplied from the transmission network to the onsite electric distribution system by two independent circuits, one immediate access and one delayed access. The delay access circuits is available by opening the generator no-load disconnect switch and establishing a feed from the 345 kV switchyard through the main generator step-up transformer and unit auxiliary transformer to the 4160 V safety buses. The iso-phase buses are used to connect the delay access circuits from the low side of main generator step-up transformer to the high side of unit auxiliary transformer. The staff asked the applicant to clarify why MEBs (iso-phase buses) were not in-scope of license renewal and did not require an AMP.

In its response, the applicant stated that UFSAR Section 8.3.3 for VYNPS describes three offsite power sources: (1) the immediate access circuits from the 345 kV/115 kV auto-transformer to the startup transformers, (2) the alternate immediate access circuits from the 115 kV yard (Keene line) through the startup transformers, and (3) the delayed access circuit which is available by opening the generator no-load disconnect switch and establishing a feed from the 345 kV switchyard through the main and auxiliary transformers. The delayed access circuit from the 345 kV switchyard through the main generator step-up transformer and unit auxiliary transformer uses the iso-phase bus for connection and is within the scope of license renewal. The applicant committed to develop the MEB program. The VYNPS Metal-Enclosed Bus Program will be added to the following LRA sections:

Section 2.5 – Electrical and I&C Systems
Section 3.6 – Electrical and Instrumentation and Controls
Table 3.6.1
Table 3.6.2-1
Appendix A
Appendix B

In a letter dated October 17, 2006, the applicant revised its LRA. The applicant added LRA Appendices A.2.1.38 and B.1.32 describing its Metal Enclosed Bus Inspection Program. The applicant also included the program basis document that provides the program elements comparison to the GALL Report. This program applies to the isophase bus located between the main transformer and the unit auxiliary transformer. The staff's evaluation of the applicant's Metal Enclosed Bus Inspection Program is documented in SER Section 3.0.3.2.20. The staff finds the applicant's response acceptable because the aging effects of MEB discussed above will be managed by the Metal Enclosed Bus Inspection Program.

All SSCs relied on in safety analyses or plant evaluation to perform a function that demonstrates compliance with the commission's regulation for SBO (10 CFR 50.63) must be within the scope of license renewal as required in part by 10 CFR 54.4(a)(3). VHS has been designated as the SBO AAC source and is used to meet SBO requirements of 10 CFR 50.63. During the audit and review, the staff requested the applicant provide an AMR for long-lived, passive SSCs (electrical, mechanical, civil, structures) associated with the hydro station. In its response, the applicant stated that the long-lived, passive components from the Vernon dam switchyard to the plant are in-scope and subject to an AMR. The underground cables and connections are included in E2. The Vermon dam is regulated by FERC and inspected in accordance with FERC regulations.

The staff noted that not all SSCs for the VHS have been included in an AMR. For example, two 13.8 kV underground medium voltage cables which connect two step-up transformers 13.8 KV to 69 KV are not included in an AMR. The staff issued RAI 3.6.2.2-N-08 and requested the applicant to provide an AMR for all long-lived, passive SSCs associated with the VHS.

In a letter dated July 14, 2006, the applicant stated that:

> Electrical SSCs for the VHS include the generators associated with each turbine, cables and bus for power transmission, and I&C components and their associated cables and connections. Power from the generators is supplied to the VHS switchyard via two medium-voltage (13.8 kV) underground cables to two independent step-up transformers in the switchyard. Switchyard bus downstream of each step-up transformer feeds the 69kV to 13.2 kV transformer that feeds the Vernon tie breaker. The Vernon tie breaker connects power from the transformer to the 13.2 kV underground cable going to VYNPS. Passive, long-lived components from the breakers feeding the 69 kV to 13.2 kV transformer to and including the 13.2 kV underground cable are included in the AMR for plant electrical and instrument and control systems as described in LRA Sections 2.5

and 3.6. The Vernon tie is a highly reliable connection between the VHS and either of the two VYNPS 4160 V emergency buses and is capable of supplying power to required loads under postulated SBO conditions. Loss of the Vernon tie is annunciated and its voltage is monitored in the VYNPS control room. Surveillance testing of the Vernon tie demonstrated the ability to energize an emergency bus and supply required SBO loads in less than 10 minutes. Additionally, the plant is able to safely cope with a total loss of AC power for a minimum of 2 hours from the onset of the SBO to the restoration of offsite AC power. The VHS is designated as a "black-start" facility under arrangements with the regional grid operator. TransCanada has affirmed that they are committed under tariff to provide black-start capability of the VHS to ISO-NE. Both the NEPOOL and REMVEC procedures state that "the most critical power requirement after a blackout is the assurance of reliable shutdowns of nuclear generators, and that expeditious restoration of alternative offsite power sources to nuclear units is imperative to promote the continued reliability of shutdown operations." TransCanada conducts and documents the black-start of the VHS annually. As a backup to local indication available to grid operators of a regional blackout, VYNPS procedures direct operators to immediately contact the regional grid control center to initiate a black start of the VHS if the Vernon tie is unavailable due to a regional grid blackout. The regional grid control center procedures direct hydro-station operators (including the VHS operators) to initiate black start procedures, and upon notification that the units are started, provide instructions to align power to VYNPS and to communicate when these actions are complete to the VYNPS control room. The owner of the VHS has a procedure for the actual black start. The combination of the periodic testing of the AAC source together with the test of the emergency bus that is conducted every operating cycle encompasses the condition of the SBO event, and provides added assurance of VHS availability to meet the requirement of 10 CFR 50.63. Based on the designation of the TransCanada VHS units as black start units by ISO-NE, the procedural requirements for achieving black start, and the operating history of the VHS units, there is reasonable assurance that a VHS unit will be available within the SBO coping time frame. Consistent with the approach described in LRA Section 2.1.2.3, “Screening of Electrical and Instrumentation and Control Systems,” the commodity groups that perform an intended function without moving parts or without a change in configuration) are high-voltage insulators, and cables, connections and electrical busses. Other electrical and I&C commodity groups, including transformers, are active and do not require an AMR.

In this letter, the applicant also stated that aging effects requiring management are those that can prevent accomplishment of the VHS intended function. Because of the multiple independent generators and power transmission circuits within the VHS, no single component failure due to the effects of aging can prevent accomplishment of the VHS intended function. Therefore, according to the applicant, no aging effects require management for electrical and I&C commodity groups within the VHS. Within the VHS switchyard (owned by National Grid), two circuits provide power to the 69 kV to 13.2 kV transformer that feeds through the Vernon tie breaker to the underground 13.2 kV cable routed to VYNPS. The switchyard bus and associated connections involved with this circuit are subject to an AMR. Aging management review of this portion of the switchyard was addressed in the LRA, Section 3.6, for the SSCs described in LRA

Section 2.5 in accordance with “Evaluation Boundaries” on page 2.5-2. Specifically, the path includes the switchyard circuit breakers near the Vernon Dam that feed the Vernon tie transformer, switchyard bus and insulators, and cables and connections in the circuit to the emergency bus and structures. Two independent paths constitute the remainder of the circuit that provides power from the VHS to the VHS switchyard. Because of the two independent power transmission circuits, no single component failure due to the effects of aging can prevent accomplishment of the VHS intended function. Therefore, there are no aging effects requiring management for this portion of the circuit. Availability of the Vernon tie line is tracked on a three-year rolling basis. Over the last 4 years, the line has been available 99.32 percent of the time. Approximately 60 percent of the unavailability was due to the planned replacement of the 4kV underground cable between the 13.2 kV / 4.16kV transformer and the VYNPS 4.16 kV buses. This operating experience indicates the effectiveness of routine switchyard maintenance in achieving acceptable performance of the switchyard circuit between VHS and VYNPS.

The staff noted that the applicant’s July 14, 2006 response stated that no aging effects require management for VHS based on independent generators and power transmission circuits. However, the statement of considerations to 10 CFR Part 54 states that redundancy can not be used to preclude aging effects of in-scope passive long-lived electrical components. In order for the staff to further evaluate the VHS issue, the staff requested that the applicant in RAI 3.6.2.2-N-08-2, to provide additional information regarding the electrical SSCs for the VHS including 2 black-start turbine generators, cables and buses for power transmission, and I&C components and their associated cables and connections. The staff noted that the applicant’s Non-EQ Inaccessible Medium-Voltage Cable Program addressed the underground cables from Vernon tie breaker routed to VYNPS. However, the rest of the SBO SCs were not included in any AMP and thus their performance could not be reasonable assured.

In response to the staff’s RAI 3.6.2.2-N-08-2, in a letter dated October 20, 2006, the applicant stated:

> The Statement of Considerations required by 10 CFR Part 54 clearly states that crediting *regulatory required* redundancy as a surrogate for an aging management program is inappropriate.
>
> "Further, the Commission believes that crediting a *regulatory requirement (i.e., redundancy)* [emphasis added] as a surrogate for an aging management program to ensure a system's intended function exploits the Commission's defense-in-depth philosophy." (SOC, Section V. Public Response to Specific Questions)

The applicant stated that it is inappropriate to generically exclude in-scope passive long-lived electrical components from an AMR based solely on *required* redundancy. However, the multiple generators and circuits associated with the VHS constitute a unique configuration different than that addressed by the *required* redundancy discussion in the SOC. That is, the VHS design incorporates redundancy that is *not required* by regulations.

The applicant also stated that unlike many typical SBO AAC sources, the VHS and portions of the VHS switchyard associated with the SBO AAC source operate continuously. Most SBO AAC sources, such as diesel generators or gas turbine generators, operate in standby service. According to the applicant, the fact that the generators and associated electrical circuits continuously operate provides verification that they remain capable of performing their license renewal intended functions under CLB conditions because no single failure due to the effects of aging can prevent the VHS from fulfilling its license renewal intended function of maintaining greater than 95 percent availability.

The applicant stated that an AMP is not necessary for the electrical components from the VHS generators to the Vernon Tie breaker and that operating experience confirms this conclusion. Historically, VHS reliability has exceeded the reliability specified in guidance documents for meeting the SBO rule, specifically, the 95 percent availability specified in NUMARC 87-00. In fact, historical availability far exceeds that expected from a more typical auxiliary diesel generator or combustion turbine generator. Additionally, the applicant stated that the following ongoing activities provide additional assurance that the SBO AAC source remains capable of performing its license renewal intended function.

(1) The VHS owner plans to replace the medium-voltage underground cable from the VHS powerhouse to the switchyard. This work is scheduled to be performed in the coming year. Only 26 years of operation remain for VYNPS between now and the end of the period of extended operation. Though not formally qualified, modern underground cables are expected to have a service life of greater than 26 years.

(2) The switchyard owner utilizes thermography on a periodic basis to ensure continued reliable switchyard performance.

The applicant also stated in a report that VHS with multiple units, has demonstrated reliability far in excess of an auxiliary generator (99.9 percent compared to 95 percent). Subsequent to 1994, the VHS has continued to demonstrate very high availability. The VHS remained on line throughout the Northeast blackout of August 14, 2003. Both long-term and recent operating experience confirms that normal operation provides reasonable assurance that the VHS will remain capable of performing its intended function in accordance with the CLB throughout the period of extended operation. Notwithstanding the above, VYNPS will monitor the availability of the VHS to ensure continued capability to perform its license renewal intended function, that is, conformance with the availability specified in NUMARC 87-00 for meeting the requirements of the SBO rule. If availability falls below the acceptable level, VYNPS will respond to the condition through the CAP. The CAP requires evaluation and appropriate corrective action to correct the nonconforming condition.

The staff finds the applicant's response unacceptable. The SOC to 10 CFR Part 54 states that redundancy can not be used to generically exclude aging effects for in-scope passive long-lived electrical components. Aging can occur at different rates on redundant trains. Similarly, operating experience and reliability of VHS can not be used to preclude aging effects of in-scope passive long-lived electrical components in VHS. The applicant argued that redundancy of transmission circuits, operating experience, and reliability of VHS preclude an AMR. Regarding the redundance argument, the staff noted that the reason the -redundancy cannot be used to preclude an AMR is that when an SSC is subject to an aging affect, no matter how much redundancies an SSC has, aging will affect all redundant paths/circuits and common cause failures and may prevent them from performing their intended functions. On this basis, the staff concludes that redundancy cannot be used to preclude an AMR. The staff finds that the applicant did not provide an adequate technical justification of how aging effects of in-scope long-lived electrical components from Vernon tie breaker to VHS generators will be managed during the extended period of operation.

In a letter dated January 4, 2007, License Renewal Application, Amendment 23, the applicant provided additional clarification to address RAI 3.6.2.2-N-08-2. Specifically, the applicant stated:

> The switchyard owner utilizes thermography on a periodic basis to ensure continued reliable switchyard performance. To further address the electrical component from the tie breaker to VHS generators, the following describes how aging effects on the VHS switchyard electrical components will be managed during the period of extended operation.
>
> The design of the transmission conductor and switchyard bolted connections preclude the aging effect of increased connection resistance due to torque relaxation. The typical design of switchyard bolted connections includes Bellville washers and no-ox coating. The type of bolting plate and the use of Bellville washers is the industry standard. Combined with the proposer sizing of the conductors, this virtually eliminates the need to consider this aging effect. The switchyard owner performs infrared inspection of the VHS switchyard connections at least annually. Based on this information, increased connection resistance due to torque relaxation of transmission connections is not a significant aging effect. Therefore, increased connection resistance of VHS switchyard connections does not require an AMP at VYNPS.
>
> Thermal infrared inspection was performed at the VHS substation on 10/06/06 and there were no abnormalities found.
>
> Loss of material due to corrosion of connections or surface oxidation is an applicable aging effect, but is not significant enough to cause a loss of intended function. The components in the VHS switchyard are exposed to precipitation, but these components do not experience an appreciable aging effect in this environment, except for minor oxidation, which does not impact the ability of the connections to perform their intended function. The VHS switchyard connection surfaces are coated with an anti-oxidant compound (i.e., a grease-type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connections thus reducing the chances of corrosion. Based on industry operating experience, the method of installation has been shown to provide a corrosion resistant low electrical resistance connection. In addition, the infrared inspection of the VHS switchyard verifies that this is not a significant aging effect for VYNPS. Therefore, it is concluded that general corrosion resulting from oxidation of VHS switchyard connection surface metals is not an AERM at VYNPS.

The staff finds that the applicant’s clarification is acceptable because the design of transmission connections using Bellville washers will eliminate the potential torque relaxation of bolted connections. Anti-oxidant compound will prevent the formation of oxides on the metal surface and to prevent moisture entering the connections thus reducing the chances of corrosion. In addition, routine infrared preventive maintenance is performed at least annually to verify the integrity of switchyard connections. On the basis of its review, the staff finds the applicant's response to RAI 3.6.2.2-N-08-2 is acceptable. The staff finds that aging effects of in-scope long-lived electrical components from Vernon tie breaker to VHS generators are not significant during the period of extended operation and an AMP is not required. Therefore, the staff's concern described in RAI 3.6.2.2-N-08-2 is resolved.

In RAI 3.6.2.2-N-08-3, the staff requested that the applicant identify all inaccessible medium-voltage (2 kV to 35 kV) cables associated with SBO AAC source from the VHS generators to 4.16 kV safety buses at VYNPS. The staff also requested that the applicant provide a description of how aging effects are managed for all inaccessible medium-voltage cables associated with SBO AAC that are exposed to moisture while energized and are not subject to Environmental qualification requirements of 10 CFR 50.49 and provide a description of how these cables will be maintained through the period of extended operation.

In response to the staff’s RAI 3.6.2.2-N-08-3, in a letter dated October 20, 2006, the applicant stated:

> Inaccessible medium-voltage cables associated with SBO AAC source from the VHS generators to 4.16 kV safety buses at VYNPS include the underground cable from the Vernon tie breaker to the Vernon tie transformer, the underground cable from the Vernon tie transformer to the 4.16kV switchgear, and the underground cable between the VHS switchyard and the VHS generators. The medium voltage underground cables from the Vernon tie breaker to the 4.16kV switchgear at VYNPS are in-scope and will be managed by the Non-Environmental Qualification Medium-Voltage Cable Program described in LRA Appendix B. The medium-voltage underground cables from the VHS generators to the VHS switchyard comprise two independent power circuits between the VHS powerhouse and the step-up transformers in the VHS switchyard. Because of the two independent power circuits, the effects of aging will not result in loss of the intended function of the VHS. Failure of a cable due to the effects of aging will be detected and repaired during normal operation without impacting the ability of the VHS to perform its intended function. The applicant also stated that the design incorporates redundancy beyond that required for AAC sources. The SBO rule does not require redundancy of the AAC source. Because of this unique configuration, the fact that the generators and associated electrical circuits are operating is verification that they remain capable of performing their license renewal intended functions under CLB conditions.

The staff noted that the purpose of aging management is to prevent a loss of intended function of a SSC. When a SSC is subject to an aging mechanism, it may not perform its intended function when called upon during a design basis accident. Loss of function due to an aging effect would likely take a long time. Sometimes, aging effects would not show as an immediate indication of problem with the equipment or circuit and are not considered an event. The staff disagrees with the applicant’s argument that redundancy and normal operation of VHS preclude an AMP for inaccessible medium-voltage cables from VHS generators to the VHS switchyard.

The staff is concerned that these cables are subjected to significant moisture and water intrusion while energized and may not perform their intended function of providing an AAC source during an SBO, thus ensuring that the reactor can be safely shutdown.

In a letter dated January 4, 2007, the applicant provided additional information for RAI 3.6.2.2-N-08-3. Specifically, the applicant stated:

> As stated in LRA Section 2.5, VYNPS uses the VHS as an AAC source to satisfy the requirements of 10 CFR 50.63 for response to a SBO. LRA Section 2.5 lists the electrical commodity groups that are subject to an AMR, and non-Environmental qualification inaccessible medium-voltage cables are included. LRA Section 3.6 provides the results of the AMR. Moisture and voltage stress is an applicable environment, and the “Non-Environmental Qualification Inaccessible Medium-Voltage Cable” program manages the aging effect of reduced insulation resistance.
>
> Previous RAI and audit question responses stated that the VHS underground medium-voltage cables do not have aging effects that require management.
>
> Reduced insulation resistance due to moisture and voltage stress is an aging effect for underground medium-voltage cables, but is not significant enough to cause a loss of intended function. The underground cables in the VHS switchyard are exposed to similar environments as the VYNPS underground cables. The VHS underground medium-voltage cable is scheduled to be replaced by the National Grid (TransCanada) in 2007.
>
> The cable planned for installation between the VHS generator and the VHS switchyard is similar to the VYNPS startup transformer to 4160 V switchgear cable.
>
> a Both have ethylene-propylene rubber (EPR) insulation at a 133 % insulation level.
>
> b The VHS cable has specified a chloro-sulfonated polyethylene jacket. Per NEI 06-05 April 2006, “Medium Voltage Underground Cable White Paper,” these jackets provide excellent moisture barriers. This jacket material is equal to or better than the VYNPS jacket.
>
> c Both cables are installed in buried conduit, with a similar physical configuration (e.g., start at an elevated external connection, vertical conduit to the underground conduit, which is a slopped horizontal conduit that penetrates the connecting building).
>
> d VHS and VYNPS are located approximately one-quarter of a mile to each other, so they experience identical environmental conditions. Even though the VHS switchyard is closer to the river and lower in elevation than VYNPS and because the VHS switchyard is located downstream of the VHS, the water table is at a similar level to VYNPS.

e Both cables utilize red or pink EPR insulation, as black EPR production ended in the 1970's. The newer EPR insulation has treated clay fillers to preclude water absorption making the insulation less prone to water degradation than the older black EPR formulations. NEI 06-05 April 2006, "Medium Voltage Underground Cable White Paper" indicates strong performance of red EPR and notes that early EPR failures were due to installation practices.

f Considering:

ii. VHS will install this cable next year.

iii. The proposed extended operation ends in 25 years (March 2032)

The observed good performance of red EPR cable to date for the industry indicated at least 25 to 30 years of cable life, which will extend beyond the VYNPS period of extended operation.

Based on the similarities of the cables, VYNPS proposed to credit testing of startup transformer cables (which are already in-scope) as an alternate method for verifying the VHS cable will continue to perform its intended function during the period of extended operation. This is considered equal or more stringent because of the following:

a The VYNPS cable will have been installed for 3 years longer than the VHS cable providing a leading indicator for the VHS cable.

b The startup transformer cable is loaded intermittently, and the VHS cable is continuously loaded. As such, the VHS cable insulation heating is more even and changes slowly, and therefore dries the cable insulation with fewer electrical transients (cycles). Therefore the startup transformer environment is more severe from this perspective.

c NEI 06-05, April 2006, "Medium Voltage Underground Cable White Paper," Page 1 noted that EPR tends to have a long service life (> 25 years) in wet applications and an even longer service in dry environments.

d If an issue is found during testing of the VYNPS cables, VYNPS will document and address the condition through the Entergy CAP. Corrective actions will include an evaluation to determine the appropriate action to ensure the VHS cables remain capable of performing their intended function.

The VYNPS AMP for the underground medium-voltage from the VHS generators to the VHS switchyard will be similar to the NUREG-1801, XI.E3 program, but will have an exception. The XI.E3 program provides for 100 % testing of all cables included in the program. The exception for the VHS cables will use a representative sample, and the sample population will include the VYNPS cables. The VYNPS cables will be included in XI.E3 program, but the program will use the test results of similar VYNPS cables installed between the startup transformer and the station 4160V switchgear to indicate any potential degradation of the VHS cables.

The staff finds that the applicant’s proposal is unacceptable. Testing of VYNPS cables will not represent the actual condition of VHS underground cables. The environmental condition of cables at VYNPS and VHS is different. VHS is located closer to the river than VYNPS. VYNPS is located approximately one-quarter of a mile from VHS. VHS cables are installed in lower elevation than VYNPS’s cables. The ground water level at VHS is higher than at VYNPS. VHS cables are installed in buried conduit with no manholes. Inspection and removal of water are difficult. Testing of VYNPS cables would not represent the actual condition of cables at VHS. Furthermore, TransCanada owns VHS not-VYNPS. Even if an issue was found during testing of VYNPS cables, there is no binding contractual agreement between VYNPS and TransCanada for TransCanada to take appropriate corrective action for VHS cables. Operating experience has shown that inaccessible medium-voltage cables installed in duct banks, conduits, or buried in dirt may fail earlier than the cable qualified life. The GALL Report recommends testing all inaccessible medium-voltage cables within the scope of license renewal prior to the period of extended operation for cable condition and every 10 years thereafter.The staff position is that testing is not required for cables designed for submerged use (submarine cables) only. The issue of testing inaccessible medium-voltage cables from VHS generators to VHS switchyard remains open.

In response to the staff’s concerning about not testing inaccessible medium cables at VHS, the applicant, in a letter dated March 23, 2007, revised LRA Table 3.6.2-1 and stated that VYNPS will include testing of the underground medium-voltage cables at VHS in the Non-EQ Inacessible Medium-Voltage Cable Program. Testing will be performed before the extended operation and within 10 -year periods after the initial test. This is Commitment #43.

The staff found the applicant’s response acceptable because testing of inaccessible medium voltage cables at VHS will ensure that aging effects of inaccessible medium-voltage due to significant moisture will be managed during the extended period of operation. The staff’s evaluation of this program is SER Section 3.6.2.1. On the basis of its review, the staff determines the applicant's response to RAI 3.6.2.2-N-08-3 acceptable. Therefore, the staff's concern described in RAI 3.6.2.2-N-08-3 is resolved.

In RAI 3.6.2.2.N-08-4, the staff requested the applicant to address the following:

> The applicant has stated that VHS switchyard passive long-lived commodity groups are effectively maintained through routine maintenance by the switchyard owner. Describe this routine maintenance and how it considers aging management of the VHS switchyard passive long-lived commodity groups.

In response to the staff's request, in a letter dated October 20, 2006, the applicant stated:

> Normal operation confirms these components remain capable of performing their intended functions. In addition, because of the two independent power transmission circuits, the effects of aging will not result in loss of the intended function of the VHS. Failure of a cable due to aging will be detected and repaired during normal operation without impacting the ability of the VHS to perform its intended function. Note that the design incorporates redundancy beyond that required for AAC sources. The SBO rule does not require redundancy of the AAC source. Because of this unique configuration, the fact that the generators and associated electrical circuits are operating is verification that they remain capable of performing their license renewal intended functions under CLB conditions.

The staff noted that the applicant again used the redundancy features to address the AMR for electrical components. As discussed above, the staff does not find this argument acceptable. If thermography is used on a periodic basis to detect heating generated by high resistance of switchyard components due to aging effects of oxidation, corrosion, and thermal cycling, this method can be credited to manage the aging of the switchyard component. An applicant that does not believe that aging management is necessary, must provide justification for why an AMP is not necessary. The justification should be technically based and not based on redundancy, operability, and reliability.

In a letter dated January 4, 2007, the applicant provided additional clarification for RAI 3.6.2.2.N-08-4. Specifically, the applicant stated that the swtichyard owner utilizes thermography on a periodic basis (at least annually) to provide additional assurance of continued reliable switchyard performance.

On the basis of its review, the staff finds that the applicant's response to RAI 3.6.2.2-N-08-4 is acceptable. The staff concludes that thermography performed on a periodic basis (at least annually) is a good method to detect heating generated by potential high resistance of switchyard components due to oxidation, and corrosion. Therefore, the staff's concern described in RAI 3.6.2.2-N-08-4 is resolved.

In RAI 3.6.2.2-N-08-5, the staff requested that the applicant addresses the following items as it related to SBO AAC:

(a) Please describe (as stated in GALL XI.E6) how aging effects are managed so that the intended function of cable connections associated with SBO AAC (including VHS) will be maintained during the extended period of operation.

(b) As stated in GALL XI.E5, fuse holders that are within the scope of license renewal should be tested. Provide an AMR and describe how aging effects are managed for fuse holders (metallic clamps) associated with SBO AAC source (including VHS).

(c) Provide a discussion why torque relaxation for bolted connections of switchyard bus within the VHS switchyards (69 kV and 13.8 kV) is not a concern.

(d) Per LRA 3.6, increased resistance of connections due to oxidation is not an applicable aging effect. Provide a discussion as to why increased resistance of connections due to oxidation is not a concern for switchyard bus and switchyard bus connections associated with VHS switchyards.

(e) A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flash over. Please describe how aging effects are managed for high-voltage insulators within the VHS switchyards.

In response to the staff's request for RAI 3.6.2.2-N-08-5(a), in a letter dated October 20, 2006, the applicant stated that:

> Two groups of components constitute the electrical components associated with the SBO AAC source for VYNPS. One group consists of components on the plant side of the Vernon tie breaker. This group of components is included in the evaluation of plant electrical equipment. Aging effects and aging management programs are common with other plant electrical equipment. The second group consists of components between the VHS generators and the Vernon tie breaker. This group of components is not owned or controlled by Entergy.
>
> Metallic parts of electrical cable connections that are exposed to thermal cycling and ohmic heating are those carrying significant current in power supply circuits. Cable connections for the SBO AAC source at the VHS are associated with redundant power circuits with the exception of a small part of the circuit that feeds the step-down transformer upstream of the Vernon tie. This part of the switchyard is normally energized supplying power to local consumers. Normal operation confirms availability of the circuit to perform its license renewal intended function. The fast action of circuit protective devices at high currents mitigates stresses associated with electrical faults and transients. In addition, mechanical stress associated with electrical faults is not a credible aging mechanism because of the low frequency of occurrence for electrical faults. Therefore, electrical transients are not aging mechanisms. Metallic parts of electrical cable connections exposed to vibration are those associated with active components that cause vibration. Active components are not subject to an AMR in accordance with 10 CFR 54.21. In addition, connections required for the SBO AAC source are not associated with rotating equipment that causes vibration. Routine releases of corrosive chemicals to areas inside VHS or the associated switchyard do not occur. Corrosive chemicals are not a normal environment for electrical connections. Contamination of electrical connections causes rapid degradation independent of the age of the connection components. Corrosion due to contamination is due to the contamination event rather than aging. Therefore, chemical contamination is not an aging mechanism for electrical connections. Corrosion and oxidation occur in the presence of moisture or contamination such as industrial pollutants and salt deposits. Enclosures and splice materials protect metal connections from moisture and contamination. In addition, the VHS is not located in an area of significant industrial pollution or near seawater with the potential for salt spray. Therefore, oxidation and corrosion are not applicable aging mechanisms for cable connections. The mechanisms discussed above are not applicable aging

> mechanisms for the SBO AAC source. In addition, normal operation of the VHS circuit components confirms the capability to perform license renewal intended functions. Therefore, no aging management program is necessary for connections. This conclusion is supported by the long history of reliable operation of the Vernon tie line.

On the basis of its review of the applicant's response, the staff determined that the applicant's response was not acceptable. Connections are passive components and in-scope of license renewal. Loosening of bolted connections is an aging effect which must be managed. Thermal cycling, ohmic heating, electrical transients, vibrations, chemical contamination, corrosion, and oxidation are aging mechanisms. Connections associated with cables in-scope of license renewal are part of this program, regardless of their association with active or passive components. Cable lugs are an integral part of cables. Integrity of lugs can be verified by testing connections. GALL AMP XI.E1 manages connections in adverse locations only and inspects insulation degradation. Most connections are not located in adverse locations. SAND 96-0344, "Aging Management Guidelines For Electrical Cable and Terminations," indicated loose terminations were identified by several plants. EPRI-TR-104213, "Bolted Joint Maintenance & Application Guide," indicates that it is difficult to maintain tightness of electrical connections and good conductivity through a large temperature range if the materials for the bolt connections and conductors are different and have different rates of thermal expansion. For example, copper and aluminum expand faster than most bolting materials. The staff was not aware of any action taken to manage the aging effects of cable connections. As discussed in the GALL Report basis document, several applicants reported loose connections due to corrosion, vibration, thermal cycling, etc. Also, past applicants have been using thermography to detect weak/loose connections and correct them as soon as possible and provided an AMP consistent with GALL AMP XI.E6 to manage aging effects of bolted connections.

In a letter dated January 4, 2007, the applicant provided additional information for RAI 3.6.2.2-N-08-5(a). The applicant proposed a one-time inspection of a representative of cable connections subject to an AMR. This AMP for electrical cable connections (metallic parts) accounts for loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. However, the applicant did not mention if the Bolted Cable Connections Program will be applicable to VHS cable connections. The staff requested the applicant to clarify if this AMP is applicable to VHS. The applicant stated that it will provide additional clarification to LRA Table 3.6.1, Item 3.6.1-13. Specifically, the following will be added to the discussion column of LRA Table 3.6.1, Item 3.6.1-13-: "SBO Connections (Vernon tie cable connections) are included in Bolted Cable Connections Program."

By letter dated January 4, 2007 the applicant added to the discussion column of LRA Table 3.6.1, Item 3.6.1-13: "SBO Connections (Vernon tie cable connections) are included in Bolted Cable Connections Program."

On the basis of its review, the staff finds the applicant's response to RAI 3.6.2.2-N-08-5(a) acceptable because the applicant included the SBO connection in its Bolted Connection Program. Therefore, the staff's concern described in RAI 3.6.2.2-N-08-5(a) is resolved.

In response to the staff's request in RAI 3.6.2.2-N-08(b), in a letter dated October 20, 2006, the applicant stated that review of VYNPS documents for the SBO AAC source at VHS revealed that fuse holders that utilize metallic clamps are part of active devices and therefore are not subject to an AMR. Fuse holders inside enclosures of active components, such as switchgear, power supplies, power inverters, battery chargers, and circuit boards, are parts of the larger active device, and are not subject to an AMR.

On the basis of its review, the staff finds the applicant's response to RAI 3.6.2.2-N-08(b) acceptable. The staff concludes that fuse holders at VHS SBO AAC source are part of an active assembly and are not subject to an AMR. Therefore, the staff's concern described in RAI 3.6.2.2-N-08(b) is resolved.

In response to the staff's request in RAI 3.6.2.2-N-08(c), in a letter dated October 20, 2006, the applicant stated that:

> The VHS switchyard employs an aerial cable system (transmission conductors suspended by insulators with vertical taps). Cable connections for the SBO AAC source at the VHS include some bolted connections that are not part of active components. Cable connections for the SBO AAC source at the VHS are associated with redundant power circuits with the exception of a small part of the circuit that feeds the step-down transformer upstream of the Vernon tie. This part of the switchyard is normally energized supplying power to local consumers. Normal operation of the switchyard confirms the ability of these connections to perform their license renewal intended function. The historically high availability of the SBO AAC source demonstrates the effectiveness of normal operation in assuring the ability of the associated connections to perform their license renewal intended function.

The applicant argued that redundancy and normal operation preclude an AMR for cable connections at the VHS switchyard. The SOC to 10 CFR Part 54 states that required redundancy can not be used to preclude aging effects of in-scope passive long-lived electrical components. Torque relaxation for bolted connections is a concern for switchyard cable connections. An electrical connection must be designed to remain tight and maintain good conductivity through a large temperature range. Meeting this design requirement is difficult if the material specified for the bolt and the conductor are different and have different rates of thermal expansion. For example, copper or aluminum bus/conductor materials expand faster than most bolting materials. If thermal stress is added to stresses inherent at assembly, the joint members or fasteners can yield. If plastic deformation occurs during thermal loading (i.e., heatup) when the connection cools, the joint will be loose. EPRI document TR-104213, "Bolted Joint Maintenance & Application Guide," recommends inspection of bolted connections for evidence of overheating, signs of burning or discoloration, and indication of loose bolds. The determined that the applicant has not provided an acceptable technical justification that an AMP is not required for cable connections at VHS switchyard. Therefore, the staff's concern in RAI 3.6.2.2-N-08-5(c) remained unresolved.

In a letter dated January 4, 2007, the applicant provided additional clarification for RAI 3.6.2.2-N-08-5(c). Specifically, the applicant stated:

> The design of the transmission conductor and switchyard bus bolted connections preclude the aging effect increased connection resistance due to torque relaxation. The typical design of switchyard bolted connections includes Bellville washers and no-ox coating. The type of bolting plate and the use of Bellville washers is the industry standard. Combined with the proposer sizing of the conductors, this virtually eliminates the need to consider this aging effect. The switchyard owner performs infrared inspection of the VHS switchyard connections at least annually. Based on this information, increased connection resistance due to torque relaxation of transmission connections is not a significant aging effects. Therefore, increased connection resistance of the VHS switchyard connections does not require an AMP at VYNPS.
>
> Thermal infrared inspection was performed at the VHS substation on 10/06/06 with no abnormalities found.

The staff finds that the applicant's response is acceptable because the design of transmission connections using Bellville washer will eliminate the potential torque relaxation of bolted connections. In addition, routine infrared preventive maintenance is performed at least annually to verify the integrity of switchyard connections. The staff finds that torque relaxation of VHS switchyard connections are not significant during the extended period of operation and an AMP is not required. Therefore, the staff's concern described in RAI 3.6.2.2-N-08(c) is resolved.

In response to the staff's request in RAI 3.6.2.2-N-08-5(d), the applicant stated that:

> NUREG-1801 defines switchyard bus as the uninsulated, unenclosed, rigid electrical conductor or pipe used in switchyards and switching stations to connect two or more elements of an electrical power circuit, such as active disconnect switches and passive transmission conductors. The VHS switchyard employs an aerial cable system (transmission conductors suspended by insulators with vertical taps). No switchyard bus is used in the Sections of the VHS switchyard that support the SBO AAC source. Normal operation of the switchyard confirms the ability of the aerial cable system to perform its license renewal intended function. The historically high availability of the SBO AAC source demonstrates the effectiveness of normal operation in assuring the ability of the switchyard components to perform their license renewal intended function.

As discussed above, redundancy, normal operation or operating experience cannot be used to preclude an AMR. Corrosion of cable connections at VHS switchyard is a concern. This corrosion could create high heat in cable system due to high resistance and could potentially fail the cable system in VHS switchyard. The staff determined that the applicant has not provided a justification of why corrosion of electrical conductor connections is not an aging effect requiring management.

In a letter dated January 4, 2007, License Renewal Application, Amendment 23, the applicant provided additional clarification to RAI 3.6.2.2-N-08-5(d). Specifically, the applicant, in its letter, stated:

> Loss of material due to corrosion of connections or surface oxidation is an applicable aging effect, but is not significant enough to cause a loss of intended function. The components in the VHS switchyard are exposed to precipitation, but these components do not experience an appreciable aging effect in this environment, except for minor oxidation, which does not impact the ability of the connections to perform their intended function. The VHS switchyard connection surfaces are coated with an anti-oxidant compound (i.e., a grease-type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connections thus reducing the chances of corrosion. Based on industry operating experience, the method of installation has been shown to provide a corrosion resistant low electrical resistance connection. In addition, the infrared inspection of the VHS switchyard verifies that this is not a significant aging effect for VYNPS. Therefore, it is concluded that general corrosion resulting from oxidation of VHS switchyard connection surface metals is not an AERM at VYNPS.

The staff finds that the applicant’s response is acceptable because the anti-oxidant compound prevents the formation of oxides on the metal surface and prevents moisture from entering the connections, thus reducing the chances of corrosion. In addition, routine infrared preventive maintenance is performed at least annually to verify the integrity of switchyard connections.

On the basis of its review, the staff finds the applicant's response to RAI 3.6.2.2-N-08-5(d) acceptable and concludes that loss of material due to corrosion of connections or surface oxidation is not significant during the extended period of operation and an AMP is not required. Therefore, the staff's concern described in RAI 3.6.2.2-N-08-5(d) is resolved.

In response to staff’s request in RAI 3.6.2.2-N-08-5 (e), in a letter dated October 20, 2006, License Renewal Application, Amendment No. 17, the applicant stated that:

> Various airborne materials such as dust, salt and industrial effluents can contaminate insulator surfaces. The surface contamination is typically washed away by rain. 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. In those areas, surface contamination buildup can occur in a matter of hours in the event of the right weather conditions. The VHS switchyard is not located near the seacoast where salt spray is applicable. At VYNPS, surface contamination buildup on high-voltage insulators is not a problem since rain removes surface contamination preventing accumulation. Cement growth is a possible aging mechanism for high-voltage insulators used in strain applications. No high-voltage insulators in the VHS switchyard are used in a strain application. Therefore, surface contamination and cement growth are not applicable degradation mechanisms for high-voltage insulators at the VHS and associated switchyard. In addition, normal operation of the switchyard confirms the ability of the insulators to perform their license renewal intended function. The historically high availability of the SBO AAC source

demonstrates the effectiveness of normal operation in assuring the ability of the associated insulators to perform their license renewal intended function.

The applicant also stated that various airborne materials such as salt deposit in coastal areas as well as dust 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. However, 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 costal area or facilities that discharge soot. Since VHS is not located near a coastal area or near industrial effluents area, there are no aging effects requiring management for VHS high-voltage insulators.

The staff finds that degradation of insulator quality due to presence of any salt deposits and surface contamination, and cement growth are not an applicable aging effects requiring management since VHS are not located near a costal area or near an industrial effuents area. On the basis of its review, the staff finds the applicant's response to RAI 3.6.2.2-N-08-5 (e) acceptable. Therefore, the staff's concern described in RAI 3.6.2.2-N-08-5 (e) is resolved.

Conclusion. On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the electrical and I&C system components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.7 Conclusion for Aging Management Review Results

The staff reviewed the information in LRA Section 3, "Aging Management Review Results," and LRA Appendix B, "Aging Management Programs and Activities." On the basis of its review of the AMR results and AMPs, the staff concludes, that the applicant has demonstrated that the aging effects will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR supplement program summaries and concludes that the supplement adequately describes the AMPs credited for managing aging, as required by 10 CFR 54.21(d).

With regard to these matters, the staff concludes that there is reasonable assurance that the applicant will continue to conduct the activities authorized by the renewed license will continue to be conducted in accordance with the CLB, and any changes made to the CLB, in order to comply with 10 CFR 54.21(a)(3), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

SECTION 4

TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This section of the safety evaluation report (SER) addresses the identification of time-limited aging analyses (TLAAs). In license renewal application (LRA) Sections 4.2 through 4.7, Entergy Nuclear Operations, Inc. (ENO or the applicant) addressed the TLAAs for Vermont Yankee Nuclear Power Station (VYNPS). SER Sections 4.2 through 4.8 document the review of the TLAAs conducted by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff).

TLAAs are certain plant-specific safety analyses that involve time-limited assumptions defined by the current operating term. In accordance with Title 10, Section 54.21(c)(1), of the *Code of Federal Regulations* (10 CFR 54.21(c)(1)), applicants must list TLAAs as defined in 10 CFR 54.3.

In addition, as required by 10 CFR 54.21(c)(2), applicants list plant-specific exemptions granted in accordance with 10 CFR 50.12 based on TLAAs. For any such exemptions, the applicant must evaluate and justify the continuation of the exemptions for the period of extended operation.

4.1.1 Summary of Technical Information in the Application

To identify the TLAAs, the applicant evaluated calculations for VYNPS against the six criteria specified in 10 CFR 54.3. The applicant indicated that it had identified the calculations and analyses meeting the six criteria by searching the current licensing basis (CLB), which includes the updated final safety analysis report (UFSAR), engineering calculations, technical reports, engineering work requests, licensing correspondence, and applicable vendor reports. LRA Table 4.1-1, "List of VYNPS TLAA and Resolution," lists the applicable TLAAs:

- reactor vessel neutron embrittlement analyses
- metal fatigue analyses
- Environmental qualification analyses for electrical components
- containment liner plate, metal containment, and penetrations fatigue analyses
- reflood thermal shock of the reactor vessel internals
- BWRVIP-05, RPV circumferential welds analysis
- BWRVIP-25, core plate rim hold-down bolts loss of preload analysis
- BWRVIP-38, shroud support fatigue analysis
- BWRVIP-47, lower plenum fatigue analysis
- BWRVIP-48, vessel ID diameter attachment welds fatigue analysis
- BWRVIP-49, instrument penetrations fatigue analysis
- BWRVIP-74, reactor vessel
- BWRVIP-76, core shroud

In compliance with 10 CFR 54.21(c)(2), the applicant stated that it had not identified exemptions granted in accordance with 10 CFR 50.12, based on a TLAA, as required by 10 CFR 54.3.

4.1.2 Staff Evaluation

LRA Section 4.1 lists the VYNPS TLAAs. The staff reviewed the information to determine whether the applicant has provided sufficient information to comply with10 CFR 54.21(c)(1) and (2).

To comply with 10 CFR 54.3, TLAAs must meet the following six criteria:

(1) involve systems, structures, and components within the scope of license renewal, as required by 10 CFR 54.4(a)

(2) consider the effects of aging

(3) involve time-limited assumptions defined by the current operating term (40 years)

(4) are determined to be relevant by the applicant in making a safety determination

(5) involve conclusions, or provide the basis for conclusions, related to the capability of the system, structure, and component to perform its intended functions, as required by 10 CFR 54.4(b)

(6) are contained or incorporated by reference in the CLB

The applicant listed common TLAAs from US NRC NUREG-1800, Revision 1, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (SRP-LR), dated September 2005. The applicant listed TLAAs applicable to VYNPS in LRA Table 4.1-1.

To comply with 10 CFR 54.21(c)(2), the applicant must list all exemptions granted in accordance with 10 CFR 50.12, based on TLAAs, and evaluated and justified for continuation through the period of extended operation. The LRA states that each active exemption was reviewed to determine whether it was based on a TLAA. The applicant did not identify any TLAA-based exemptions. Based on the information provided by the applicant regarding the process used to identify these exemptions and its results, the staff finds, in accordance with 10 CFR 54.21(c)(2), that there are no TLAA-based exemptions justified for continuation through the period of extended operation.

4.1.3 Conclusion

On the basis of its review, the staff concludes that the applicant provided an acceptable list of TLAAs, as required by 10 CFR 54.21(c)(1). The staff confirms, in accordance with 10 CFR 54.21(c)(2), that no exemption to the requirements of 10 CFR 50.12 had been granted based on a TLAA.

4.2 Reactor Vessel Neutron Embrittlement Analyses

Reactor vessel integrity is governed by the requirements of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." To comply with 10 CFR 50.60, all light-water reactors must meet the fracture toughness, pressure-temperature limits, and material surveillance program requirements of 10 CFR 50, Appendices G and H, for the reactor coolant pressure boundary (RCPB). The CLB analyses evaluating reduction of fracture toughness of the reactor vessel (RV) for 40-years are TLAAs. The RV neutron embrittlement TLAA has been projected to the end of the period of extended operation. Fifty-four effective full-power years (EFPYs) are projected for the end of the period of extended operation (60-years), assuming an average capacity factor of 90 percent for 60-years.

During plant service, neutron irradiation reduces the fracture toughness of ferritic steel in the beltline region of the RV for light-water nuclear power reactors. Areas of review to ensure that the RV and RV internals have adequate fracture toughness to prevent brittle failure during normal and off-normal operating conditions are: (1) RV fluence; (2) operating pressure-temperature (P-T) limits for heatup and cooldown operations, as well as hydrostatic and leak-testing conditions; (3) RV materials Charpy upper-shelf energy (C_VUSE) reduction due to neutron embrittlement; (4) adjusted reference temperature (ART) for RV materials because of neutron embrittlement; (5) RV circumferential weld examination relief; (6) RV axial weld failure probability; (7) reflood thermal shock of the RV internals; (8) BWRVIP-05, RV Axial Welds; and (9) BWRVIP-25, Core Plate. The adequacy of the analyses for these nine review areas is evaluated for the period of extended operation.

The ART is defined as the sum of the initial (unirradiated) reference temperature (RT_{NDT}), the mean value of the adjustment in reference temperature caused by irradiation (delta RT_{NDT}), and a margin term (m). Delta RT_{NDT} is the product of a chemistry factor (CF) and a fluence factor (FF). The CF is dependent upon the amount of copper and nickel in the material and may be determined from tables in Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," or from surveillance data. The FF is dependent upon the neutron fluence. The margin term is dependent upon whether the initial RT_{NDT} is a plant-specific value or a generic value and whether the CF was determined using the tables in RG 1.99, Revision 2, or surveillance data. The margin term is used to account for uncertainties in the values of the initial RT_{NDT}, the copper and nickel contents, the fluence, and the calculation methods. RG 1.99, Revision 2, describes the methodology to be used in calculating the margin term. The mean RT_{NDT} is the sum of the initial RT_{NDT} and the delta RT_{NDT}, without the margin term. The mean RT_{NDT} and ART calculations meet the requirements of 10 CFR 54.3(a). Therefore, they are considered TLAAs. The ART values for the RV materials are used for the P-T limits analysis. The mean RT_{NDT} values are used in the analysis of the circumferential weld examination relief and the axial weld failure probability.

Appendix G of 10 CFR Part 50, provides the requirements for maintaining acceptable levels of upper-shelf energy (USE) for the RV beltline materials of operating reactors throughout the licensed lives of the facilities. 10 CFR 50, Appendix G, requires RV beltline materials to have a minimum USE value of 75 ft-lb in the unirradiated condition and to maintain a minimum USE value above 50 ft-lb throughout the life of the facility, unless it can be demonstrated through analysis that lower values of USE would provide acceptable margins of safety against fracture equivalent to those required by the American Society of Mechanical Engineers Boiler and

Pressure Vessel (ASME) Code, Section XI, Appendix G. 10 CFR 50, Appendix G, also requires that the methods used to calculate USE values must account for the effects of neutron irradiation on the USE values for the materials and must incorporate any relevant RV surveillance capsule data that are reported through implementation of a plant's RV Material Surveillance Program, required by 10 CFR Part 50, Appendix H.

RG 1.99, Revision 2, provides an expanded discussion regarding the calculation of USE values and describes two methods for determining USE values for RV beltline materials, depending on whether or not a given RV beltline material is represented in the plant's RV material surveillance program (i.e., 10 CFR 50, Appendix H program). If surveillance data is not available, the USE value is determined in accordance with RG 1.99, Revision 2, Position 1.2. If surveillance data is available, the USE should be determined in accordance with RG 1.99, Revision 2, Position 2.2. RG 1.99, Revision 2, Figure 2, describes how the percentage drop in USE is dependent upon the amount of copper in the material and the neutron fluence. Since the analyses performed in accordance with 10 CFR Part 50, Appendix G, are based on a flaw with a depth equal to one-quarter thickness ($^1/_4$T) of the RV wall, the neutron fluence used in the USE analysis is the neutron fluence at the $^1/_4$T depth location.

The applicant has described its evaluation of these TLAAs in LRA Section 4.2, "Neutron Embrittlement of the Reactor Vessel and Internals," and LRA Section 4.7, "Other Plant-Specific TLAA." In order to demonstrate that neutron embrittlement does not significantly impact RV and RV internals integrity during the license renewal term, the applicant included a discussion of the following topics related to neutron embrittlement in LRA Sections 4.2 and 4.7:

- RV neutron fluence (LRA Section 4.2.1)
- Operating P-T Limits (LRA Section 4.2.2)
- RV materials Charpy USE reduction due to neutron embrittlement (LRA Section 4.2.3)
- ART for the reactor vessel materials due to neutron embrittlement (LRA Section 4.2.4)
- RV circumferential weld examination relief (LRA Section 4.2.5)
- RV axial weld failure probability (LRA Section 4.2.6)
- Reflood thermal shock of the RV internals (LRA Section 4.7.1)
- BWRVIP-05, RV axial welds, and
- BWRVIP-25, core plate

4.2.1 Reactor Vessel Fluence

4.2.1.1 Summary of Technical Information in the Application

LRA Section 4.2.1 summarizes the evaluation of RV fluence for the period of extended operation. General Electric (GE) Licensing Topical Report NEDC-32983P-A, approved by the staff for licensing applications, documents the method for the neutron flux calculation. The staff finds that this method generally adheres to the guidance in RG 1.190 for neutron flux evaluation. The calculated RV inner diameter (ID) fluence for 51.6 EFPY is 5.16 x 10^{17} n/cm^2 (E greater than 1 MeV). Extrapolated to 54 EFPY, the vessel surface ID fluence is 5.39 x 10^{17} n/cm^2 (E greater than 1 MeV). Using RG 1.99, Revision 2, Equation (3) results in a 54 EFPY $^1/_4$T fluence of 3.98 x 10^{17} n/cm^2 (E greater than 1 MeV). The 40-year beltline consists of four plates (1-14, 1-15, 1-16, 1-17) and their connecting welds, all adjacent to the active fuel zone. There are no nozzles in the beltline region. The beltline was re-evaluated for 60-years with the axial distribution of fast fluence at the reactor pressure vessel (RPV) wall. With the additional fluence during the period of extended operation, the vertical section of the RV ID that will receive more than 1 x 10^{17} n/cm^2 (E greater than 1 MeV) extends from 3.5 inches below the bottom to 10 inches above the top of the active fuel. There are no nozzles in this region. The limiting plate and weld materials in the 40-year beltline remain the limiting materials for the period of extended operation.

4.2.1.2 Staff Evaluation

The staff reviewed LRA Section 4.2.1 to verify, as required by 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

The applicant has provided fluence values for the VYNPS RV beltline materials in LRA Section 4.2.1. These fluence values were used throughout LRA Section 4.2 for the RV neutron embrittlement calculations. RG 1.190 provides guidance regarding acceptable methods for the benchmarking of vessel fluence methodologies based on the requirements of General Design Criterion (GDC) 31 and in part on GDCs 14 and 30. Therefore, the staff's review of the peak vessel fluence evaluation for VYNPS was based the on the adherence of the calculational method to the guidance provided in RG 1.190.

In RAI 4.2-1, the staff requested additional information regarding the end-of-extended life calculated vessel fluence and its axial distribution. By letter dated September 20, 2006, the applicant responded that:

> VYNPS originally performed the fluence extrapolation using a 32 EFPY axial fluence profile provided in GE-NE-0000-2342-R1-NP dated July 2003. The results of this extrapolation were provided in response to RAI 3.1.1-17-P-01.
>
> A 60-year (51.6 EFPY) axial fluence profile is available in GE-NE-0000-0014-0292-01 dated May 2003. Both of these profiles were produced by GE as part of the extended power uprate and both are based on the expected plant operating history including the power uprate. The 60-year curve does show the peak fluence lower in the core (75 inches above the bottom of the active fuel (BAF) versus 85 inches), and consequently the 60-year curve has slightly higher fluence below the active fuel in the area of the recirculation inlet nozzles. VYNPS repeated the extrapolation to 54 EFPY for the 32 EFPY curve and extrapolated the 60 -year curve from 51.6 to 54 EFPY with the following results.

1/4 T fluence, n/cm^2 (E>1 Mev)			
Location	Original Extrapolation from 32 EFPY curve	Revised Extrapolation from 32 curve	Extrapolation from 60-year curve
BAF	9.8E+16	9.8E+16	1.0E+17
BAF + 19%	1.2E+17	1.2E+17	1.2E+17
nozzle	6.7E+16	6.4E+16	7.5E+16
nozzle + 19%	7.9E+16	7.6E+16	9.0E+16

> As indicated in this table, the projected fluence at the nozzle is still less than $1x10^{17}$ n/cm^2 (E>1 Mev). Even when 19 percent is added to the extrapolated value to account for possible error in the calculation as suggested by RAI 3.1.1-17-P-01, all values remain below $1x10^{17}$ n/cm^2
>
> The projected axial fluence profile was based on the projected operating plan, including the extended power uprate; therefore the projected operating plan supports the assumed power distribution to the end of the period of extended operation.

The staff reviewed the applicant's response. The staff determined that the 60-year fluence value was calculated by General Electric using NRC approved methodology. For VYNPS, the end-of extended license irradiation in terms of EFPYs is estimated to be 51.6. The licensee conservatively extrapolated the results to 54 EFPYs. The results of the calculation are recorded in GE-NE-0000-0014-0292-01. The 60-year peak fluence appears at a lower elevation than the 40-year peak fluence. The peak fluence shift resulted from the extended power uprate. The calculation assumed the projected long term operation with the extended power uprate and expected fuel loadings factored into the evaluation.

The staff finds the applicant's response acceptable since the proposed inside diameter peak fluence value of $5.16x10^{17}$ n/cm^2 is at an elevation of 75 inches above the bottom active fuel level. The value is considered to be conservative because of the extension of the operating time by 2.4 EFPYs. On this basis, the staff's concern described in RAI 4.2-1 is resolved.

4.2.1.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of RV fluence in LRA Section A.2.2.1.1 which include the following:

> Calculated fluence is based on a time-limited assumption defined by the operating term. As such, fluence is the time-limited assumption for the TLAA that evaluates RV embrittlement.
>
> GE's Licensing Topical Report NEDC-32983P-A, which was approved by the NRC for licensing applications in Reference A.2-6, documents the method used

for the neutron flux calculation. The staff finds that, in general, this method adheres to the guidance in RG 1.190 for neutron flux evaluation.

The applicant's UFSAR Supplement summary description for the TLAA of the RV fluence appropriately describes how the projected RV fluence is calculated for the extended period of operation for VYNPS.

On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address RV fluence is adequate.

4.2.1.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(ii), that, for RV fluence, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.2 Pressure-Temperature Limits

4.2.2.1 Summary of Technical Information in the Application

LRA Section 4.2.2 summarizes the evaluation of P-T limits for the period of extended operation. 10 CFR Part 50, Appendix G, requires the RV to remain within established P-T limits calculated from materials and fluence data obtained through the Reactor Vessel Surveillance Program, during RV boltup, hydrotest, pressure tests, normal operation, and anticipated operational occurrences. In March 2003, the applicant requested a license amendment to change the P-T limits to incorporate data from analysis of the first surveillance capsule and to extend the curves to 32 EFPY. The staff approved this request as License Amendment 218. As stated in the safety evaluation, the applicant used conservative values of 1.24×10^{18} n/cm^2 (E greater than 1 MeV) peak vessel fluence, 89 °F $^1/_4$T ART, and 73 °F $^3/_4$T ART to determine the P-T limits. LRA Table 4.2-1 compares the bases for the present curves with the projected fluence and ARTs for 54 EFPY and shows that the projected values at 54 EFPY (fluence of 5.39×10^{17} n/cm^2, $^1/_4$T ART of 68.5 °F and a $^3/_4$T ART of 56.9 °F) are still less that those of the P-T curves. As such, the TLAA for P-T limits remains valid for the period of extended operation.

4.2.2.2 Staff Evaluation

The staff reviewed LRA Section 4.2.2 to verify in accordance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

In its March 2003 license amendment request, VYNPS requested use of the present P-T limit curves through 32 EFPY of facility operation. This request was approved by the NRC in a license amendment dated March 29, 2004. The applicant provided a comparison of the fluence and ART values for the 32 EFPY P-T limits with the projected 54 EFPY fluence and ART values for the extended period of operation, based on the 2002 fluence analysis in LRA Table 4.2-1. The staff finds that the new projected 54 EFPY fluence and ART values are, in fact, less than the 32 EFPY fluence and ART values, on which the current technical specification (TS) P-T limits are based.

In its request for additional information (RAI), the staff had a number of questions concerning the applicant's TLAAs. For the P-T limits, it was unclear to the staff why the projected 54 EFPY fluence and ART values from LRA Table 4.2-1 are, in fact, less than the 32 EFPY fluence and ART values for the current TS P-T limits. Therefore, the staff requested, in RAI 4.2.2-1, that the applicant discuss the 1984 fluence analysis assumptions that resulted in conservative values for the 32 EFPY neutron fluence and ART values, taking into consideration why the 32 EFPY fluence and ART values are more conservative relative to the projected 54 EFPY fluence and ART values based on the 2002 fluence analysis.

In its response to RAI 4.2.2-1, the applicant stated that the current 32 EFPY P-T limits were originally prepared based on a $^{1}/_{4}$T fluence of 1.24 x 10^{18} n/cm^2 (E greater than 1 MeV) from the 1984 fluence analysis. This fluence value was determined to be overly conservative based a subsequent 32 EFPY fluence calculation that generated a $^{1}/_{4}$T fluence value of 2.2 x 10^{17} n/cm^2 (E greater than 1 MeV) from the 2002 fluence analysis. However, the applicant opted not to amend the existing 32 EFPY P-T limits to incorporate the 2002 32 EFPY fluence calculation, based on time and expense associated with the TS amendment. Therefore, the conservative existing P-T limits based on the 1984 32 EFPY fluence values were retained in the TSs. Given the conservatism inherent in the 1984 32 EFPY fluence and ART values, the applicant determined that the projected 54 EFPY fluence and ART values from the 2002 fluence analysis would remain bounded by the fluence and ART values for the 32 EFPY P-T limits currently established in the VYNPS TSs. The staff reviewed the applicant's response and finds the response acceptable since the projected 54 EFPY fluence and ART values from the 2002 fluence analysis would remain bounded by the fluence and ART values for the 32 EFPY P-T limits currently established in the VYNPS TSs. On this basis, the staff's concern described in RAI 4.2.2-1 is resolved.

In RAI 4.2.2-2, the staff requested that the applicant discuss whether the 54 EFPY P-T limit curve bases (fluence and ART values) from the 2002 fluence analysis summarized in LRA Table 4.2-1 take into consideration the VYNPS extended-power uprate (EPU) conditions. In its response to RAI 4.2.2-2, the applicant stated that the projected 54 EFPY fluence from the 2002 fluence analysis was calculated taking into consideration EPU conditions. Therefore, the 32 EFPY fluence and ART values from LRA Table 4.2-1 still bound the projected 54 EFPY fluence and ART values, including consideration of EPU conditions through the end of the period of extended operation. The staff reviewed the applicant's response and finds the response acceptable since the 32 EFPY fluence and ART values still bound the projected 54 EFPY fluence and ART values, including consideration of EPU conditions through the end of the period of extended operation. On this basis, the staff's concern described in RAI 4.2.2-2 is resolved.

The staff does not require the P-T limit curves for the extended period of operation to be submitted as part of the applicant's LRA for this TLAA. However, the staff does require NRC approval of the P-T limit curves for the extended period of operation prior to the expiration of the facility's current P-T limit curves. LRA Section 4.2.2 of VYNPS states that the P-T limit curve bases for 54 EFPY are bounded by the bases for the current P-T limit curves, and, as such, the TLAA for the P-T limits remains valid in compliance with 10 CFR 54.21(c)(1)(i). Therefore, the staff requested, in RAI 4.2.2-3, that the applicant indicate when it intends to submit P-T limit curves for NRC approval for the extended licensed period of operation (54 EFPY).

In its response to RAI 4.2.2-3, the applicant stated that it plans to submit a TS amendment requesting extension of the P-T limit curves prior to the expiration of the P-T limit curves currently established in the VYNPS TSs. The staff reviewed the applicant's response and finds the response acceptable since the applicant indicated that it plans to submit a P-T limit curves for NRC approval for the extended licensed period of operation. On this basis, the staff's concern described in RAI 4.2.2-3 is resolved.

The staff finds that the applicant's plan to manage the P-T limits is acceptable because changes to the P-T limit curves will be implemented by the license amendment process (i.e., through revisions of the plant TS) and will meet the requirements of 10 CFR 50.60 and 10 CFR 50, Appendix G.

4.2.2.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of P-T limits in LRA Section A.2.2.1.2. which include the following:

> In March 2003, VYNPS submitted a license amendment request (Reference A.2-4) to change the P-T limits to incorporate data from analysis of the first VYNPS surveillance capsule and to extend the curves to 32 EFPY. The NRC approved this submittal as Amendment 218 to the VYNPS license (Reference A.2-5). As stated in the SER (Reference A.2-5), VYNPS used conservative values for determining the 32 EFPY P-T limits. The projected fluence and ARTs for 54 EFPY, including the EPU, are still less than the conservative values on which the 32 EFPY P-T curves are based. As such the current 32 EFPY P-T limits do not require modification for the period of extended operation and the TLAA remains valid in compliance with 10 CFR 54.21(c)(1)(i).

The staff finds applicant's UFSAR Supplement summary description of the TLAA for the P-T limits appropriately describes how the applicant will determine the P-T limits for the extended period of operation for VYNPS.

On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address P-T limits is adequate.

4.2.2.4 Conclusion

The staff reviewed the applicant's TLAA for the P-T limits, as summarized in LRA Section 4.2.2, including the RAI response, dated November 9, 2006, and finds that the applicant plans to submit an application to amend the P-T limits for the period of extended operation for VYNPS in accordance with the applicable regulatory requirements. The staff therefore concludes that the applicant's TLAA for the VYNPS P-T limits will be in compliance with the staff's acceptance criterion for TLAAs as required by CFR 54.21(c)(1)(ii), when the amendment application to revise the P-T limits for the period of extended operation is submitted and the staff-approved P-T limits are incorporated into the VYNPS TS. Safety margins established and maintained during the current operating term will be maintained during the period of extended operation as required by 10 CFR 54.21(c)(1).

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that, for P-T limits, the analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.3 Charpy Upper-Shelf Energy

4.2.3.1 Summary of Technical Information in the Application

LRA Section 4.2.3 summarizes the evaluation of C_VUSE for the period of extended operation. 10 CFR 50, Appendix G, requires that RV beltline materials "have Charpy upper-shelf energy … of no less than 75 ft-lb initially and must... maintain Charpy upper-shelf energy throughout the life of the vessel of no less than 50 ft-lb."

RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," provides two methods or positions for estimating C_VUSE at end of life. Position 1 applies to material without surveillance data and Position 2, to material with surveillance data. Position 2 requires a minimum of two sets of credible material surveillance data. As the applicant has data from only one material surveillance capsule, Position 2 does not apply. For Position 1, the percentage drop in C_VUSE for a stated copper content and neutron fluence is determined by reference to RG 1.99, Revision 2, Figure 2.

This percentage drop is applied to the initial C_VUSE to obtain the adjusted C_VUSE. LRA Table 4.2-2 calculates the end of life C_VUSE by this method. Safety Analysis Report NEDC-33090P documents the most recent calculations of C_VUSE. Analyses were done for 51.6 EFPY. Results of NEDC-33090P were extrapolated to 54 EFPY. The unirradiated surveillance specimens were from plate 1-14 with a C_VUSE of 89 ft-lb (137 ft-lb times 0.65). The 54 EFPY C_VUSE value for plate 1-14 was calculated according to RG 1.99, Position 1, Figure 2. Specifically, the calculation used the formulae for the lines to calculate the percentage drop in C_VUSE with the fluence determined in SER Section 4.2.1. For 54 EFPY, LRA Table 4.2-2 shows the minimum projected C_VUSE for plate 1-14 remaining above the 50 ft-lb requirement of 10 CFR Part 50, Appendix G.

Initial (un-irradiated) USE data for the weld materials and for plates 1-15, 1-16, and 1-17 do not exist. The BWR Owners Group prepared an equivalent margins analysis (EMA) for plants without this data in topical report BWRVIP-74, "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines (BWRVIP-74)." The NRC reviewed and accepted the evaluation, as documented in the staff's SER on BWRVIP-74, dated July 27, 2001. Calculation of plant-specific end of life (EOL) USE is impossible without initial USE data for RV beltline materials. Therefore, based upon BWRVIP-74, a plant without initial USE data may calculate the percent drop in USE and show that the percent drop is less than the percent drop from the EMA. BWRVIP-74 gives allowable percent drops in USE of 23.5 percent for BWR 3-6 plates and 39 percent for welds. LRA Table 4.2-3 uses the BWRVIP-74 method to verify that the reductions in USE for limiting RV beltline plate and weld materials at VYNPS remain less than the reduction calculated in the BWRVIP-74 EMA. The EMA for the non-limiting plates and welds are shown in LRA Table 4.2-2, along with the EOL USE data for RV beltline plate 1-14. For RV beltline plate 1-14, the applicant was able to directly demonstrate that the actual calculated EOL USE value remained above the 50 ft-lb acceptance requirement of 10 CFR 50, Appendix G. Therefore, the use of the EMA from the BWRVIP-74 report was not required. As such, this TLAA has been projected to the end of the period of extended operation as required by 10 CFR 54.21(c)(1)(ii).

4.2.3.2 Staff Evaluation

The staff reviewed LRA Section 4.2.3 to verify in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

Section IV.A.1.a of 10 CFR Part 50, Appendix G to, requires in part that RV beltline materials have C_VUSE values in the transverse direction for base metal and along the weld for weld material of no less than 50 ft-lb, unless it is demonstrated in a manner approved by the staff, that lower values of C_VUSE will ensure margins of safety against fracture equivalent to those required by ASME Code, Section XI, Appendix G.

According to RG 1.99, Revision 2, the predicted decrease in USE due to neutron embrittlement during plant operation is dependent upon the amount of copper in the material and the predicted neutron fluence for the material. RG 1.99, Revision 2, Position 1.2, specifies methods for calculating the predicted decrease in USE for materials that do not have sufficient credible surveillance data available. The staff finds that the applicant correctly used Position 1.2 for calculating the predicted percentage decrease in USE for the extended period of operation, because only one credible set of surveillance data is available for the VYNPS RV.

Initial USE values were unavailable for RV beltline plates 1-15, 1-16, 1-17, and all welds at VYNPS. As such, the applicant utilized the results of the EMA that were summarized in BWRVIP-74, Appendix B. The EMA from BWRVIP-74 utilized the technique originally developed in GE Topical Report NEDO-33205-A, “10 CFR Part 50, Appendix G, Equivalent Margin Analysis for Low Upper-Shelf Energy in BWR/2 through BWR/6 Vessels,” Revision 1, February 1994. The staff finds that the applicant correctly applied the acceptance criteria from BWRVIP-74 for the allowable percentage drop in the USE by demonstrating the predicted percentage decrease in the USE at 54 EFPY, as determined from RG 1.99, Revision 2, Position 1, was less than the EMA acceptance criteria for these plates and welds.

The applicant was able to directly calculate the predicted EOL USE value for RV beltline plate 1-14 at VYNPS because initial (unirradiated) values for USE were available for this particular plate. The staff confirmed that the initial USE values were appropriately based on credible surveillance data that were representative of plate 1-14. The applicant appropriately determined the predicted EOL USE values for the extended period of operation by applying the predicted percentage decrease in USE from RG 1.99, Revision 2, to the initial USE values.

The applicant submitted plant-specific information in LRA Tables 4.2-2 and 4.2-3 to demonstrate that the applicable beltline materials for the VYNPS RV meet the applicable EMA acceptance criteria from the BWRVIP-74 report and, in the case of plate 1-14, the predicted EOL USE meets the requirements of 10 CFR 50, Appendix G, at the end of the extended operating period. The projected USE data at the end of the period of extended operation for the limiting beltline plate and weld materials are summarized in the table below.

VY RV Material	RG 1.99, Revision 2 Predicted USE % Drop Or EOL USE Value	EOL USE Acceptance Criterion	Evaluation Result
Limiting Plate 1-15[1]	10.7%	% USE drop must be < 23.5%	Acceptable per 10 CFR 54.21(c)(1)(ii)
Limiting Welds 1-338A, B, C[1]	11.19%	% USE drop must be < 39%	Acceptable per 10 CFR 54.21(c)(1)(ii)
Plate 1-14[2]	67.7	USE must be > 50 ft-lb	Acceptable per 10 CFR 54.21(c)(1)(ii)

[1] As noted in text, acceptance criteria established per BWRVIP-74
[2] As noted in text, acceptance criteria established per 10 CFR 50, Appendix G.

The staff verified the values for the percent decrease in USE resulting from neutron irradiation using the methodology in RG 1.99, Revision 2 and finds that all the beltline materials meet the applicable acceptance criteria.

4.2.3.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of C_VUSE in LRA Section A.2.2.1.3. which included the following:

> The predictions for percent drop in USE at 54 EFPY are based on chemistry data and unirradiated USE data submitted to the NRC in support of the VYNPS power uprate, and the $^1/_4$T fluence maximum value.
>
> The 54 EFPY USE values were calculated using RG 1.99, Position 1, Figure 2; specifically, the formula for the lines was used to calculate the percent drop in USE.
>
> Because VYNPS does not have complete unirradiated data for all beltline materials, equivalent margin analyses were done for the limiting plate and weld, using the technique in NEDO-32205. The results showed that the percent reductions in USE are less than the limiting decreases identified in the NRC SER for BWRVIP-74. A conservative assumption used in the calculation of USE reduction is that no credit is taken for axial or azimuthal lead factors to reduce the peak fluence. Instead, the maximum calculated $^1/_4$T fluence value is assumed for all plates and welds.

The applicant’s UFSAR Supplement summary description is consistent with the staff analysis for the TLAA of the USE in SER Section 4.2.3.2. The UFSAR Supplement summary description summarizes the applicable USE requirements that must be met to ensure continued compliance with 10 CFR 50, Appendix G, during the period of extended operation. The staff therefore finds that UFSAR Supplement summary description for the TLAA of the USE is acceptable.

On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant’s actions to address C_VUSE is adequate.

4.2.3.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that, for C_VUSE, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.4 Adjusted Reference Temperature

4.2.4.1 Summary of Technical Information in the Application

LRA Section 4.2.4 summarizes the evaluation of ART for the period of extended operation. Irradiation by high-energy neutrons raises the value of RT_{NDT} for the RV. RT_{NDT} is the reference temperature for nil-ductility transition as defined in ASME Code, Section NB-2320. The initial RT_{NDT} is determined through testing un-irradiated material specimens. The shift in reference temperature, ΔRT_{NDT}, is the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. The ART = RT_{NDT} + ΔRT_{NDT} + margin.

The applicant's response to General Letter (GL) 92-01 included chemistry data; interpolated chemistry factors (CFs) from RG 1.99, Table 1; initial RT_{NDT} values and standard deviations from NEDC-33090P, Table 3-2a, "Safety Analysis Report;" and calculated margins as twice the square root of the sum of the squares of the two standard deviations. ARTs were for $^1/_4$T fluence. FFs were calculated using RG 1.99, Revision 2, Equation 2.

The applicant calculated extrapolated ΔRT_{NDT} values by multiplying the CF and the FF for each plate and weld, then added the initial RT_{NDT}, the calculated ΔRT_{NDT}, and the calculated margins for the new ART value. LRA Table 4.2-4 shows the 54 EFPY values of ART. As shown in the table, the plates remain the limiting subcomponents rather than the welds, and plate 1-14 remains the limiting plate. All calculated values are well below the 200 °F suggested in RG 1.99, Section 3, and are acceptable for the period of extended operation. The TLAA for RT_{NDT} is thus projected through the period of extended operation.

4.2.4.2 Staff Evaluation

The staff reviewed LRA Section 4.2.4 to verify in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

The applicant calculated the 54 EFPY fluences for the VYNPS RV beltline materials using the fluence methodology of GE's Licensing Topical Report NEDC-32983P-A. Since this methodology is approved by the NRC, the calculated fluences provided in the LRA are acceptable. The fluence values for the VYNPS RV beltline materials at 54 EFPY, given in LRA Table 4.2-4, correspond to the fluence values provided in LRA Section 4.2.1.

In reviewing the initial RT_{NDT} data, chemistry data (percent Cu and percentNi), and CF values for the RV beltline materials provided by the applicant in LRA Table 4.2-4, the staff found that initial RT_{NDT} values were provided that are less conservative than the corresponding initial RT_{NDT} values that were established in the staff's Reactor Vessel Integrity Database (RVID) for the VYNPS RV beltline materials. Based on the non-conservatism with respect to the initial RT_{NDT}

values established in the RVID, the staff requested, in RAI 4.2.4-1, that the applicant provide additional information that points to where the NRC staff authorized the use of the specific initial RT_{NDT} values listed in LRA Table 4.2-4 for determining the ART values.

In its November 9, 2006 response to RAI 4.2.4-1, the applicant stated that the initial RT_{NDT} values listed in LRA Table 4.2-4 were originally provided to the NRC with the proposed TS amendment submitted on September 10, 2003, in support of the EPU. The NRC SER authorizing the EPU was issued on March 2, 2006. The justification for the use the initial RT_{NDT} values listed in LRA Table 4.2-4 was provided in Report NEDC-33090P, "Updated Evaluation of Reactor Pressure Vessel Material Properties for Vermont Yankee Nuclear Power Station," which was included as part of September 2003 submittal for the proposed EPU TS amendment. This technical report was previously evaluated by the staff as part of the review for the EPU. In the course of performing the review for the EPU, the NRC performed confirmatory calculations of the 32 EFPY ART values under EPU conditions and concluded that the ART values were acceptable, based, in part, on the new initial RT_{NDT} values. The staff finds that this response resolves the issue in RAI 4.2.4-1.

The staff independently reviewed all ART calculations in LRA Table 4.2-4 based on the approved chemistry and fluence data and finds that the applicant appropriately followed the guidance of RG 1.99, Revision 2, in determining the projected 54 EFPY ART values for the VYNPS RV beltline materials.

4.2.4.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of adjusted reference temperature in LRA Section A.2.2.1.4. which include the following:

> VYNPS has projected values for ART at 54 EFPY using the methodology of RG 1.99. These values were calculated using the chemistry data, margin values, initial RT_{NDT} values, and chemistry factors (CFs) submitted to the NRC in support of the VYNPS power uprate, and the $^1/_4$T fluence maximum value. New fluence factors (FFs) were calculated using the expression in RG 1.99, Revision 2, Equation 2 using 54 EFPY fluence values.
>
> The RT_{NDT} TLAA has been projected through the period of extended operation, with acceptable results, in compliance with 10 CFR 54.21(c)(1)(ii).

The staff finds that the applicant used the staff-approved methods of RG 1.99, Revision 2, for calculating projected 54 EFPY ART values for the VYNPS RV beltline materials. The applicant's UFSAR Supplement summary description is consistent with the staff analysis for the TLAA of the ART in SER Section 4.2.4.2.

On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address adjusted reference temperature is adequate.

4.2.4.4 Conclusion

The staff reviewed the applicant's TLAA of the ART calculations, as summarized in SER Section 4.2.4, including the RAI response dated November 9, 2006, and finds that the applicant's calculations of the ART values for the RV beltline materials, as projected through the period of extended operation for VYNPS, are in conformance with the recommended guidelines of RG 1.99, Revision 2.

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that, for adjusted reference temperature, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.5 Reactor Vessel Circumferential Welds Inspection Relief

4.2.5.1 Summary of Technical Information in the Application

LRA Section 4.2.5 summarizes the evaluation of RV circumferential welds inspection relief for the period of extended operation. BWRVIP-74 reiterated the recommendation of BWRVIP-05 to exempt RPV circumferential welds from examination. The NRC SER for BWRVIP-74 agrees but requires plants to request this relief individually by demonstrating that at the expiration of the current license the circumferential welds will satisfy the BWRVIP-05 limiting conditional failure probability for circumferential welds. The applicant requested relief but has evaluated the welds only to the end of the current period of operation. The changes in metallurgical conditions expected over the period of extended operation require additional analysis for 54 EFPY for the RV circumferential weld inspection relief request. The evaluations have been projected to 54 EFPY. The applicant's relief request includes an analysis showing that the RV parameters after 32 EFPY were within the bounding Chicago Bridge & Iron (CBI) 32 EFPY vessel parameters so for the circumferential welds, there is a conditional probability of failure lower than that stated in the safety evaluation of BWRVIP-05.

The staff's evaluation of BWRVIP-05 utilized the FAVOR code to perform a probabilistic fracture mechanics analysis to estimate the RV shell weld failure probabilities. Three key assumptions of the probabilistic fracture mechanics analysis were: 1) the neutron fluence was the estimated EOL mean fluence; 2) the chemistry values were mean values based on vessel types; and 3) the potential for beyond-design-basis events was considered. LRA Table 4.2-5 provides a comparison of the VYNPS RV limiting circumferential weld parameters to those used in the NRC evaluation of BWRVIP-05 for the first two key assumptions. Data provided in LRA Table 4.2-5 was supplied from BWRVIP-05, Table 4.4 and BWRVIP-05, "Final Safety Evaluation Report," Table 2.6-5.

The VYNPS 54 EFPY fluence is substantially lower than the limits of the NRC analysis. As a result, the shift in reference temperature, delta RT_{NDT}, is lower for VYNPS at 54 EFPY compared to the NRC analysis. This lower delta RT_{NDT} value yields a mean RT_{NDT} value that is considerably lower than the NRC mean analysis value. Therefore, the RV circumferential shell weld embrittlement due to neutron irradiation has a negligible effect on the probabilities of RV circumferential shell weld failure. The mean RT_{NDT} value at 54 EFPY is bounded by the 64 EFPY mean RT_{NDT} provided by the NRC.

Based on this analysis, the applicant concluded that the VYNPS RV circumferential weld conditional failure probability is bounded by the staff analysis of BWRVIP-05. The RPV circumferential weld parameters at 54 EFPY will remain within the staff's (64 EFPY) bounding CBI vessel parameters. Thus, the conditional probability of failure for the circumferential welds remains below that stated in the staff's safety evaluation of BWRVIP-05. This analysis has been projected for the period of extended operation.

4.2.5.2 Staff Evaluation

The staff reviewed LRA Section 4.2.5 to verify, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

The technical basis for relief from the ASME Code, Section XI, "Circumferential Weld Inservice Inspection (ISI) Requirements," is discussed in the staff's final SER concerning the BWRVIP-05 report, which is enclosed in a July 28, 1998, letter from Mr. G.C. Lanais, NRC, to Mr. C. Terry, the BWRVIP Chairman. In this letter, the staff concludes that since the failure frequency for circumferential welds in BWR plants is significantly below the criterion specified in RG 1.154, "Format and Content of Plant-Specific Pressurized Thermal Shock Safety Analysis Reports for Pressurized Water Reactors," and below the core damage frequency of any BWR plant, the continued inspection would result in a negligible decrease in an already acceptably low RV failure probability. Therefore, elimination of the ISI requirements for RV circumferential welds is justified. The staff's letter indicated that BWR applicants may request relief from the ISI requirements of 10 CFR 50.55a(g) for volumetric examination of circumferential RV welds by demonstrating that: (1) at the expiration of the license, the circumferential welds satisfy the limiting conditional failure probability for circumferential welds in the NRC staff's July 28, 1998 evaluation, and (2) the applicant implemented operator training and established procedures that limit the frequency of cold over-pressure events to the frequency specified in the staff's SER. The letter indicated that as part of any BWR LRA, the requirements for inspection of RV circumferential welds during an additional 20-year extended operating period must be reassessed, on a plant-specific basis. In addition, the applicant must request relief from the ISI requirements for volumetric examination of circumferential welds for the extended license term in accordance with the requirements of 10 CFR 50.55a(g).

Section A.4.5 of the BWRVIP-74 report indicates that the staff's SER of the BWRVIP-05 report conservatively evaluated the BWR RVs to 64 EFPY, which is 10 EFPY greater than what is realistically expected for the end of the extended operating period. The NRC staff used the mean RT_{NDT} value to evaluate the failure probability of BWR circumferential welds at 32 and 64 EFPY in the staff SER on the BWRVIP-05 report, dated July 28, 1998. The neutron fluence used in this evaluation was the neutron fluence at the RV inner diameter clad-weld interface.

Since the staff analysis discussed in the BWRVIP-74 report is a generic analysis, the applicant submitted plant-specific information to demonstrate that the VYNPS beltline materials meet the criteria specified in the report. To demonstrate that the VYNPS RV has not become embrittled beyond the basis for the relief, the applicant, in LRA Table 4.2-5, supplied a comparison of 54 EFPY material data for the limiting VYNPS circumferential weld with that of the 64 EFPY reference case in Appendix E of the staff's SER of the BWRVIP-05 report. The VYNPS material data included amounts of copper and nickel, chemistry factor, the neutron fluence, delta RT_{NDT}, initial RT_{NDT}, and mean RT_{NDT} for the limiting circumferential weld at the end of the period of extended operation. The staff verified the validity of the data for the copper and nickel contents and the initial RT_{NDT} values for the VYNPS RV beltline materials based on the evaluation in SER Section 4.2.4. The 54 EFPY mean RT_{NDT} value for the limiting beltline circumferential weld at VYNPS is 32.9 °F. The staff checked the applicant's calculations using the data presented in LRA Table 4.2-5 and found them accurate. This 54 EFPY mean RT_{NDT} value for the limiting VYNPS circumferential weld is bounded by the 64 EFPY mean RT_{NDT} value of 70.6 °F used by the NRC for determining the conditional failure probability of a circumferential weld. The 64 EFPY mean RT_{NDT} value from the staff SER dated July 28, 1998, is representative of a Chicago Bridge & Iron (CBI) weld because CBI fabricated the circumferential welds in the VYNPS RV. Since the VYNPS 54 EFPY mean RT_{NDT} value is less than the 64 EFPY value from the staff SER dated July 28, 1998, the staff concludes that the VYNPS RV conditional failure probability is bounded by the NRC analysis.

Based on the above, the staff finds that the applicant adequately addressed condition (1) from BWRVIP-74, Section A.4.5 by demonstrating that the VYNPS RV circumferential welds will satisfy the limiting conditional failure probability for circumferential welds established in the staff's SER on BWRVIP-05 at the end of the period of extended operation. However, the applicant did not address condition (2) from BWRVIP-74, Section A.4.5, which specifies that applicants must demonstrate that they have implemented operator training and established procedures that limit the frequency of cold over-pressure events to the frequency specified in the staff's SER. In RAI 4.2.5-1, the staff requested that the applicant address condition (2) as it relates to the proposed period of extended operation.

In its response to RAI 4.2.5-1, the applicant provided a description of reactor operator training and related procedural controls designed to limit the frequency of cold over-pressure events. This description was included in the original request for relief from RV circumferential weld examination requirements for the current licensed operating term. As part of its response to RAI 4.2.5-1, the applicant stated that this training remains in effect and will continue throughout the period of extended operation. Based on its review, the staff finds that the applicant's response to RAI 4.2.5-1 is acceptable because the applicant adequately addressed condition (2) from BWRVIP-74, pertaining to the implementation of operator training and procedures for limiting the frequency of cold over-pressure events that will remain in effect during the period of extended operation. The staff's concern described in RAI 4.2.5-1 is resolved.

In accordance with 10 CFR 50.55a(g), the staff requires that a request for relief from the ASME Code, Section XI, "Circumferential Shell Weld Examination Requirements" be submitted for the extended period of operation. In RAI 4.2.5-2, the staff requested that the applicant indicate when it would apply for relief from the ASME Code, Section XI "Circumferential Shell Weld Examination Requirements" for the extended licensed period of operation.

In its response to RAI 4.2.5-2, the applicant stated that it will submit the necessary relief request for each ISI interval within 12 months after the completion of the previous ISI interval, as required by 10 CFR 50.55a(g). The staff finds the applicant's response to RAI 4.2.5-2 acceptable. The staff's concern described in RAI 4.2.5-2 is resolved.

In the July 28, 1998 SER on BWRVIP-05, the staff concludes that examination of the RV circumferential shell welds must be performed if the corresponding volumetric examinations of the RV axial shell welds revealed the presence of an age-related degradation mechanism. In RAI 4.2.5-3, the staff requested that the applicant confirm whether or not previous volumetric examinations of the RV axial shell welds have shown any indication of cracking or other age-related degradation mechanisms in the welds.

In its response to RAI 4.2.5-3, the applicant stated that previous examinations of the RV axial shell welds at VYNPS have not identified any relevant indications of cracking or other age-related degradation mechanisms in the welds. The staff finds the applicant's response to RAI 4.2.5-3 acceptable. The staff's concern described in RAI 4.2.5-3 is resolved.

The staff finds that the applicant's evaluation for this TLAA is acceptable because the VYNPS 54 EFPY conditional failure probability for the RV circumferential welds is bounded by the NRC analysis in the staff SER dated July 28, 1998, and the applicant will be using procedures and training to limit cold over-pressure events during the period of extended operation. This analysis satisfies the evaluation requirements of the staff SER dated July 28,1998. However, the applicant is still required to request relief for the circumferential weld examination for the extended period of operation as required by 10 CFR 50.55a(g).

4.2.5.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of RV circumferential welds inspection relief in LRA Section A.2.2.1.5., which includes:

> Relief from RV circumferential weld examination requirements of GL 98-05 is based on assessments indicating an acceptable probability of failure per reactor operating year. The analysis is based on RV metallurgical conditions as well as flaw indication sizes and frequencies of occurrence that are expected at the end of a licensed operating period.
>
> VYNPS requested NRC approval for this relief for the remainder of the original 40-year license term. The basis for this request is an analysis that satisfied the limiting conditional failure probability for the circumferential welds at the expiration of the current license, based on the NRC SERs for BWRVIP-05 and BWRVIP-74 and the extent of neutron embrittlement.
>
> The 54 EFPY fluence value for VYNPS is considerably lower than the corresponding 64 EFPY generic value. As a result, the shift in reference temperature is lower than the 64 EFPY shift in the NRC analysis. However, the unirradiated reference temperature of the VYNPS material is higher than the initial value assumed in the NRC analysis. This combination of opposing effects yields an adjusted reference temperature that is lower than the NRC mean analysis value. Therefore, this TLAA has been projected to the end of the period of extended operation as required by 10 CFR 54.21(c)(1)(ii).

The applicant's UFSAR Supplement summary description for the TLAA of the RV circumferential weld examination relief appropriately discusses how the conditional failure probability for the RV circumferential welds is bounded by the NRC analysis in the staff SER dated July 28, 1998. The applicant's UFSAR Supplement summary description is consistent with the staff analysis for the TLAA of the RV circumferential weld examination relief in SER Section 4.2.5.2.

On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address RV circumferential welds inspection relief is adequate.

4.2.5.4 Conclusion

The staff reviewed the applicant's TLAA of the RV circumferential weld examination relief, as summarized in LRA Section 4.2.5, including the RAI response dated November 9, 2006. The staff finds that the applicant appropriately describes how the conditional failure probability for the RV circumferential welds is bounded by the NRC analysis in the staff SER on the BWRVIP-05 report, dated July 28, 1998, and how the applicant's procedures and training will be used to limit cold over-pressure events during the period of extended operation for VYNPS.

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, as required by 10 CFR 54.21(c)(1)(ii), that, for RV circumferential welds inspection relief, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.6 Reactor Vessel Axial Weld Failure Probability

4.2.6.1 Summary of Technical Information in the Application

LRA Section 4.2.6 summarizes the evaluation of RV axial weld failure probability for the period of extended operation. Applicants must show that the failure frequency of axially-oriented RPV welds remains below the 5×10^{-6} calculated in the BWRVIP-74 SER. This finding is documented in the March 7, 2000 BWRVIP-05 supplement to the final SER. The supplement, provided by the BWRVIP, contains the NRC staff evaluation of information regarding axial weld failure rates due to low temperature over-pressure events, using specific staff recommendations on input variables. The axial weld failure probability meets the requirements of 10 CFR 54.3(a). As such, it is a TLAA.

The applicant discussed the assumptions associated with the supplement to the NRC SER for BWRVIP-05, which concluded that the axial weld failure rate in the BWR fleet at the end of 40-years is no more than 5×10^{-6} per reactor year. This generic BWR axial weld failure rate is dependent upon given assumptions on flaw density, distribution, and location. The failure rate also assumes that "essentially 100 percent" of the RV axial welds will be inspected.

The applicant compared the limiting axial weld properties at 54 EFPY for VYNPS with the limiting axial weld properties provided in the supplement to the NRC SER for BWRVIP-05. The supplemental SER stated that the axial welds for the Clinton plant are the limiting welds for the BWR fleet, and the vessel failure probability determined for Clinton should bound the BWR fleet. The VYNPS limiting axial weld 54 EFPY mean RT_{NDT} value is within the limits of the mean RT_{NDT}

value for Clinton. Analysis performed by the NRC staff in the BWRVIP-05 SER supplement resulted in an NRC-calculated axial weld failure probability of 2.73 x 10^{-6} per reactor year. The VYNPS limiting axial weld mean RT_{NDT} value also falls well within the 64 EFPY value reported in BWRVIP-05 and the 64 EFPY value reported in Table 2.6-5 of the staff's original SER on BWRVIP-05. Based on the above comparisons, as summarized in LRA Table 4.2-4, the applicant concluded that the probability of failure for the RV axial welds is bounded by the NRC evaluation. Therefore, this analysis has been projected for the period of extended operation.

4.2.6.2 Staff Evaluation

The staff reviewed LRA Section 4.2.6 to verify in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

In its July 28, 1998 letter to Mr. C. Terry, the BWRVIP Chairman, the staff identified a concern regarding the failure frequency of axial welds in BWR RVs. In response to this concern, the BWRVIP supplied evaluations of axial weld failure frequency in letters dated December 15,1998, and November 12, 1999. The staff's BWRVIP-05 supplemental SER on these analyses is enclosed in a March 7, 2000 letter from Mr. J. Strosnider (NRC) to Mr. C. Terry (BWRVIP). The staff performed a generic analysis using Clinton as a model for BWR RVs manufactured by CBI and which demonstrated that a mean axial weld RT_{NDT} of 91°F resulted in a RV failure frequency of 2.73 x 10^{-6} per reactor-year of operation. The applicant calculated, and the staff confirmed, that the limiting axial weld mean RT_{NDT} value for VYNPS at 54 EFPY is 16.5°F, This RT_{NDT} value supports the conclusion that the failure frequency for the VYNPS RV axial welds will be far less than 5 x 10^{-6} per reactor-year of operation at the end of the period of extended operation. Therefore, this analysis is acceptable.

The limiting axial weld failure probability calculated by the NRC staff in the BWRVIP-05 SER supplement is based on the assumption that "essentially 100 percent" (i.e., greater than 90 percent) examination coverage of all RV axial welds can be achieved in accordance with ASME Code, Section XI requirements. In RAI 4.2.6-1, the staff requested that the applicant indicate whether ISI examinations achieve "essentially 100 percent" (i.e., greater than 90 percent) overall examination coverage for the RV axial welds for the duration of the current licensed operating period. If less than 90 percent overall examination coverage is achieved for the RV axial welds, the staff requested that the applicant revise their TLAA of the RV axial welds to account for the effects of the limited scope examination coverage.

In its response to RAI 4.2.6-1, the applicant stated that, because of various obstructions within the RV, VYNPS had not been able to inspect "essentially 100 percent" of the RV beltline axial welds. VYNPS was granted an ISI Program relief by the NRC for the third ISI interval authorizing limited scope examination coverage for specified RV axial welds. The limited-scope examinations resulted in an overall coverage of 65 percent of the total axial weld length in the beltline region. The technical basis for granting this relief from the ASME Code, Section XI requirements mandating "essentially 100 percent" examination coverage of all axial welds for the third ISI interval is documented in a February 18, 1999 staff SER.

Examinations of the axial welds during Refueling Outage 24 (in the facility's fourth ISI interval) resulted in significantly greater coverage for all but two welds that could not be examined. Axial welds F1 and F2 were obstructed from any volumetric examination coverage during the 2004 inspection because of the installation of shroud repair tie rods prior to the 2004 inspection.

However, axial welds F1 and F2 each received an overall partial volumetric coverage of 65 percent of their respective weld volume during the third ISI interval. The remaining axial welds (not including welds F1 and F2) received an average overall volumetric coverage of 88 percent. The applicant stated that the request for relief from full examination coverage of the RV axial welds will be submitted prior to the end of the fourth ISI interval, as required by 10 CFR 50.55a.

There is a large margin between the limiting axial weld mean RT_{NDT} value of 16.5°F for VYNPS at 54 EFPY and the analysis performed by the NRC staff in the BWRVIP-05 SER supplement which yielded a mean RT_{NDT} value of 91°F for the Clinton plant. Therefore, the difference between the axial weld coverage achieved for the fourth ISI interval at VYNPS and the 90 percent minimum coverage required to meet the “essentially 100 percent” examination coverage requirement would not offset the large margin between the mean RT_{NDT} value for VYNPS at 54 EFPY and the mean RT_{NDT} value for the Clinton plant. Furthermore, given that the mean RT_{NDT} value of 91°F for Clinton resulted in an NRC-calculated axial weld failure probability of only 2.73×10^{-6} per reactor year, it can be concluded that even with the limited-scope coverage of the axial welds, the axial weld failure probability would not exceed 5×10^{-6} per reactor operating year during the extended license term.

The third ISI interval at VYNPS ended during the fall of 2003. Relief for the limited-scope axial weld examination coverage was effective only through the end of the third ISI interval, and it does not authorize reduced examination coverage for the applicable RV axial welds beyond that point. Therefore, to comply with 10 CFR 50.55a, the applicant must submit a fourth interval ISI relief request for the limited-scope axial weld examination coverage at least 12 months prior to the end of the fourth ISI interval.

The anticipated changes in metallurgical conditions expected over the period of extended operation require an additional analysis for 54 EFPY and approval by the NRC to extend the RV axial weld inspection relief through the end of the period of extended operation, on an interval-by-interval basis.

4.2.6.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of RV axial weld failure probability in LRA Section A.2.2.1.6. which includes:

The BWRVIP recommendations for inspection of RV shell welds (BWRVIP-05) are based on generic analyses supporting an NRC SER conclusion that the generic-plant axial weld failure rate is no more than 5×10^{-6} per reactor year as calculated in the BWRVIP-74 SER. BWRVIP-05 showed that this axial weld failure rate is orders of magnitude greater than the 40-year end-of-life circumferential weld failure probability and used this analysis to justify relief from inspection of the circumferential welds as described above.

> The basis for this relief request was a plant-specific analysis that showed the limiting conditional failure probability for the VYNPS circumferential welds at the end of the original operating term were less than the values calculated in the BWRVIP-05 SER. The BWRVIP-05 SER concluded that the RV failure frequency

due to failure of the limiting axial welds in the BWR fleet at the end of 40-years of operation is less than 5 x 10^{-6} per reactor year. This failure frequency is dependent upon given assumptions of flaw density, distribution, and location. The failure frequency also assumes that essentially 100 percent of the RV axial welds will be inspected.

> The BWRVIP-74 SER states it is acceptable to show that the mean RT_{NDT} of the limiting beltline axial weld at the end of the period of extended operation is less than the limiting value given in the SERs for BWRVIP-74 and BWRVIP-05. The projected 54 EFPY mean RT_{NDT} values for VYNPS are less than the limiting 64 EFPY RT_{NDT} in the analysis performed by the NRC staff (Table 2.6-5 of the BWRVIP-05 SER). As such, this TLAA has been projected to the end of the period of extended operation as required by 10 CFR 54.21(c)(1)(ii).

The staff finds that the applicant's UFSAR Supplement summary description for the TLAA of the RV axial weld failure probability appropriately describes how the conditional failure probabilities for the RV axial welds are bounded by the NRC analysis in the staff's supplemental SER dated March 7, 2000. The applicant's UFSAR Supplement summary description is consistent with the staff analysis for the TLAA of the RV axial weld failure probability in Section 4.2.6.2 of this SER. Based on this assessment, the staff concludes that the UFSAR Supplement summary description for the TLAA of the RV axial weld failure probability is acceptable.

On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address RV axial weld failure probability is adequate.

4.2.6.4 Conclusion

The staff reviewed the applicant's TLAA of the RV axial weld failure probability, as summarized in LRA Section 4.2.6, including its RAI response dated November 9, 2006, and finds that the applicant appropriately describes how the conditional failure probability for the RV axial welds are bounded by the NRC analysis in the staff supplemental SER on the BWRVIP-05 report, dated March 7, 2000, for the period of extended operation at VYNPS. The staff therefore concludes that the applicant's TLAA in LRA Section 4.2.6 is acceptable.

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, as required by 10 CFR 54.21(c)(1)(ii), that, for RV axial weld failure probability, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3 <u>Metal Fatigue Analyses</u>

Fatigue analyses are potential TLAAs for Class 1 and selected non-Class 1 mechanical components. Fatigue is an age-related degradation mechanism caused by cyclic stressing of a component by either mechanical or thermal stresses that become evident by cracking of the component. Fatigue analyses are treated as TLAAs, if based on a set of design transients and on the life of the plant.

Fatigue evaluations that meet the definition of TLAA for Class 1 and non-Class 1 mechanical components are described and evaluated below. Cumulative usage factors (CUFs) have been documented and the actual numbers of design transient cycles have been projected to 60 years. The CUF sums the fatigue damage from each transient. The ASME Code Section III criterion requires that the CUF not exceed 1.0. If the CUF is going to exceed 1.0 at the end of the period of extended operation, then the calculation can be refined to reduce the CUF to a value below 1.0. Cracking because of fatigue is an aging effect requiring management in accordance with 10 CFR 54.21(c)(1)(iii).

Although some transients are projected to exceed the cycle limits before the end of 60 years, a program is in place to track cycles and to provide corrective actions if limits are approached. In addition to metal fatigue analyses, fracture mechanics analyses of flaw indications discovered during ISI are TLAAs for those analyses based on time-limited assumptions defined by the current operating term. When a flaw is detected during ISIs, the flawed component can be evaluated for continued service in accordance with ASME Code, Section XI. These evaluations may show the component as acceptable at the end of the current operating term based on predicted inservice flaw growth, typically based on the design thermal and loading cycles.

4.3.1 Class 1 Fatigue

Class 1 components evaluated for fatigue and flaw growth include the RPV and appurtenances, certain RV internals, the reactor recirculation system (RRS), and the reactor coolant system (RCS) pressure boundary. The Class 1 systems include components within the ASME Code, Section XI, SubSection IWB inspection boundary. Fatigue evaluations were performed in the design of the Class 1 components in accordance with the requirements specified in ASME Code, Section III. Fatigue evaluations are contained in analyses and stress reports, and because they are based on a number of transient cycles assumed for a 40-year plant life, these evaluations are considered TLAAs. Design cyclic loadings and thermal conditions for the Class 1 components are defined by the applicable design specifications for each component. The original design specifications provided the initial set of transients used in the design of the components and are included as part of each component analysis or stress report. The component analyses and stress reports contain the fatigue evaluations for each component.

4.3.1.1 Reactor Pressure Vessel

4.3.1.1.1 Summary of Technical Information in the Application

LRA Section 4.3.1.1 summarizes the evaluation of RPV fatigue analyses for the period of extended operation. These analyses were in accordance with ASME Code, Section III requirements. Design cyclic loadings and thermal conditions for the RPV were defined in its original design specifications, which provided the set of transients used in the design of the components. The applicant modified the transients to reflect actual plant transients more closely and to make them easier to track while still bounding the original design transients. The Fatigue Monitoring Program will assure that the allowed number of transient cycles is not exceeded by requiring corrective action if transient cycle limits are approached. Consequently, the TLAAs based on those transients will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i) or the effects of aging will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii).

4.3.1.1.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.1 to verify in accordance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation, or 10 CFR 54.21(c)(1)(iii), that the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The staff reviewed LRA Section 4.3.1.1 against the criteria in SRP-LR Section 4.3.2.1.1.

SRP-LR Section 4.3.2.1.1 stated that for components designed or analyzed to ASME Code Class 1 requirements, the acceptance criteria, depending on the applicant's choice of compliance with 10 CFR 54.21(c)(1)(i), (ii), or (iii), are:

(i) The existing CUF calculations remain valid because the number of assumed transients would not be exceeded during the period of extended operation.

(ii) The existing CUF calculations have been reevaluated based on an increased number of assumed transients to bound the period of extended operation. The resulting CUF remains less than or equal to unity for the period of extended operation.

(iii) In Chapter X of the GALL Report, the staff evaluated a program for monitoring and tracking the number of critical thermal and pressure transients for the selected RCS components. As documented in the Audit and Review Report, the staff finds that this program is an acceptable aging management program to address the RCS components metal fatigue compliance with 10 CFR 54.21(c)(1)(iii). The GALL Report may be referenced in an LRA and should be treated in the same manner as an approved topical report. In referencing the GALL Report, the applicant should indicate that the referenced material is applicable to the specific plant involved and should provide information necessary to adopt the finding of program acceptability as described and evaluated in the report. The applicant should also verify that the approvals set forth in the GALL Report for the generic program apply to the applicant's program.

The staff reviewed the applicant's TS documentation for RCS heatup/cooldown. Results are found in the Audit and Review Report. The TS identified that the maximum heatup or cooldown rate is 100°F when averaged over any one hour period. Also, the staff reviewed the Fatigue Monitoring Program basis document which identified the heatup/cooldown transient with a rate change of 100°F/hour. As documented in the Audit and Review Report, the staff reviewed the applicant's calculation for heatup/cooldown cycles from plant startup in 1972 through 1980. In this calculation, the staff found that some transients may have a temperature rate change exceeding 100°F/hour. For example, a 60°F change in six minutes represents a temperature rate change of 600°F/hour. Physically, thermal stress is a function of the rate change of temperature. The higher the rate the higher the stress.

In RAI 4.3-H-03, dated August 1, 2006, the staff requested that the applicant provide documentation ensuring that the Fatigue Monitoring Program and fatigue analysis addressed and enveloped any operation that may exceed 100°F/hour and still meet the heatup/cooldown rate of 100°F, when averaged over one hour period. The applicant responded, in a letter dated January 4, 2007, stating that the vessel has been analyzed for 200 heatup/cooldown cycles in which the cooldown transient includes a 1000°F/Hr temperature change. On the basis that the stresses derived from 1000°F/Hr are conservative, the staff finds the applicant's response acceptable.

In LRA Table 4.3-2, the applicant did not identify the number of design basis cycles for the reactor startup/shutdown transient. The number of transient cycles should be based on the design fatigue analysis. The applicant stated that VYNPS developed a condensed list of transients provided in LRA Table 4.3-2 to simplify cycle tracking by the plant operations staff. As documented in the Audit and Review Report, the staff questioned the range of the condensed list and asked the applicant to provide all the RCS transients. The staff also asked the applicant to demonstrate that the condensed bounding transient list for reactor startup and shutdown envelopes all other RCS transients. The staff further asked the applicant to demonstrate that the CUFs are still within the limit of this revised bounding transient and the allowable number of cycles. In RAI 4.3-H-01, dated August 1, 2006, the staff requested the applicant to provide additional justification to address the condensed transient of reactor startup and shutdown.

The applicant responded, in a letter dated September 5, 2006, stating that the original fatigue analyses were based on 18 transients. The applicant also stated that to improve the process of tracking design transients, the applicant combined some transients and eliminated one transient which resulted in 13 transients. The staff found that the response did not provide sufficient information related to transient cycles and asked applicant to provide additional clarification.

In a letter dated January 4, 2007, the applicant offered additional clarification for RAI 4.3-H-01. The applicant provided actual cycles versus design cycles for all transients and current fatigue usage status. The staff reviewed the applicant's response. On the basis of its review, the staff concludes that the applicant's fatigue tracking and CUFs evaluation are acceptable since the applicant provided the missing gap for its fatigue tracking in the design basis transients. Therefore, the staff's concern described in RAI 4.3-H-01 is resolved.

In addition, during the audit and review, the staff noted that power uprate increased temperature and pressure values and asked the applicant to explain why its Power Uprate Safety Analysis Report (PUSAR) shows no changes to the stresses between the power uprate fatigue analysis and the original design analysis of all components other than the feedwater (FW) nozzle. The applicant stated that the original stress evaluations were performed at conditions that bound the slight change in conditions for the power uprate and only the FW nozzle had a large enough change in parameters to require a re-calculation of CUF. On the basis of its review of the basis document, the staff finds the applicant's response acceptable.

Also, during the audit and review, the staff asked the applicant to address the non-design transients of the BWR FW nozzle because of bypass flow leakage as described in NUREG-0619. The staff noted that the number of cycles due to bypass flow leakage for the BWR FW nozzle must be identified in order to perform a valid fatigue analysis for the BWR FW nozzle. If the actual transient was not considered in the CUF evaluation, the staff considers the resulting fatigue CUF to be invalid. In RAI 4.3-H-02, the staff asked the applicant to provide additional justification for excluding this actual transient. In a letter dated September 5, 2006, the applicant provided its response and stated that:

> As discussed in NUREG-0619, leakage past the FW nozzle thermal sleeve stresses the nozzle in two ways. The first is the cold FW leakage past the thermal sleeve as it contacts the nozzle throat behind the thermal sleeve. The second is the rapid movement of the hot/cold interface on the nozzle inner blend radius caused by the mixing of the leakage flow with the hot water in the annulus region. This second effect is commonly referred to as "rapid mixing" or "rapid thermal cycling" which results in high cycle fatigue.
>
> (1) The calculated CUFs for the FW nozzle (shown in LRA Tables 4.3-1 and 4.3-3) include the effect of the FW leakage past the thermal sleeve contacting the nozzle bore. These CUFs do not include the rapid thermal cycling in the nozzle inner blend radius. The CUFs in these tables represent the highest CUFs for the FW nozzle safe end and nozzle throat areas.
>
> (2) Rapid thermal cycling affects the CUF of the FW nozzle inner blend radius; however, this effect is not included in the calculation of the CUF for the nozzle inner blend radius. VYNPS has conservatively assumed that fatigue cracks may be present in the clad. Subsequent system cycling could cause these surface cracks to grow into the nozzle base metal. VYNPS manages this cracking by performing periodic inspections that were implemented in response to GL 80-095 and NUREG-0619. The inspection frequency is based on a calculated fatigue crack growth rate of a postulated flaw in the nozzle inner blend radius. The NRC previously reviewed and approved this approach to handling FW nozzle inner blend radius cracking. (Letter D.H. Dorman (USNRC) to D.A Reid (VYNPS), Subject: Evaluation of Request for Relief from NUREG-061 9 for VYNPS dated 2/6/95, (TAC No. M88803))
>
> The VYNPS flaw growth calculation uses methods in compliance with GE BWR Owners Group Topical Report "Alternate BWR Feedwater Nozzle Inspection Requirements," GE-NE-523-A71 -0594, Revision 1, August 1999, and the NRC Final Safety Evaluation (TAG No. MA6787) dated March 10, 2000. The FW nozzle inspection interval is based on 20 percent of the time required for a postulated 0.25 inch flaw in the base metal to grow to 10 percent of the nozzle wall thickness, or a maximum of 6-years (4 operating cycles).
>
> Rapid thermal mixing has some effect on the base metal of the FW nozzle; however, the associated temperature changes are so rapid that they do not propagate deeply into the base metal. In fact, NUREG-0619, Section 2.2, states: "From analysis and from experience in repairing FW nozzles, it is known that high cycle thermal fatigue cracks propagate to a depth of about 1/4 inch before the cyclic thermal stress amplitude attenuates to a an insignificant level." Unlike many BWRs, VYNPS has not removed the 3/16 inch stainless steel cladding from the inner blend radius. The effect of the rapid thermal cycling is largely in the cladding,

affecting approximately 1/16 inch of the base metal (not an exact value because of the different heat transfer properties of the clad and the base metal). While NUREG-0619 documents that the cladding is more likely to crack than the unclad base metal, the cladding does keep the thermal stresses from penetrating as deeply into the base metal.

The staff reviewed the applicant’s response. The staff finds that the applicant had conservatively postulated the 0.25-inch cracking in FW fatigue and crack growth analysis and provided adequate inspection programs to manage cracking in addition to its Fatigue Monitoring Program. Therefore, the staff’s concern described in RAI 4.3-H-02 is resolved.

The staff reviewed the fatigue results for the RV components in LRA Table 4.3-1. When the 40-year CUFs were multiplied by 1.5 (60yrs /40yrs), the RV components, except FW nozzle and reactor recirculation (RR) outlet nozzle, have CUFs less than 1.0 for the 60-year plant life. On this basis, the staff concludes that the RV components, other than FW nozzle and RR outlet nozzle, meet the requirement of 10 CFR 54.21(c)(1)(ii). The environmental assisted fatigue assessment is discussed further in SER Section 4.3.3.2.

In a letter dated January 4, 2007, the applicant provided additional clarification for the 60-year projected CUF. In its letter, the applicant clarified that the 40-year design analysis CUF for the RR outlet nozzle safe end is 0.807 and RR outlet nozzle safe end was replaced in 1986. Therefore, the 60-year design CUF will be based on a linear projection by multiplying the 40-year CUF with 1.15 (46yrs /40yrs). The staff finds that the CUF for RR outlet nozzle safe end will be 0.928, which should remain valid for the period of extended operation. The staff finds that the applicant’s approach is acceptable and meets the requirement of 10 CFR 54.21(c)(1)(i).

The staff reviewed the applicant’s Fatigue Monitoring Program and documented its acceptance in SER Section 3.0.3.2.10. In addition to the Fatigue Monitoring Program, the applicant also identified additional aging monitoring items that may be used to manage fatigue. The staff finds this acceptable and that the applicant meets the requirements of 10 CFR 54.21(c)(1)(iii).

4.3.1.1.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of RPV fatigue analyses in LRA Section A.2.2.2.1. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant’s actions to address RPV fatigue analyses is adequate.

4.3.1.1.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated that the RPV fatigue analyses will remain valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i). The staff concludes that the applicant has demonstrated that the RPV fatigue analyses have been projected through the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(ii). The staff also concludes that the applicant has demonstrated that the effects of aging on the intended function(s) of the RPV will be adequately managed for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(iii). The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.2 Reactor Vessel Internals

4.3.1.2.1 Summary of Technical Information in the Application

LRA Section 4.3.1.2 summarizes the evaluation of RV internals fatigue analysis for the period of extended operation. Although not mandated, the design of the RV internals is in accordance with the intent of ASME Code, Section III. In a letter dated August 7, 1996, “Response to Request Additional Information Regarding VYNPS Core Shroud Modification,” VYNPS stated that a fatigue analysis had been performed for the shroud repair hardware and this calculation included a fatigue analysis of the slotted hole in the shroud support plate where the shroud repair ligaments are attached. The resulting CUF was 0.23 based on the numbers of design transients in the original RV design report. This analysis is treated as a TLAA.

The Fatigue Monitoring Program for VYNPS will assure that the allowed number of transient cycles is not exceeded by requiring corrective action if transient cycle limits are approached. Consequently, the TLAAs based on those transients will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i), or aging effects on the intended function(s) will be adequately managed for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(iii).

4.3.1.2.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.2 to verify in accordance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation, or 10 CFR 54.21(c)(1)(iii), that the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The staff reviewed the applicant’s TLAA basis document and UFSAR Section K.3.1. UFSAR Section K.3.1 stated that the core shroud repair was designed for a 40-year life. The staff agrees that the core shroud repair fatigue is a TLAA. The staff reviewed the applicant’s power uprate re-evaluation of the core shroud repair. The CUFs for the shroud repair as listed in LRA Table 4.3-1 are 0.23 and 0.12, which are well below 1.0. On this basis, the TLAA (fatigue analysis) based on those transients will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i). The Fatigue Monitoring Program will assure that the allowed number of transient cycles will not be exceeded and will be used to manage the effects of aging on the intended function(s) for the period of extended operation, as required by 10 CFR 54.219(c)(1)(iii). Therefore, the core shroud repair fatigue TLAA is acceptable.

4.3.1.2.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of RV internals in LRA Section A.2.2.2.1. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant’s actions to address RV internals is adequate.

4.3.1.2.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated that the RV internals fatigue analyses will remain valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i). The staff also concludes that the applicant has demonstrated that the effects of aging on the intended function(s) of the RV internals will be adequately managed for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(iii). The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.3 Class 1 Piping and Components

4.3.1.3.1 Summary of Technical Information in the Application

LRA Section 4.3.1.3 summarizes the evaluation of Class 1 piping and components for the period of extended operation. The applicant, in 1986, replaced RR system piping and connecting portions of the residual heat removal (RHR) system piping. The new piping was designed and analyzed to ANSI B31.1 but inspected and tested to ASME Code, Section III requirements. Stress analyses for the RRS were to ANSI B31.1 requirements. Even though ANSI B31.1 does not require it, there was a fatigue analysis for the highest anticipated usage factor location, the RHR to RR tee. These analyses were based on a number of cycles not expected to be exceeded in 40-years and as such treated as TLAAs.

The Fatigue Monitoring Program will assure that the allowed number of transient cycles is not exceeded by requiring corrective action if transient cycle limits are approached. Consequently, the TLAA based on those transients will remain valid, or the effects of aging on the intended function(s) will be adequately managed, for the period of extended operation.

UFSAR Section 4.6.3 states that the main steam isolation valves (MSIVs) are designed for 40-years based on 100 cycles of operation the first year and 50 cycles of operation per year thereafter. This statement may be interpreted to infer a TLAA that will remain valid through the period of extended operation, as required by 10 CFR 54.21(c)(1)(i). The MSIVs will not exceed 2050 cycles in 60-years (34 cycles per year).

4.3.1.3.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.3 to verify in accordance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The staff reviewed the technical information in LRA Section 4.3.1.3, on the fatigue analysis of Class 1 piping and components. The applicant indicated that the piping stress analyses were performed to ANSI B31.1 requirements and an additional fatigue analysis was done for the highest anticipated usage factor location, the RHR to RR tee. The staff noted that in LRA Table 4.3-1, the applicant stated that the plant-specific CUFs were not found for the RR piping tee and asked the applicant to clarify the difference between LRA Section 4.3.1.3 and LRA Table 4.3-1.

The applicant stated that the statement was made as part of the GE template for these calculations, since many plants were replacing the RR piping in accordance with ASME Code, Section III. VYNPS replaced their piping to meet requirements of ANSI B31.1 rather than the ASME Code, Section III requirements. No plant-specific fatigue analysis was performed for VYNPS. In a letter dated July 14, 2006, the applicant revised its LRA to address the above issue. In this letter, the applicant stated that stress analyses for the RRS were performed to meet ANSI B31.1 standards, which do not require a detailed fatigue analysis that calculates a CUF, but allows up to 7000 cycles with a stress reduction factor of 1.0 in the stress analyses. The applicant also stated that the 7000 thermal cycle assumption is valid and bounding for 60-years of operation. The staff reviewed the RCS transients and concludes that 7000 thermal cycle for the 60-years of operation is valid. On this basis, the staff finds the applicant's response acceptable.

The staff asked the applicant to identify the design code and the number of operating cycles for the MSIVs. The applicant stated that the MSIVs were built to the ASME Code. The applicant reviewed the plant operating records and estimated that there were 587 operations of the MSIVs in 35-years of operation. Extrapolating this number to 60-years of operation (considering changes in surveillance testing of the valves) yields 785 cycles. This is well below the design value of 2050 cycles for these valves as indicated in UFSAR Section 4.6.3. On this basis, the staff finds the fatigue assessment for the MSIVs for VYNPS to be acceptable, in accordance with 10 CFR 54.21(c)(1)(i).

4.3.1.3.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of Class 1 piping and components in LRA Section A.2.2.2.1.

The applicant committed (Commitment #27) to perform a fatigue analysis that addresses the effects of reactor coolant environment on fatigue by March 21, 2012.

On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address Class 1 piping and components is adequate.

4.3.1.3.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(i), that, for Class 1 piping and components, the analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2 Non-Class 1 Fatigue

4.3.2.1 Summary of Technical Information in the Application

LRA Section 4.3.2 summarizes the evaluation of non-Class 1 fatigue for the period of extended operation. The design of ASME Code III Class 2 and 3 piping systems incorporates the code stress reduction factor for determining acceptability of piping design for thermal stresses. The design of ANSI B31.1 Code components also incorporates stress reduction factors based upon an assumed number of thermal cycles. In general, 7000 thermal cycles are assumed for a stress reduction factor of 1.0 in the stress analyses. The applicant's evaluation of the validity of this assumption for 60-years of plant operation indicates that the 7000 thermal cycle assumption is valid and bounding for 60-years of operation; therefore, the pipe stress calculations are valid for the period of extended operation as required by 10 CFR 54.21(c)(1)(i).

Some applicants for license renewal have estimated that piping in the primary sampling system will have more than 7000 thermal cycles before the end of the period of extended operation. The sampling system takes reactor coolant samples every 96 hours during normal operation; however, the normal samples are taken from the RWCU filter influent, where the water already has been cooled. Thus, normal sampling does not cause a thermal cycle. Alternate samples may be taken directly from the B discharge header of the RRS via containment penetration X-41; however, this procedure is infrequent and this piping, designed to ANSI B31.1, will not exceed 7000 cycles prior to 60-years of operation.

4.3.2.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2 to verify in accordance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The staff reviewed the technical information in LRA Section 4.3.2, pertaining to the non-Class 1 fatigue analysis of piping, against the criteria contained in SRP-LR Section 4.3.2.1.2 and documented the results in the Audit and Review Report.

SRP-LR Section 4.3.2.1.2.1 stated that for piping designed or analyzed to ANSI B31.1 standards, the acceptance criteria is the existing fatigue strength reduction factors remain valid because the number of cycles would not be exceeded during the period of extended operation.

Although ANSI B31.1 Code does not require explicit fatigue analysis, it considers fatigue implicitly in the design calculation by applying an allowable stress range reduction factor. Fatigue also can depend on the number of design thermal expansion cycles.

The staff reviewed the applicant's basis document which provided the basis and calculations for the metal fatigue. In the basis document, the applicant discussed the operating cycles for all the systems, including RHR, automatic depression system, high pressure coolant injection, reactor core isolation coolant, emergency diesel generator, and fire protection. The applicant concluded that these systems have experienced far less than 7000 thermal cycles for 60-years of operation.

On the basis of its audit and review, the staff concludes that the number of thermal cycles for ANSI B31.1 piping systems is less than 7000 for 60-years operation. Therefore, the existing ANSI B31.1 piping analysis will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i).

In addition, the staff requested that the applicant clarify the statement related to the design of ASME Code, Section III, Class 2 and 3 piping systems. The applicant stated that VYNPS does not have any ASME Code, Section III, Class 2 and 3 piping systems and that all the piping systems are designed in accordance with ANSI B31.1 requirements. In a letter dated July 14, 2006, the applicant provided an LRA amendment to clarify this issue. In this letter, the applicant revised ASME Code, Section III, Class 2 and 3 piping systems designation to safety Class 2 and 3 piping systems. The staff finds this change is acceptable.

4.3.2.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of non-Class 1 fatigue in LRA Section A.2.2.2.2. which stated that:

> "For non-Class 1 components identified as subject to cracking due to fatigue, a review of system operating characteristics was conducted to determine the approximate frequency of any significant thermal cycling. If the number of equivalent full temperature cycles for 60-years of operation is below 7000 cycles, the component is acceptable for the period of extended operation. If the number of equivalent full temperature cycles exceeds 7000, the individual stress calculations require further evaluation. No components were identified with projected cycles exceeding 7000. Therefore, the TLAA for non-Class 1 piping and components remain valid for the period of extended operation in compliance with 10 CFR 54.21(c)(i)."

On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address non-Class 1 fatigue is adequate, as required by 10 CFR 54.21(d).

4.3.2.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, as required by 10 CFR 54.21(c)(1)(i), that, for non-Class 1 fatigue, the analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 Effects of Reactor Water Environment on Fatigue Life

4.3.3.1 Summary of Technical Information in the Application

LRA Section 4.3.3 summarizes the evaluation of effects of reactor water environment on fatigue life for the period of extended operation. NUREG/CR-6260 applies fatigue design curves incorporating environmental effects on several plants and identifies locations of interest for consideration of environmental effects with the following six component locations as most sensitive to them:

(1) reactor vessel shell and lower head
(2) reactor vessel feedwater nozzle
(3) reactor recirculation piping (including inlet and outlet nozzles)
(4) core spray line reactor vessel nozzle and associated piping
(5) RHR return piping
(6) feedwater piping

Entergy evaluated the limiting locations (a total of nine components corresponding to the six most sensitive locations) with the guidance of the GALL Report, Volume 2, Section X.M.1. Seven of nine components evaluated have an environmentally adjusted CUF of greater than 1.0. The ASME Code does not require environmental adjustment for fatigue analyses.

Considering environmental effects prior to the period of extended operation, for each location that may exceed a 1.0 CUF the applicant will implement one or more of the following: (1) further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0;(2) management of fatigue at the affected locations by an inspection program reviewed and approved by the staff; or (3) repair or replacement of the affected components.

Should VYNPS select the option to manage environmental-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be provided to the NRC prior to the period of extended operation. The effects of environmental-assisted thermal fatigue for the limiting locations identified in NUREG-6260 have been evaluated. Cracking by environmentally-assisted fatigue of these locations will be addressed by one or more of these three approaches in compliance with 10 CFR 54.21(c)(1).

4.3.3.2 Staff Evaluation

The staff reviewed LRA Section 4.3.3 to verify: (1) in accordance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation; (2) in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation; and (3) in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The staff reviewed the technical information in LRA Section 4.3.3, pertaining to the effect of reactor water environment on the fatigue analysis of components and piping, against the criteria contained in SRP-LR Section 4.3.3.2.

SRP-LR Section 4.3.3.2 stated that the applicant must address the staff recommendation for closure of General Safety Issue (GSI)-190 and also address the effects of the coolant environment on component fatigue life when aging management programs are formulated to support license renewal. If an applicant has chosen to assess the impact of the reactor coolant environment on a sample of critical components, the applicant shall address the following:

(a) The critical components include, as a minimum, those selected in NUREG/CR-6260.

(b) The sample of critical components has been evaluated by applying environmental correction factors, F_{en}, to the existing ASME Code fatigue usage factor.

(c) Formulas for calculating the environmental life correction factors are those contained in NUREG/CR-6583 for carbon and low-alloy steels, and in NUREG/CR-5704 for austenitic stainless steels (SSs), or an approved technical equivalent.

The staff verified that the applicant included into the environmental assisted fatigue evaluation all the critical components selected in NUREG/CR-6260. LRA Table 4.3-3 indicated that the sample of critical components has been evaluated by applying environmental correction factors to the existing ASME Code fatigue analysis, except for RR piping tee, core spray (CS) safe end, RHR return piping, and FW piping. The staff also verified the formulas for calculating the environmental life correction factors. Since the formulas follow SRP-LR guidance, they are acceptable.

During the audit and review, the staff noted that the CUFs for the components of CS safe end, FW piping, RHR return piping, and RR piping tee, in LRA Tables 4.3-1 and 4.3-3, are taken from NUREG/CR-6260 and not based on plant-specific analysis results. Staff requested that the applicant provide justification for not using plant-specific analysis results. In a letter dated July 14, 2006, the applicant revised its LRA to address this issue. In this letter, the applicant stated that LRA Table 4.3-1 has been revised to remove the NUREG/CR-6260 values for CS safe end, FW piping, RHR return piping, and RR piping tee and replaced them with "not applicable." The staff finds that CUFs for these four locations require to address the effects of reactor coolant environment on fatigue as mentioned above.

The staff reviewed the applicant's Commitment #27, which was provided in a letter dated July 6, 2006, and LRA question and answer (Q&A) database Item 318. In the LRA Q&A database Item 318, the applicant stated that the more limiting, VYNPS-specific locations, with a valid CUF may be substituted for the NUREG/CR-6260 locations. The staff did not find the substitution proposed by the applicant acceptable since SRP-LR clearly stated that "the critical components include, as a minimum, those selected in NUREG/CR-6260." The staff asked whether the applicant will address all nine locations instead of substitutions. In a letter dated January 4, 2007, the applicant provided its revised Commitment #27. The applicant stated that more limiting VYNPS-specific locations with a valid CUFs may be added in addition to the NUREG/CR-6260 locations to address the effects of the coolant environment. Since the applicant will address more locations than the minimum required by NUREG/CR-6260, the staff finds applicant's response acceptable.

The staff requested that the applicant clarify whether oxygen concentrations derived from implementation of normal water chemistry (NWC) were factored in the environmental fatigue life correction factor (F_{en}) calculations for those operational periods when NWC was implemented instead of hydrogen water chemistry (HWC). The applicant stated that F_{en} was estimated based on (HWC) oxygen concentration. Prior to the period of extended operation, VYNPS will perform fatigue analyses and an appropriate F_{en} will be used to account for operating times when both HWC and NWC are implemented. On the basis of its review, the staff finds this acceptable.

The applicant indicated that seven of nine components reviewed have an environmentally adjusted CUF of greater than 1.0 as indicated in LRA Table 4.3-3. For each location that may exceed a CUF of 1.0 when considering environmental effects prior to entering the period of extended operation, VYNPS will implement one or more of the following:

(1) further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0;

(2) management of fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals determined by a method acceptable to the NRC);

(3) repair or replacement of the affected locations.

The staff finds that the original fatigue evaluations were analyzed based on the design transients. The applicant has plant-specific operating transient data that could be used to refine the fatigue analyses to remove the conservatism which was assumed during the design stage. The applicant also could use later developments in the ASME Code fatigue assessment to lower the CUF. On the above mentioned basis, the staff finds that option (1) is acceptable.

ASME Code, Section XI, IWB-3740(a) states that “Appendix L provides procedures that may be used to assess the effects of thermal and mechanical fatigue concerns on component acceptability for continued service.” IWB-3740(b) states that “Appendix L provides procedures that may also be used when the calculated fatigue usage exceeds the fatigue usage limit defined in the original Construction Code.” On the basis that option (2) meets the recommendation of the ASME Code, the staff finds option (2) acceptable.

The repair and replacement of the affected locations to ensure the structural integrity is a corrective action. On this basis, the staff finds option (3) acceptable.

In its letter dated July 6, 2006, the applicant stated that if it selects the option to manage environmental-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be provided to the NRC prior to the period of extended operation. The staff reviewed the applicant’s letter and noted that the applicant must provide adequate time for the staff to review and approve the aging management program. The staff asked the applicant to address this issue. In a letter dated August 22, 2006, the applicant revised its LRA to address this issue. In this letter, the applicant stated that detail of the aging management program such as scope, qualification, method, and frequency will be provided to the NRC for review and approval, two-years prior to the period of extended operation. The staff finds that two-years will provide adequate time for the NRC to review and approve the aging management program.

4.3.3.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of effects of reactor water environment on fatigue life in LRA Section A.2.2.2.3.

The staff reviewed the applicant’s Commitment #27 and concludes that implementation of this commitment prior to period of extended operation will address environmentally assisted fatigue for the seven components which have not been addressed.

On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant’s actions to address effects of reactor water environment on fatigue life is adequate.

4.3.3.4 Conclusion

On the basis of its review, and Commitment #27as discussed above, the staff finds that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(i), that, for effects of reactor water environment on fatigue life, the analyses remain valid for the period of extended operation. The applicant also demonstrated, as required by 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation, and that, as required by 10 CFR 54.21(c)(1)(iii), the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d)

4.4 Environmental Qualification Analyses for Electrical Components

The 10 CFR 50.49 environmental qualification requirement is a TLAA for purposes of license renewal. The TLAA of the EQ electrical components includes all long-lived, passive, and active electrical and instrumentation and control components that are important to safety and located in a harsh environment. The harsh environments of the plant are those areas subject to environmental effects by loss of coolant accidents or high-energy line breaks. EQ equipment comprises safety-related and Q-list equipment, nonsafety-related equipment the failure of which could prevent satisfactory accomplishment of any safety-related function, and necessary post-accident monitoring equipment.

To comply with 10 CFR 54.21(c)(1), the applicant must provide a list of EQ TLAAs in the LRA. The applicant shall demonstrate that for each type of EQ equipment, one of the following is true: (1) the analyses remain valid for the period of extended operation;(2) the analyses have been projected to the end of the period of extended operation; or (3) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

4.4.1 Summary of Technical Information in the Application

LRA Section 4.4 summarizes the evaluation of EQ analyses for electrical components for the period of extended operation. The Environmental Qualification of Electric Components Program manages component thermal, radiation, and cyclical aging, as applicable, through aging evaluations based on 10 CFR 50.49(f) qualification methods. In accordance with 10 CFR 50.49, EQ components not qualified for the current license term must be refurbished or replaced or their qualification must be extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components with a specified qualification of at least 40-years are considered TLAAs for license renewal. The Environmental Qualification of Electric Components Program maintains these EQ components in accordance with their qualification basis. This program, established to comply with 10 CFR 50.49, is consistent with GALL AMP X.E1, “Environmental Qualification of Electric Components.”

The program considers operating experience to modify qualification basis and conclusions, including qualified life. Compliance with 10 CFR 50.49 is reasonable assurance that components can perform their intended function(s) during accident conditions after the effects of in-service aging. Consistent with staff guidance in Regulatory Issues Summary 2003-09, no additional information is required to address GSI-168, “Environmental Qualification of Electrical Components.” Review of the existing program and of operating experience provides reasonable assurance that continued implementation of the Environmental Qualification of Electric Components Program will manage aging effects and that the in-scope EQ components will continue to perform their intended function(s) for the period of extended operation. The effects of aging will be adequately managed by the VYNPS program in compliance with 10 CFR 54.21(c)(1)(iii).

4.4.2 Staff Evaluation

The staff reviewed LRA Section 4.4 to verify in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Regulatory Bases for Environmental Qualification Evaluations

Regulation 10 CFR 50.49(e)(5) contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. It also requires component replacement or maintenance prior to the end of designated life, unless additional life is established through ongoing qualification. The requirements of 10 CFR 50.49(k) and (l) permit the application of different qualification criteria based on plant vintage. RG 1.89, Revision 1, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," staff guidance, and NUREG-0588 provide EQ regulatory guidance for compliance with these different qualification criteria. The Environmental Qualification of Electric Components Program was established to demonstrate that certain electrical components located in harsh plant environment (*i.e.*, areas subject to the harsh environmental effects of loss-of-coolant-accident (LOCA), high-energy line break or post-LOCA radiation, etc.) are qualified to perform their safety function operation in those harsh environments after the effects of in service aging. The Environmental Qualification of Electric Components Program manages applicable component thermal, radiation, and cyclic aging effects for the current operating license period using the qualification methods required by 10 CFR 50.49(f). Maintaining qualification through the extended extended operating period requires that existing EQ evaluations be reanalyzed.

Scope of Review and Assessment

The staff reviewed LRA Section 4.4 and the plant basis document to determine whether the applicant provided adequate information to meet the requirements of 10 CFR 54.21(c)(1). For the electrical equipments identified in the basis document, the applicant used 10 CFR 54.21(c)(1)(iii) compliance in its TLAA evaluation to demonstrate that the aging effects of environmentally qualified equipment will be adequately managed during the period of extended operation. The staff reviewed the Environmental Qualification of Electric Components Program to determine whether it will assure that the electrical and instrumentation and control components covered in accordance with this program will continue to perform their intended functions consistent with the CLB for the period of extended operation. The staff's evaluation of the components qualification focused on how the Environmental Qualification of Electric Components Program manages the aging effects to meet the requirements of 10 CFR 50.49.

On the basis of its review, the staff finds that the applicant's Environmental Qualification of Electric Components Program, consistent with GALL AMP X.E1,"Environment Qualification of Electrical Components," as documented in SER Section 3.0.3.1.1, the staff finds that the Environmental Qualification of Electric Components Program is capable of programmatically managing the qualified life of components within the scope of the program for license renewal. The continued implementation of the Environmental Qualification of Electric Components Program provided assurance that the aging effects will be managed and that components within the scope of the Environmental Qualification of Electric Components Program will continue to perform their intended functions for the period of extended operation.

4.4.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of EQ analyses for electrical components in LRA Section A.2.2.3. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address EQ analyses for electrical components is adequate.

4.4.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(iii), that, for EQ analyses for electrical components, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5 Concrete Containment Tendon Prestress Analysis

4.5.1 Summary of Technical Information in the Application

LRA Section 4.5 states that this section is not applicable because VYNPS has no pre-stressed tendons in the containment building. As such, this topic is not a TLAA at VYNPS.

4.5.2 Staff Evaluation

VYNPS containment does not have prestressed tendons; therefore, the staff agrees with the applicant that this TLAA is not applicable.

4.5.3 UFSAR Supplement

The staff concludes that no UFSAR Supplement is required because VYNPS has no pre-stressed tendons in the containment building.

4.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that this TLAA is not applicable at VYNPS.

4.6 Containment Liner Plate, Metal Containment, and Penetrations Fatigue Analysis

VYNPS is a BWR with a Mark I containment. The Mark I containment consists of a freestanding steel containment drywell, vent system, and steel pressure suppression chamber (torus). Large-scale testing of the Mark I containment and in-plant testing of Mark I primary containment systems identified additional hydrodynamic loads that were not considered in the original design of the VYNPS containment. The Mark I owners group initiated the Mark I Containment Program to develop a generic load definition and structural analysis techniques.

The torus and torus attached piping systems were analyzed as part of the Mark 1 containment long-term program, using methods and assumptions consistent with NUREG-0661, “Safety Evaluation Report, Mark I Containment Long Term Program, resolution of Generic Technical Activity A-7,” July 1980. The Mark I Containment Long Term Program evaluation of hydrodynamic loads included fatigue analyses of the torus, SRV piping and penetrations, and other torus attached piping.

4.6.1 Fatigue of the Torus

4.6.1.1 Summary of Technical Information in the Application

LRA Section 4.6.1 summarizes the evaluation of torus fatigue analyses for the period of extended operation. The torus fatigue analyses looked at both the shell and the attached piping systems. The plant-specific fatigue usage factor for the torus shell is 0.001 for normal operation and 0.078 for design basis accidents, values so small that, when multiplied by 1.5 to account for 60 rather than 40-years, they are still insignificant usage factors. The fatigue analysis of the torus during normal operation and upset conditions thus has been projected through the period of extended operation as required by 10 CFR 54.21(c)(1)(ii).

4.6.1.2 Staff Evaluation

The staff reviewed LRA Section 4.6.1 to verify in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

The staff reviewed the LRA regarding the fatigue TLAAs of the torus. The staff also asked the applicant to provide the estimate of the total number of 60-year safety relief valve (SRV) actuations used in the design fatigue analysis remains valid and conservative, based on the actual SRV actuations counted through 2005 and to confirm that VYNPS remains bounded by MPR-751 after power uprate. In its response, the applicant stated that per the MPR-751, all domestic Mark I BWRs appear to meet MPR-751 for both current operating and license renewal terms. VYNPS's SRV operation has been very low. VYNPS has estimated approximately 150 actuations of SRV in 35-years of operation. Extrapolating this number to 60-years given less than 260 lifts. Based on this, the projected CUF for 60-years is calculated as 0.035. VYNPS has not had a leaking SRV since the early 1980's. VYNPS only functionally tests its SRV once per cycle during the reactor shutdown. The applicant also stated that VYNPS has had two SRV actuations events of note, e.g., loss of Normal Power Event (1990) and loss of Switchyard Insulator Event (2005). VYNPS replaces all of its four installed SRVs every refueling cycle with readied spares. This refurbishment strategy has ensured that inadvertent SRV operation has been minimized. The staff finds the applicant has projected the SRV actuations for the period of extended operation in accordance with the requirements of 10 CFR 54.21(c)(1)(ii). On the basis of its review, the staff finds this is acceptable.

4.6.1.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of fatigue of the torus, primary containment, and attached piping, in LRA Section A.2.2.4. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address fatigue of the torus, primary containment, and attached piping is adequate because it reflects the information provided in the LRA.

4.6.1.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(ii), that, for fatigue of the torus, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.2 Fatigue of Safety Relief Valve Discharge Piping

4.6.2.1 Summary of Technical Information in the Application

LRA Section 4.6.2 summarizes the evaluation of SRV discharge piping fatigue for the period of extended operation. Fatigue analysis of SRV piping, along with all other torus attached piping, is bounded by MPR-751, the GE Mark 1 containment program designed to bound all BWR plants utilizing the Mark I containment design. The analysis concluded that for all plants and piping systems considered the fatigue usage factors for an assumed 40-year plant life was less than 0.5. In a worst-case scenario, for an additional 20-years of plant life usage factors would be below 0.75, less than 1.0, satisfying fatigue criteria. The MPR-751 generic fatigue analysis thus is projected for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(ii).

A plant-specific analysis addressing the torus SRV penetration sleeves and bellows states that the SRV penetrations are qualified for 7500 cycles of maximum load while the SRVs are expected to see fewer than 50 cycles at maximum load and 4500 cycles at partial load. The number of 40-year cycles increased by 1.5 for the period of extended operation still would be less than the 7500 maximum load cycles permitted. The fatigue analysis for torus penetrations thus remains valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i).

4.6.2.2 Staff Evaluation

The staff reviewed LRA Section 4.6.2 to verify, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The staff reviewed the technical information in LRA Section 4.6.2 regarding the TLAAs of the fatigue of SRV discharge piping. As documented in the Audit and Review Report, the staff requested that the applicant provide a statement indicating that VYNPS is bounded by MPR-751. In its response, the applicant stated that letter MFN-187-82 (MPR-751) dated November 30, 1982 from GE to NRC, Section 3.0, “Results and Conclusions,” indicated that this section contains the results of the fatigue evaluations performed on over 30 torus piping systems. These systems were selected by each architect-engineer as representative of the most highly stressed torus piping systems in their respective plants. Thirty percent of these were SRV discharge lines and the remainder were lines attached to the torus with sizes ranging from 2 to 24 inches. All torus piping systems have a fatigue usage of less than 0.5. The fatigue evaluation results which were tabulated in Table 3-1, are summarized as follows:

SRV discharge Piping:

Percent less than 0.3 fatigue usage - 72.7 percent
Percent less than 0.5 fatigue usage - 100 percent.

A conservative methodology has been developed for fatigue analysis of Mark I Class 2 piping. The fact that the calculated fatigue usage factors are low, coupled with a conservative approach used to develop the fatigue, is not a concern for attached piping. Thus, MPR-751 answers the concern expressed by the staff regarding the effect of cyclic mechanical loads on fatigue. Accordingly, there is no need for a complete evaluation of torus piping fatigue on a plant-unique basis. The staff finds that the applicant has projected the safety relief valve (SRV) discharge piping analysis remains valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i). On the basis of its review, the staff finds this acceptable.

4.6.2.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of fatigue of safety relief valve discharge piping in LRA Section A.2.2.4. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address fatigue of safety relief valve discharge piping is adequate.

4.6.2.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(i), that, for fatigue of safety relief valve discharge piping, the analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.3 Fatigue of Other Torus-Attached Piping

4.6.3.1 Summary of Technical Information in the Application

LRA Section 4.6.3 summarizes the evaluation of fatigue analysis of other torus-attached piping for the period of extended operation. The plant-specific analysis refers to the generic GE Mark 1 containment program for other torus-attached piping. The results of the GE Mark 1 program (based on 40-years of operation) were that 92 percent of the torus-attached piping would have CUFs of less than 0.3 and that 100 percent would have CUFs of less than 0.5. These CUFs conservatively multiplied by 1.5 for 60-years of operation show that 92 percent of the torus-attached piping would have CUFs below 0.45 and 100 percent would have CUFs below 0.75. This analysis thus has been projected through the period of extended operation, in compliance with 10 CFR 50.21(c)(ii).

4.6.3.2 Staff Evaluation

The staff reviewed LRA Section 4.6.3 to verify, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

The staff reviewed the information in LRA Section 4.6.3 regarding the fatigue TLAAs of other torus attached piping. The staff also reviewed the applicant's disposition of these TLAAs and finds it acceptable. The staff verified that the applicant selected a CUF threshold limit of less than 0.5 for 40-years of operation, when performing the fatigue analysis in accordance with MPR-751.

The staff finds that the analysis has been projected to the end of the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(ii). On the basis of its review, the staff finds this is acceptable.

4.6.3.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of fatigue of other torus-attached piping in LRA Section A.2.2.4. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address fatigue of other torus-attached piping is adequate.

4.6.3.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(ii), that, for fatigue of other torus-attached piping, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Other Time-Limited Aging Analyses

LRA Section 4.7 summarizes the evaluation of the following plant-specific TLAAs:

- reflood thermal shock of the reactor vessel internals
- TLAA in BWRVIPs

4.7.1 Reflood Thermal Shock of the Reactor Vessel Internals

4.7.1.1 Summary of Technical Information in the Application

LRA Section 4.7.1 summarizes the evaluation of reflood thermal shock of the RV internals for the period of extended operation. UFSAR Section 3.3.5.4 addresses reflood thermal shock of the RV internals (core shroud). This evaluation of thermal shock is a TLAA because it is based on the shroud receiving by the end of plant life a maximum integrated neutron fluence of 2.7×10^{20} n/cm^2 (greater than 1 MeV), a generic value bounding all BWRs. To show that VYNPS remains bounded for the period of extended operation, it is adequate to show that shroud fluence for 54 EFPY remains below 2.7×10^{20} n/cm^2. The peak shroud fluence was calculated for the extended power uprate at 9.67×10^{10} n/cm^2-sec. Integration of this fluence and the pre-uprate flux indicates an end of life shroud fluence of 1.5×10^{20} n/cm^2. This value remains below the 2.7×10^{20} n/cm^2 value in the evaluation documented in the UFSAR, and thus that evaluation remains valid for the period of extended operation. As such, this TLAA remains valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i).

4.7.1.2 Staff Evaluation

The applicant demonstrated that the VYNPS core shroud will receive a projected peak fluence of 1.5×10^{20} n/cm^2 (E greater than 1 MeV) at 54 EFPY. Therefore, the peak core shroud fluence will remain below the maximum bounding fluence value of 2.7×10^{20} n/cm^2 (E greater than 1 MeV) by the end of the period of extended operation. However, given that the peak core shroud fluence at VYNPS was, in fact, projected out to 54 EFPY, the staff determines that the applicant's TLAA for reflood thermal shock of the RV internals met the regulatory requirements of 10 CFR 54.21(c)(1)(ii) because this fluence was actually projected to the end of the period of extended operation. Therefore, the staff finds that the applicant's TLAA for reflood thermal shock of the RV internals will be in compliance with the staff's acceptance criterion, as required by 10 CFR 54.21(c)(1)(ii).

4.7.1.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of reflood thermal shock of the RV internals in LRA Section A.2.2.2.1. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address reflood thermal shock of the RV internals is adequate.

4.7.1.4 Conclusion

The staff has reviewed the applicant's TLAA of the reflood thermal shock of the RV internals, as summarized in Section 4.7.1 of the LRA, and has determined that the applicant appropriately describes how the peak core shroud fluence at 54 EFPY is projected to remain well below the maximum bounding fluence value of 2.7×10^{20} n/cm^2 (E greater than 1 MeV). The staff concludes that the applicant's TLAA in LRA Section 4.7.1 is acceptable. The staff concludes that the applicant's TLAA in LRA Section 4.7.1 for the reflood thermal shock analysis of the RV internals will be in compliance with the staff's acceptance criterion for TLAAs in 10 CFR 54.21(c)(1)(ii). The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2 Time- Limited Aging Analysis in BWRVIPs

BWRVIP documents identify various potential TLAAs. The TLAAs applicable to VYNPS are described below.

4.7.2.1 BWRVIP-05, Reactor Vessel Axial Welds

4.7.2.1.1 Summary of Technical Information in the Application

LRA Section 4.7.2.1 summarizes the evaluation of RV axial welds for the period of extended operation. BWRVIP-05 justifies elimination of RV circumferential welds from examination. BWRVIP-74 extends this justification to the period of license renewal. LRA Section 4.2.5 documents the evaluation of the TLAA associated with this issue.

4.7.2.1.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2.1 to verify, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

LRA Section 4.7.2.1 of the VYNPS is titled "BWRVIP-05, Reactor Vessel Axial Welds." However, this section addressed the criteria of BWRVIP-05 and BWRVIP-74, as they relate to the granting of relief from RV circumferential weld examination requirements during the period of extended operation. Therefore, the staff requested, in RAI 4.7.2.1-1, that the applicant resolve this discrepancy, and address whether there is any additional TLAA for the RV axial welds, other than what is addressed in LRA Section 4.2.6. In response, the applicant stated that the only TLAA associated with the axial welds is the mean RT_{NDT} projection which shows that the bases for the circumferential weld inspection relief will still be met at 54 EFPY. This is the TLAA addressed in LRA Section 4.2.6. Based on the TLAAs in LRA Section 4.2.5 and 4.2.6, the staff finds that this response resolves the concern described in of RAI 4.7.2.1-1. Therefore, the staff finds that the applicant's TLAA for BWRVIP-05 will be in compliance with the staff's TLAA acceptance criterion, as required by 10 CFR 54.21(c)(1)(ii). The staff's findings and conclusions regarding the TLAA in LRA Sections 4.2.5 and 4.2.6 are discussed in SER Sections 4.2.5 and 4.2.6 respectively. The staff found each TLAA acceptable.

4.7.2.1.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of RV axial welds in LRA Section A.2.2.1.5. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address RV axial welds is adequate.

4.7.2.1.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(ii), that, for RV axial welds, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2.2 BWRVIP-25, Core Plate

4.7.2.2.1 Summary of Technical Information in the Application

LRA Section 4.7.2.2 summarizes the evaluation of the core plate for the period of extended operation, particularly loss of preload and cracking of core plate rim hold-down bolts. The calculation of loss of preload on the core plate rim hold-down bolts is a TLAA. BWRVIP-25 calculates the loss of preload for these bolts for 40-years. Appendix B to BWRVIP-25 projects this calculation to 60-years, showing that the bolts would experience only 5 to 19 percent loss of preload. This TLAA is thus projected to the end of the period of extended operation. There is no TLAA for cracking of the core plate bolts. BWRVIP-25 inspection requirements manage core plate bolt cracking for the period of extended operation, and the applicant implements BWRVIP-25 inspection requirements in the BWR Vessel Internals Program, which will adequately manage cracking of the core plate rim hold-down bolts for the period of extended operation.

4.7.2.2.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2.2 to verify, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

LRA Section 4.7.2.2 of VYNPS addresses the recommendations of BWRVIP-25 relating to the TLAA for the RV core plate rim hold-down bolts. For the 40-year licensed operating period, BWRVIP-25 concluded that all core plate rim hold-down bolts will maintain sufficient preload throughout the life of the plant. The applicant indicated that BWRVIP-25, Appendix B, projected the BWRVIP-25 calculation to 60-years. For the period of extended operation, the expected loss of preload in BWRVIP-25, Appendix B, was assumed to be 20 percent. This bounds the original BWRVIP analysis, including VYNPS through the end of the period of extended operation. With a 20 percent loss of preload, the core plate rim hold-down bolts will maintain sufficient preload to prevent sliding of the core plate in accordance with both normal and accident conditions. Based on this assumption, the applicant concludes that the loss of preload is acceptable for the period of extended operation.

The staff found that additional information was required concerning the data and analyses that were used to determine that the loss of preload due to stress relaxation at the end of the period of extended operation would remain less than 20 percent. Therefore, the staff requested, in RAI 4.7.2.2-1, that the applicant provide additional information demonstrating that BWRVIP-25 and BWRVIP-25, Appendix B, are applicable to VYNPS, based on the following:

(1) configuration and geometry of the VYNPS core plate rim hold-down bolts,

(2) the temperature of the core plate rim hold-down bolts during normal operation, taking into consideration EPU conditions, and

(3) projected bolt neutron fluence at the end of the period of extended operation, taking into consideration EPU conditions.

In response to RAI 4.7.2.2-1, the applicant, based on the criteria outlined by the staff above, discussed how BWRVIP-25 and BWRVIP-25, Appendix B, are applicable to VYNPS:

(1) The applicant stated that the configuration and geometry of the VYNPS core plate and core plate rim hold-down bolts was reviewed and confirmed during the preparation of BWRVIP-25. Thus, the less than 20 percent criterion for loss of preload due to stress relaxation at the end of the period of extended operation is applicable to VYNPS, based on core plate configuration and geometry.

(2) The FW temperature nominally increased about 15°F for the power uprate; however, the recirculation steam flow in the RV decreased as a percentage of total flow, resulting in less “hot” steam mixing with “cold” FW. This resulted in a decrease in core inlet enthalpy. Therefore, the EPU conditions had a net effect of a smaller loss of preload in the core plate rim hold-down bolts, and the original BWRVIP-25 analysis remained bounding for the EPU conditions.

(3) The applicant did not calculate the neutron fluence at the core plate rim hold-down bolts for the period or extended operation. However, the projected 54 EFPY RV fluence of 3.98 x 10^{17} n/cm^2 (E greater than 1 MeV) from LRA Section 4.2.1 will remain significantly lower than the corresponding EOL RV fluence for the majority of BWRs. Therefore, given that the fluence used by BWRVIP-25 bounds all BWRs, the applicant finds that it would also continue to be bounding for VYNPS.

The staff finds that the applicant adequately addressed how the BWRVIP-25 analysis was applied to VYNPS based on the configuration and the geometry of core plate rim hold-down bolts and the reactor environment (temperature and neutron fluence) assumed in the original report. The staff's concern described RAI 4.7.2.2-1 is resolved. The applicant has projected the TLAA to the end of the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(ii).

In RAI 4.7.2.2-2, the staff also requested that the applicant demonstrate that, in accordance with the conditions stated in BWRVIP-25, Appendix A, Scenario 3 (determination of rim hold-down bolt loading with no credit for aligner pins or rim weld), the axial and bending stresses for the rim hold-down bolts with the mean and highest loading would not exceed the ASME Code, Section III, allowable stresses for primary membrane and primary membrane plus bending, as a result of a 20 percent reduction in the specified bolt pre-load. The staff requested that the applicant state the assumptions on which this analysis is based, taking into consideration the fact that the approach recommended in BWRVIP-25, Appendix A, is based on an elastic finite element analysis of the core plate and rim hold-down bolts.

In its response to RAI 4.7.2.2-2, the applicant indicated that the staff onsite audit of the LRA TLAAs requested the site-specific calculation for core plate rim hold-down bolts discussed in BWRVIP-25, Appendix A. The applicant responded to the staff onsite audit by indicating that there was no site-specific calculation. This issue was subsequently addressed by the applicant through VYNPS license renewal Commitment #29, which states that "[VYNPS] will either install core plate wedges or complete a plant-specific analysis to determine acceptance for continued inspection of core plate rim hold-down bolting in accordance with BWRVIP-25." The applicant stated that if the calculation is performed, it will demonstrate that the axial and bending stresses for the rim hold-down bolts with the mean and highest loading will not exceed the ASME Code, Section III, allowable stresses for primary membrane and primary membrane plus bending, as a result of a 20 percent reduction in the specified bolt pre-load.

Based on the applicant's response to RAI 4.7.2.2-2, the staff finds that the applicant will resolve this issue in accordance with license renewal Commitment #29 from the staff onsite audit of the LRA TLAAs. The applicant may resolve license renewal Commitment #29 through the installation of core plate wedges. However, if core plate wedges are not installed prior to the beginning of the period of extended operation, the applicant must resolve license renewal Commitment #29 through the completion of a plant-specific analysis to determine acceptance for continued inspection of core plate rim hold-down bolting in accordance with BWRVIP-25, Appendix A, prior to the beginning of the period of extended operation. The staff's concern described RAI 4.7.2.2-2 is resolved. The applicant will adequately manage the effects of aging on the intended function of the core plate and core plate rim hold-down bolts for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(iii), with the implementation of BWRVIP-25 inspection requirements in the BWR Vessel Internals Program.

4.7.2.2.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of the core plate in LRA Section A.2.2.5. which includes:

> The calculation of loss of preload on the core plate rim bolts is a TLAA. BWRVIP-25 calculated the loss of preload for these bolts for forty-years. BWRVIP-25, Appendix B, projected this calculation to 60-years, showing that the VYNPS bolts would experience only 5 to 19 percent loss of preload. This TLAA is thus projected to the end of the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(ii).

On the basis of its review of the UFSAR Supplement,with the implementation of Commitment #29 into the UFSAR the staff concludes that the summary description of the applicant's actions to address core plate rim hold-down bolt fatigue is adequate.

4.7.2.2.4 Conclusion

The staff reviewed the applicant's TLAA of the loss of preload for the core plate rim hold-down bolts, as summarized in LRA Section 4.7.2.2, including its RAI response dated November 9, 2006, and finds that the applicant appropriately describes how the criteria of BWRVIP-25 are applied for determining the loss of preload for the core plate rim hold-down bolts at VYNPS.

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(ii) and (iii), that, the core plate analyses have been projected to the end of the period of extended operation and aging effects on the intended functions will be adequately managed for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2.3 BWRVIP-38, Shroud Support

4.7.2.3.1 Summary of Technical Information in the Application

LRA Section 4.7.2.3 summarizes shroud support fatigue analysis for the period of extended operation. Fatigue analysis of the shroud support is a TLAA. The BWRVIP-38 fatigue analysis of the RV internals, including the shroud, is addressed in LRA Section 4.3.1.2. The CUFs for the shroud are based on the design basis transients and the analyses remain valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i).

4.7.2.3.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2.3 to verify in accordance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

In a letter dated August 7, 1996, “Response to Request Additional Information Regarding Vermont Yankee Core Shroud Modification,” VYNPS stated that a fatigue analysis had been performed for the shroud repair hardware. This calculation included a fatigue analysis of the slotted hole in the shroud support plate where the shroud repair ligaments attach. The resulting CUF was 0.23. The applicant also stated that this CUF is based on the number of design transients in the original RV design report.

The staff reviewed the applicant’s TLAA basis document and UFSAR Section K.3.1. UFSAR Section K.3.1 stated that the core shroud repair was designed for a 40-year life. The staff finds that the core shroud repair is a TLAA. The staff also reviewed the applicant’s power uprate re-evaluation of the core shroud repair and finds this acceptable. On the basis of its review, the staff finds that the Fatigue Monitoring Program for VYNPS will assure that the allowed number of transient cycles is not exceeded and the TLAA (fatigue analysis) based on those transients will remain valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i). Therefore, the core shroud repair fatigue TLAA is acceptable.

4.7.2.3.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of shroud support fatigue in LRA Section A.2.2.2.1. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant’s actions to address shroud support fatigue is adequate.

4.7.2.3.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, as required by 10 CFR 54.21(c)(1)(i), that, for shroud support, the analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2.4 BWRVIP-47, Lower Plenum Fatigue Analysis

4.7.2.4.1 Summary of Technical Information in the Application

LRA Section 4.7.2.4 summarizes the evaluation of lower plenum fatigue analyses for the period of extended operation. BWRVIP-47 treats fatigue analyses, especially of lower plenum pressure boundary components, as TLAAs. The only lower plenum CUF identified was for the CRD penetrations equal to 0.13. The applicant maintains this CUF by limiting the allowed number of transients; therefore, the analysis remains valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i).

4.7.2.4.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2.4 to verify, in compliance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation. The staff also reviewed the applicant’s basis document.

The staff requested that the applicant provide specific calculations for the lower plenum. The applicant noted that LRA Section 4.7.2.4 (Lower Plenum) is the VYNPS-specific calculation and that it is included in LRA Table 4.3-1. The staff reviewed this response finds that the analysis has been projected through the period of extended operation. On the basis of its review, the staff finds that the CUF will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i).

4.7.2.4.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of lower plenum fatigue analysis in LRA Section A.2.2.6. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address lower plenum fatigue analysis is adequate.

4.7.2.4.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, as required by 10 CFR 54.21(c)(1)(i), that, for lower plenum fatigue, the analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2.5 BWRVIP-48, Vessel ID Attachment Welds Fatigue Analysis

4.7.2.5.1 Summary of Technical Information in the Application

LRA Section 4.7.2.5 summarizes the evaluation of vessel ID attachment weld fatigue analyses for the period of extended operation. The BWRVIP-48 fatigue analyses for various configurations of vessel ID bracket attachments are considered TLAAs. VYNPS has no unique bracket configurations. Fatigue analysis for 60-years showed no CUFs above 0.4. This analysis remains valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i).

4.7.2.5.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2.5 to verify, in compliance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The staff asked the applicant to confirm that the CUF values calculated in the BWRVIPs could be applied to VYNPS. The applicant noted that the generic analyses performed in the BWRVIP documents are not VYNPS-specific calculations. Therefore, this is a TLAA not applicable to VYNPS.

In its letter, dated July 14, 2006, the applicant revised its LRA to address this generic application of BWRVIP-48. In this letter, the applicant revised its LRA to delete Sections 4.7.2.5 and A.2.2.7.

4.7.2.5.3 UFSAR Supplement

The applicant deleted LRA Section A.2.2.7 because VYNPS does not have a TLAA for this component.

4.7.2.5.4 Conclusion

This TLAA is not applicable to VYNPS.

4.7.2.6 BWRVIP-49, Instrument Penetrations Fatigue Analysis

4.7.2.6.1 Summary of Technical Information in the Application

LRA Section 4.7.2.6 summarizes the evaluation of instrument penetrations fatigue analyses for the period of extended operation. The BWRVIP-49 fatigue analyses for several configurations of instrumentation penetrations, including the VYNPS configuration, are considered TLAAs. Fatigue analyses for 60-years showed all CUFs below 0.4. These analyses remain valid for the period of extended operation, in compliance with 10 CFR 54.21(c)(1)(i).

4.7.2.6.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2.6 to verify, in compliance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

During the audit and review, the staff asked that the applicant to confirm that the CUF values calculated in the BWRVIPs could be applied to VYNPS. The applicant noted that the generic analyses performed in the BWRVIP documents are not VYNPS-specific calculations. Therefore, this is a TLAA not applicable to VYNPS.

In its letter, dated July 14, 2006, the applicant revised its LRA to address this generic application of BWRVIP-49. In this letter, the applicant revised its LRA to delete Sections 4.7.2.6 and A.2.2.8.

4.7.2.6.3 UFSAR Supplement

The applicant deleted LRA Section A.2.2.7 because VYNPS does not have a TLAA for this component.

4.7.2.6.4 Conclusion

This TLAA is not applicable to VYNPS.

4.7.2.7 BWRVIP-74, Reactor Pressure Vessel

4.7.2.7.1 Summary of Technical Information in the Application

LRA Section 4.7.2.7 summarizes the evaluation of RPV fatigue analysis for the period of extended operation. BWRVIP-74 and the corresponding NRC SER for BWRVIP-74 document the following four TLAAs:

(1) P-T Curves - The SER concludes “a set of P-T curves should be developed for the heatup and cooldown operating conditions in the plant at a given EFPY in the LR period.”

(2) Fatigue - The SER states that license renewal applicants should not rely solely on the BWRVIP-74 analysis but also verify that the number of cycles assumed in the original

fatigue design is conservative. The SER states that staff concerns about environmental fatigue were not resolved and that each applicant should address environmental fatigue for the components covered by BWRVIP-74.

(3) Equivalent Margins Analysis for RPV Materials with C_VUSE Less than 50 ft-lb - BWRVIP-74 addresses the percent reductions in C_VUSE for limiting BWR/3-6 plates and BWR non-Linde 80 submerged arc welds.

(4) Material Evaluation for Exempting RPV Welds from Inspection.

4.7.2.7.2 Staff Evaluation

The staff reviewed the information in LRA Section 4.7.2.7, pertaining to BWRVIP-74, Reactor Pressure Vessel. The staff also reviewed the applicant's basis document, as documented in the Audit and Review Report, and BWRVIP-74. The staff verified that all TLAAs are discussed in LRA Sections 4.2.2, 4.2.3, 4.2.5, 4.2.6, 4.3, and 4.3.3, and are addressed in the SER for BWRVIP-74.

The staff reviewed the TLAAs for P-T curves, Fatigue, Charpy USE, and RPV welds and found 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, and the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. On the basis of its review, the staff finds that the applicant adequately addressed all the TLAAs as identified in BWRVIP-74.

4.7.2.7.3 UFSAR Supplement

The applicant provided a UFSAR analyses summary description of its TLAA evaluation of RPV in LRA Section A.2.2.1. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address RPV analyses is adequate.

4.7.2.7.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(i), (ii) and (iii), that, for the RPV TLAA, the analyses remain valid for the period of extended operation, the analyses have been projected to the end of the period of extended operation, and the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2.8 BWRVIP-76, Core Shroud

4.7.2.8.1 Summary of Technical Information in the Application

LRA Section 4.7.2.8 summarizes the evaluation of core shroud fatigue analyses for the period of extended operation. BWRVIP-76 Appendix K states that plant-specific analyses for shroud fatigue will be reviewed for TLAAs. A review of the plant-specific shroud analyses found one TLAA. The calculation of the allowable interval between inspections for various core shroud welds using the limit load analysis techniques described in ASME Code, Section XI is valid as long as total neutron fluence remains below 3 x 10^{20} n/cm^2. Extrapolation of neutron fluence shows that shroud fluence will be approximately 1.5 x 10^{20} n/cm^2 at the end of the period of extended operation (54 EFPY). Therefore, this calculation remains valid for the period of extended operation.

4.7.2.8.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2.8 to verify, in compliance with 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The staff reviewed the applicant's fluence evaluation method, including extrapolation and projection. The staff finds the the applicant's 60-year fluence value was calculated using staff approved methodology. Since shroud fluence value remains below 3 x 10^{20} n/cm^2, the material property used in the limit load analysis remains the same. On this basis, the staff concludes that the calculation will remain valid for the period of extended operation.

4.7.2.8.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of core shroud analyses in LRA Section A.2.2.1.1. On the basis of its review of the UFSAR Supplement, the staff concludes that the summary description of the applicant's actions to address core shroud is adequate.

4.7.2.8.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant demonstrated, in compliance with 10 CFR 54.21(c)(1)(i), that, for the core shroud, the analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR Supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.8 Conclusion for Time-Limited Aging Analyses

The staff reviewed the information in LRA Section 4, "Time-Limited Aging Analysis." On the basis of its review, the staff concludes, that the applicant provided a sufficient list of TLAAs, as defined in 10 CFR 54.3 and that the applicant demonstrated that: (1) the TLAAs will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i); (2) the TLAAs have been projected to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii); or (3) that the effects of aging on the intended function(s) will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also reviewed the UFSAR Supplement for the TLAAs and finds that the supplement contains descriptions of the TLAAs sufficient to satisfy the requirements of 10 CFR 54.21(d). In addition, the staff concludes, as required by 10 CFR 54.21(c)(2), that no plant-specific, TLAA-based exemptions are in effect.

With regard to these matters, the staff concludes that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB, and any changes made to the CLB, in order to comply with 10 CFR 54.29(a), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

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SECTION 5

REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with Title 10, Part 54, of the *Code of Federal Regulations*, the Advisory Committee on Reactor Safeguards (ACRS) will review the license renewal application (LRA) for Vermont Yankee Nuclear Power Station. The ACRS Subcommittee on Plant License Renewal will continue its detailed review of the LRA after this safety evaluation report (SER) is issued. Entergy Nuclear Operations, Inc. (the applicant) and the staff of the US Nuclear Regulatory Commission (NRC) (the staff) will meet with the subcommittee and the full committee to discuss issues associated with the review of the LRA.

After the ACRS completes its review of the LRA and SER, the full committee will issue a report discussing the results of the review. An update to this SER will include the ACRS report. This update will also include the staff's response to any issues and concerns identified in the ACRS report.

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SECTION 6

CONCLUSION

The staff of the US Nuclear Regulatory Commission (NRC) (the staff) reviewed the license renewal application (LRA) for Vermont Yankee Nuclear Power Station in accordance with the NRC's regulations and US NRC NUREG-1800, Revision 1, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated September 2005. Title 10, Section 54.29, of the *Code of Federal Regulations* (10 CFR 54.29) provides the standards for issuance of a renewed license.

On the basis of its review, the staff concludes that, pending resolution of the confirmatory items, the applicant has adequately identified those systems and components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and those systems and components that are subject to an aging management review, as required by 10 CFR 54.21(a)(1). The staff also concludes that the applicant demonstrated that the aging effects will be adequately managed so that the intended functions will be maintained consistent with the current licensing basis (CLB) for the period of extended operation, as required by 10 CFR 54.21(a)(3). Further, the staff concludes that the applicant has demonstrated that (1) the time-limited aging analyses (TLAAs) will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i), (2) the TLAAs has been projected to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii), or (3) that the aging effects will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). On the basis of its evaluation of the LRA, the staff finds that the requirements of 10 CFR 54.29(a) have been met, that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB, and that any changes made to the plant's CLB in order to comply with this paragraph are in accord with the Act and the Commission's regulations.

The staff notes that any requirements of 10 CFR Part 51, Subpart A, are documented in NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)." The staff issued the draft, plant-specific supplement to the GEIS, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants Supplement 30 Regarding Vermont Yankee Nuclear Power Station," on December 13, 2006.

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APPENDIX A

VYNPS LICENSE RENEWAL COMMITMENTS

During the review of the Vermont Yankee Nuclear Power Station (VYNPS) license renewal application (LRA) by the staff of the US Nuclear Regulatory Commission (NRC) (the staff), Entergy Nuclear Operations, Inc. (the applicant) made commitments related to aging management programs (AMPs) to manage the aging effects of structures and components prior to the period of extended operation. The following table lists these commitments along with the implementation schedules and the sources for each commitment.

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
1	Guidance for performing examinations of buried piping will be enhanced to specify that coating degradation and corrosion are attributes to be evaluated.	B.1.1 Audit Items 5 and 130	March 21, 2012	BVY 06-009
2	Fifteen (15) percent of the top guide locations will be inspected using enhanced visual inspection technique, EVT-1, within the first 18 years of the period of extended operation, with at least one-third of the inspections to be completed within the first 6 years and at least two-thirds within the first 12 years of the period of extended operation. Locations selected for examination will be areas that have exceeded the neutron fluence threshold.	B.1.7 Audit Item 14	Inspections completed within the first 18 years of the period of extended operation (one-third of inspections completed within the first 6 years and two-thirds completed of inspections completed within the first 12 years of the period of extended operation)	BVY 06-009

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
3	The Diesel Fuel Monitoring Program will be enhanced to ensure ultrasonic thickness measurement of the fuel oil storage tank bottom surface will be performed every 10 years during tank cleaning and inspection.	B.1.9 and regional inspection	March 21, 2012	BVY 06-009 BVY 07-018
4	The Diesel Fuel Monitoring Program will be enhanced to specify UT measurements of the fuel oil storage tank bottom surface will have acceptance criterion ≥ 60% Tnom.	B.1.9	March 21, 2012	BVY 06-009
5	The Fatigue Monitoring Program will be modified to require periodic update of cumulative fatigue usage factors (CUFs), or to require update of CUFs if the number of accumulated cycles approaches the number assumed in the design calculation.	B.1.11	March 21, 2012	BVY 06-009
6	A computerized monitoring program (e.g., FatiguePro) will be used to directly determine cumulative fatigue usage factors (CUFs) for locations of interest.	B.1.11	March 21, 2012	BVY 06-009
7	The allowable number of effective transients will be established for monitored transients. This will allow quantitative projection of future margin.	B.1.11	March 21, 2012	BVY 06-009
8	Procedures will be enhanced to specify that fire damper frames in fire barriers will be inspected for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion.	B.1.12.1 Audit Items 35,151,152,153 and 159	March 21, 2012	BVY 06-009

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
9	Procedures will be enhanced to state that the diesel engine subsystems (including the fuel supply line) will be observed while the pump is running. Acceptance criteria will be enhanced to verify that the diesel engine did not exhibit signs of degradation while it was running; such as fuel oil, lube oil, coolant, or exhaust gas leakage.	B.1.12.1 Audit Items 33,150 and 155	March 21, 2012	BVY 06-009
10	Fire Water System Program procedures will be enhanced to specify that in accordance with NFPA 25 (2002 edition), Section 5.3.1.1.1, when sprinklers have been in place for 50 years a representative sample of sprinkler heads will be submitted to a recognized testing laboratory for field service testing. This sampling will be repeated every 10 years.	B.1.12.2	March 21, 2012	BVY 06-009
11	The Fire Water System Program will be enhanced to specify that wall thickness evaluations of fire protection piping will be performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections will be performed before the end of the current operating term and during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.	B.1.12.2 Audit Items 37 and 41	March 21, 2012	BVY 06-009

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
12	Implement the Heat Exchanger Monitoring Program as described in LRA Section B.1.14.	B.1.14	March 21, 2012	BVY 06-009
13	Implement the Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program as described in LRA Section B.1.17.	B.1.17	March 21, 2012	BVY 06-009
14	Implement the Non-Environmental Qualification Instrumentation Circuits Test Review Program as described in LRA Section B.1.18.	B.1.18	March 21, 2012	BVY 06-009
15	Implement the Non-Environmental Qualification Insulated Cables and Connections Program as described in LRA Section B.1.19.	B.1.19	March 21, 2012	BVY 06-009
16	Implement the One-Time Inspection Program as described in LRA Section B.1.21. Include destructive or non-destructive examination of one (1) socket welded connection using techniques proven by past industry experience to be effective for the identification of cracking in small bore socket welds. Should an inspection opportunity not occur (e.g., socket weld failure or socket weld replacement), a susceptible small-bore socket weld will be examined either destructively or non-destructively prior to entering the period of extended operation.	B.1.21 Audit Items 239, 240, 330 and 331	March 21, 2012	BVY 06-009 BVY 07-009

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
17	Enhance the Periodic Surveillance and Preventive Maintenance Program to assure that the effects of aging will be managed as described in LRA Section B.1.22.	B.1.22 Audit Item 377	March 21, 2012	BVY 06-009
18	Enhance the Reactor Vessel Surveillance Program to proceduralize the data analysis, acceptance criteria, and corrective actions described in the program description in LRA Section B.1.24.	B.1.24	March 21, 2012	BVY 06-009
19	Implement the Selective Leaching Program as described in LRA Section B.1.25.	B.1.25	March 21, 2012	BVY 06-009
20	Enhance the Structures Monitoring Program to specify that process facility crane rails and girders, condensate storage tank (CST) enclosure, CO_2 tank enclosure, N_2 tank enclosure and restraining wall, CST pipe trench, diesel generator cable trench, fuel oil pump house, service water pipe trench, man-way seals and gaskets, and hatch seals and gaskets are included in the program.	B.1.27.2 Audit Item 377	March 21, 2012	BVY 06-009
21	Guidance for performing structural examinations of wood to identify loss of material, cracking, and change in material properties will be added to the Structures Monitoring Program.	B.1.27.2	March 21, 2012	BVY 06-009

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
22	Guidance for performing structural examinations of elastomers (seals and gaskets) to identify cracking and change in material properties (cracking when manually flexed) will be enhanced in the Structures Monitoring Program procedure.	B.1.27.2	March 21, 2012	BVY 06-009
23	Guidance for performing structural examinations of PVC cooling tower fill to identify cracking and change in material properties will be added to the Structures Monitoring Program procedure.	B.1.27.2	March 21, 2012	BVY 06-009
24	System walkdown guidance documents will be enhanced to perform periodic system engineer inspections of systems in-scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(1) and (a)(3). Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject system will include SSCs that are in-scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(2).	B.1.28 Audit Items 187, 188 and 190	March 21, 2012	BVY 06-009
25	Implement the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.1.29.	B.1.29	March 21, 2012	BVY 06-009

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
26	Procedures will be enhanced to flush the John Deere Diesel Generator cooling water system and replace the coolant and coolant conditioner every three years.	B.1.30.1 Audit Items 84 and 164	March 21, 2012	BVY 06-009
27	At least 2 years prior to entering the period of extended operation, for the locations identified in NUREG/CR-6260 for BWRs of the VY vintage, VY will implement one or more of the following: (1) Refine the fatigue analyses to determine valid CUFs less than 1 when accounting for the effects of reactor water environment. This includes applying the appropriate Fen factors to valid CUFs determined in accordance with one of the following: 1. For locations, including NUREG/CR-6260 locations, with existing fatigue analysis valid for the period of extended operation, use the existing CUF to determine the environmentally adjusted CUF. 2. More limiting VY-specific locations with a valid CUF may be added in addition to the NUREG/CR-6260 locations. 3. Representative CUF values from other plants, adjusted to or enveloping the VY plant-specific external loads may be used if demonstrated applicable to VY. 4. An analysis using an NRC-approved version of the ASME code or NRC-approved alternative (e.g.,	4.3.3 Audit Items 29, 107 and 318	March 21, 2012 March 21, 2010 for performing a fatigue analysis that addresses the effects of reactor coolant environment on fatigue (in accordance with an NRC approved version of the ASME Code)	BVY-06-058

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
	NRC-approved code case) may be performed to determine a valid CUF. (2) Manage the effects of aging due to fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic nondestructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC). (3) Repair or replace the affected locations before exceeding a CUF of 1.0. Should VY select the option to manage the aging effects due to environmental-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be submitted to the NRC at least 2 years prior to the period of extended operation.			
28	Revise program procedures to indicate that the Instrument Air Program will maintain instrument air quality in accordance with ISA S7.3	B.1.16 Audit Item 47	March 21, 2012	BVY 06-009

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
29	VYNPS will perform one of the following: 1. Install core plate wedges, or, 2. Complete a plant-specific analysis to determine acceptance criteria for continued inspection of core plate hold down bolting in accordance with BWRVIP-25 and submit the inspection plan and analysis to the NRC two years prior to the period of extended operation for NRC review and approval.	B.1.7 Audit Item 9	March 21, 2012	BVY 06-009
30	Revise System Walkdown Program to specify CO2 system inspections every 6 months.	B.1.28 Audit Items 30, 141, 146 and 298	March 21, 2012	BVY 06-009
31	Revise Fire Water System Program to specify annual fire hydrant gasket inspections and flow tests.	B.1.12.2 Audit Item 39 and 40	March 21, 2012	BVY 06-009
32	Implement the Metal Enclosed Bus Program. Details are provided in an LRA Amendment 16, Attachment 3 and LRA Amendment 23, 7.	Audit Item 97	March 21, 2012	BVY 06-058 BVY 07-003
33	Include within the Structures Monitoring Program provisions that will ensure an engineering evaluation is made on a periodic basis (at least once every five years) of groundwater samples to assess aggressiveness of groundwater to concrete. Samples will be monitored for sulfates, pH and chlorides.	B.1.27 Audit Item 77 RAI 3.5-7	March 21, 2012	BVY 06-009

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
34	Implement the Bolting Integrity Program. Details are provided in an LRA Amendment 16, Attachment 2 and LRA Amendment 23, Attachment 5.	Audit Items 198, 216, 218, 237, 331, & 333	March 21, 2012	BVY 06-058 BVY 07-003
35	Provide within the System Walkdown Training Program a process to document biennial refresher training of Engineers to demonstrate inclusion of the methodology for aging management of plant equipment as described in EPRI Aging Assessment Field Guide or comparable instructional guide.	Audit Item 384	March 21, 2012	BVY 06-058
36	If technology to inspect the hidden jet pump thermal sleeve and core spray thermal sleeve welds has not been developed and approved by the NRC at least two years prior to the period of extended operation, VYNPS will initiate plant-specific action to resolve this issue. That plant-specific action may be justification that the welds do not require inspection.	Audit Item 12	March 21, 2010	BVY06-058
37	Continue inspections in accordance with the Steam Dryer Monitoring Program, Revision 3 in the event that the BWRVIP-139 is not approved prior to the period of extended operation.	Audit Item 204	March 21, 2010	BVY 06-079
38	“The BWRVIP-116 report which was approved by the Staff will be implemented at VYNPS with the conditions documented in Sections 3 and 4 of the Staff's final SE dated March 1, 2006, for the BWRVIP-116 report.”	Response to RAI B.1.24-1	March 21, 2012	BVY 06-088

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
39	“If the VYNPS standby capsule is removed form the reactor vessel without the intent to test it, the capsule will be stored in a manner which maintains it in a condition which would permit its future use, including during the period of extended operation, if necessary.”	Response to RAI B.1.24-2	March 21, 2012	BVY 06-088
40	This Commitment has been deleted and replaced with Commitment 43	N/A	N/A	BVY 07-018
41	This Commitment has been deleted and replaced with Commitment 43	N/A	N/A	BVY 07-018
42	Implement the Bolted Cable Connections Program. Details are provided in LRA Amendment 23, Attachment 7.	Response to: RAI 3.6.2.2-N-01 LRA Sections: 3.6.2.1 A.2.1.39 B.1.33 Table 3.6.1 Table 3.6.2-1	March 21, 2012	BVY 07-003 BVY 07-018
43	Establish and implement a program that will require testing of the two 13.8 kV cables from the two Vernon Hydro Station 13.8 kV switchgear buses to the 13.8 kV / 69 kV step up transformers before the period of extended operation and at least once every 10 years after the initial test.	Am. 24 Response to: RAIs 3.6.2.2-N-08-2 3.6.2.2-N-08-4	March 21, 2012	BVY 07-009

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
44	Guidance for performing examinations of buried piping will be revised to include the following. "A focused inspection will be performed within the first 10 years of the period of extended operation, unless an opportunistic inspection (or an inspection via a method that allows an assessment of pipe condition without excavation) occurs within this ten-year period."	Regional inspection	March 21, 2012	BVY 07-018
45	Enhance the Service Water Integrity Program to require a periodic visual inspection of the RHRSW pump motor cooling coil internal surface for loss of material.	Regional inspection	March 21, 2012	BVY 07-018
46	Enhance the Diesel Fuel Monitoring Program to specify that fuel oil in the fire pump diesel storage (day) tank will be analyzed according to ASTM D975-02 and for particulates per ASTM D2276. Also, fuel oil in the John Deere diesel storage tank will be analyzed for particulates per ASTM D2276.	Regional inspection	March 21, 2012	BVY 07-018

APPENDIX A: VYNPS LICENSE RENEWAL COMMITMENTS				
Number	**Commitment**	**LRA Section**	**Enhancement or Implementation Schedule**	**Source**
47	Enhance the Diesel Fuel Monitoring Program to specify that fuel oil in the common portable fuel oil storage tank will be analyzed according to ASTM D975-02, per ASTM D2276 for particulates, and ASTM D1796 for water and sediment.	Regional inspection	March 21, 2012	BVY 07-018
48	Perform an internal inspection of the underground Service Water piping before entering the period of extended operation.	Regional inspection	March 21, 2012	BVY 07-018
49	Revise station procedures to specify fire hydrant hose testing, inspection, and replacement, if necessary, in accordance with NFPA code specifications for fire hydrant hoses.	Audit Item 38	March 21, 2012	BVY 07-009

APPENDIX B

CHRONOLOGY

This appendix contains a chronological listing of the routine licensing correspondence between the staff of the US Nuclear Regulatory Commission (NRC) (the staff) and Entergy Nuclear Operations, Inc. (ENO). This appendix also contains other correspondence regarding the staff's review of the Vermont Yankee Nuclear Power Station (VYNPS) license renewal application (LRA) (under Docket No. 50-271).

CHRONOLOGY	
Date	**Subject**
January 25, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application (BVY 06-009) (Accession No. ML060300082)
March 2, 2006	Vermont Yankee Nuclear Power Station - Issuance of Amendment Re: Extended Power Uprate (Accession No. ML060050024)
March 15, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 1 (BVY 06-022) (Accession No. ML060800223)
May 1, 2006	Vermont Yankee Aging Management Program (AMP) Audit Questions Database, Revision 0 (Accession No. ML061250393)
May 15, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment No. 2 (BVY 06-043) (Accession No. ML061380079)
June 1, 2006	Request for Additional Information Regarding Severe Accident Mitigation Alternatives for the Vermont Yankee Nuclear Power Station (Accession No. ML061520506)
June 7, 2006	Request for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML061580640)
June 19, 2006	Vermont Yankee AMP/AMR/TLAA Audit Question and Answer Database, Revision 1 (A) (Accession No. ML061700481)
June 19, 2006	Vermont Yankee AMP/AMR/TLAA Audit Question and Answer Database, Revision 1 (B) (Accession No. ML061700484)
July 6, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 3 (BVY 06-058) (Accession No. ML061920284)

CHRONOLOGY	
Date	**Subject**
July 10, 2006	Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML061720212)
July 11, 2006	Vermont Yankee AMP/AMR/TLAA Audit Question and Answer Database, Revision 1 (Accession No. ML061920452)
July 11, 2006	Summary of Public Scoping Meetings Conducted Related to the Review of the Vermont Yankee Nuclear Power Station, License Renewal Application (Accession No. ML061920506)
July 11, 2006	Summary of Environmental Site Audit Related to the Review of the License Renewal Application for Vermont Yankee Nuclear Power Station (Accession No. ML061730397)
July 13, 2006	Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML061950021)
July 14, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 4 (BVY 06-063) (Accession No. ML062010219)
July 14, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 5 (BVY 06-064) (Accession No. ML062010226)
July 26, 2006	Vermont Yankee AMP/AMR/TLAA Audit Question and Answer Database, Revision 3 (Part 1 of 2) (Accession No. ML062200561)
July 26, 2006	Vermont Yankee AMP/AMR/TLAA Audit Question and Answer Database, Revision 3 (Part 2 of 2) (Accession No. ML062200563)
July 27, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 6 (BVY 06-065) (Accession No. ML062130080)
August 1, 2006	Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062151553)
August 1, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 7 (BVY 06-071) (Accession No. ML062160079)
August 3, 2006	Request for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062150561)

CHRONOLOGY	
Date	**Subject**
August 3, 2006	Request for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062150560)
August 10, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 8 (BVY 06-076) (Accession No. ML062270057)
August 10, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 9 (BVY 06-077) (Accession No. ML062270500)
August 15, 2006	Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062270620)
August 15, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 10 (BVY 06-078) (Accession No. ML062340519)
August 16, 2006	Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062340035)
August 16, 2006	Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062290437)
August 22, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 11 (BVY 06-079) (Accession No. ML062400342)
September 5, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 12 (BVY 06-083) (Accession No. ML062550439)
September 11, 2006	Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062560341)
September 18, 2006	Vermont Yankee AMP/AMR/TLAA Audit Question and Answer Database, Revision 4 (Part 1 of 2) (Accession No. ML062630098)
September 18, 2006	Vermont Yankee AMP/AMR/TLAA Audit Question and Answer Database, Revision 4 (Part 2 of 2) (Accession No. ML062630102)

CHRONOLOGY	
Date	**Subject**
September 19, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 13 (BVY 06-086) (Accession No. ML062680034)
September 20, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 14 (BVY 06-088) (Accession No. ML062680164)
September 20, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 15 (BVY 06-090) (Accession No. ML062680168)
September 28, 2006	Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062720029)
October 10, 2006	Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062840595)
October 12, 2006	Summary of a Telephone Conference Call Held on September 14, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062790071)
October 12, 2006	Summary of a Telephone Conference Call Held on September 19, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062780122)
October 17, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 16 (BVY 06-091) (Accession No. ML062960301)
October 20, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment No. 17 (BVY 06-096) (Accession No. ML062990142)
October 20, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment No. 18, Response to Request for Clarification of SAMA RAI Responses (BVY 06-095) (Accession No. ML062990155)

CHRONOLOGY	
Date	**Subject**
October 27, 2006	Summary of a Telephone Conference Call Held on September 25, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062920034)
October 27, 2006	Summary of a Telephone Conference Call Held on September 27, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML062960125)
October 31, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 19 (BVY 06-097) (Accession No. ML063110071)
November 6, 2006	Summary of a Telephone Conference Call Held on October 10, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML063050619)
November 6, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 21, Response to Request for Clarification of SAMA RAIs (BVY 06-099) (Accession No. ML063170080)
November 9, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 20 (BVY 06-098) (Accession No. ML063240163)
November 21, 2006	Summary of a Telephone Conference Call Held on October 12, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML063120496)
November 30, 2006	Summary of a Telephone Conference Call Held on November 6, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML063280078)

CHRONOLOGY	
Date	**Subject**
December 1, 2006	Summary of a Telephone Conference Call Held on November 8, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML063330358)
December 4, 2006	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 22, Clarification of Aging Management Program and Environmental Report Items (BVY 06-100) (Accession No. ML063420178)
January 4, 2007	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 23 (BVY 07-003) (Accession No. ML070110504)
January 29, 2007	Summary of a Telephone Conference Call Held on December 6, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML070180534)
January 29, 2007	Summary of a Telephone Conference Call Held on December 14, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc., Concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application (Accession No. ML070180561)
March 12, 2007	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 24 (BVY 07-009) (Accession No. ML070750358)
March 23, 2007	Vermont Yankee Nuclear Power Station License No. DPR-28 (Docket No. 50-271) License Renewal Application, Amendment 26 (BVY 07-018) (Accession No. ML070880709)

APPENDIX C

PRINCIPAL CONTRIBUTORS

This appendix lists the principal contributors for the development of this safety evaluation report (SER) and their areas of responsibility.

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APPENDIX D

REFERENCES

This appendix contains a list of the references used throughout this safety evaluation report for review of the license renewal application (LRA) for Vermont Yankee Nuclear Power Station.

	REFERENCES
Number	Reference
1	BWRVIP-03, “BWR Vessel and Internals Project, Reactor Pressure Vessel and Internals Examination Guidelines.”
2	BWRVIP-18, “BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines.”
3	BWRVIP-25, “BWR Core Plate Inspection and Flaw Evaluation Guidelines.”
4	BWRVIP-26, “BWR Top Guide Inspection and Flaw Evaluation Guidelines.”
5	BWRVIP-27, “BWR Vessel and Internals Project, BWR Standby Liquid Control System/Core Plate DP Inspection and Flaw Evaluation Guidelines.”
6	BWRVIP-29, “BWR Water Chemistry Guidelines – 1993 Revision,” EPRI Topical Report (TR)-103515.
7	BWRVIP-38, “BWR Shroud Support Inspection and Flaw Evaluation Guidelines.”
8	BWRVIP-41, “BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines.”
9	BWRVIP-47, “BWR Lower Plenum Inspection and Flaw Evaluation Guidelines.”
10	BWRVIP-48, “Vessel ID Attachment Weld and Inspection and Flaw Guidelines,” EPRI TR-108724.
11	BWRVIP-49, “BWR Instrument Penetration Inspection and Flaw Evaluation Guidelines.”
12	BWRVIP-74-A, “BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal.”
13	BWRVIP-78, “BWR Integrated Surveillance Program (ISP) Plan.”
14	BWRVIP-86, “BWR Vessel and Internals Project: BWR Integrated Surveillance Program (ISP) Implementation.”
15	BWRVIP-130, “BWR Water Chemistry Guidelines—2004 Revision,” EPRI TR-1008192.

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Number	**Reference**
16	Title 10, Part 50, “Domestic Licensing of Production and Utilization Facilities,” of the *Code of Federal Regulations*.
17	Title 10, Part 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants,”of the *Code of Federal Regulations.*
18	Title 10, Part 50, Appendix G, “Fracture Toughness Requirements,” of the *Code of Federal Regulations*.
19	Title 10, Part 50, Appendix H, “Reactor Vessel Material Surveillance Program Requirements,” of the *Code of Federal Regulations.*
20	Title 10, Part 50, Appendix J, “Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors,” of the *Code of Federal Regulations.*
21	Title 10, Part 50, Appendix R, “Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979,” of the *Code of Federal Regulations*.
22	Title 10, Part 51, “Environmental Protectioin Regulations for Domestic Licensing and Related Regulatory Functions,” of the *Code of Federal Regulations.*
23	Title 10, Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” of the *Code of Federal Regulations.*
24	Title 10, Part 100, “Reactor Site Criteria,” of the *Code of Federal Regulations*.
25	Title 10, Part 140, Appendix B, “Form of Indemnity Agreement With Licensees Furnishing Insurance Policies As Proof of Financial Protection,” of the *Code of Federal Regulations*.
26	EPRI Report GS-7086, “Testing, Monitoring, and Maintenance of Aboveground Storage Tanks,” December 1990.
27	EPRI Report NP-5067, Volumes 1 and 2, “Good Bolting Practices.”
28	EPRI Report NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants.”
29	EPRI Report NP-7079, “Instrument Air Systems: A Guide for Power Plant Maintenance Personnel,” 1990.
30	EPRI Report 1002950, Revision 1, “Aging Effects for Structures and Structural Components (Structural Tools),” May 2003.
31	EPRI Report 1003056, Revision 3, “Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools.”
32	EPRI Report 1007933, “Aging Assessment Field Guide,” December 2003.

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Number	**Reference**
33	EPRI Report 1008035, Revision 1, “Expansion Joint Maintenance Guide,” May 2003.
34	EPRI Report 1009743 "Aging Identification and Assessment Checklist," August 27,2004.
35	EPRI Report NSAC-202L-R2, “Recommendations for an Effective Flow-Accelerated Corrosion Program,” April 8, 1999.
36	EPRI TR-1007820, “Closed Cooling Water Chemistry Guideline.”
37	EPRI TR-103595, “Report of the Instrument Air Working Group.”
38	EPRI TR-103834-P1-2, “Effects of Moisture on the Life of Power Plant Cables, Electric Power,” August 1994.
39	EPRI TR-104213, “Bolted Joint Maintenance & Application Guide,” December 1995.
40	EPRI TR-107396, Revision 0, “Closed Cycle Cooling Water Chemistry Guideline,” November 1997.
41	EPRI TR-108147, “Compressor and Instrument Air System Maintenance Guide,” March 1998.
42	EPRI TR-112657, Revision B-A, “Revised Risk Informed In-Service Inspection Evaluation Procedure.”
43	Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc., “Vermont Yankee Nuclear Power Station License Renewal Application,” January 2006.
44	American Concrete Institute (ACI) 349.3R-96, “Evaluation of Existing Nuclear Safety Related Concrete Structures.”
45	American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Section XI, Subsection IWB, IWC, and IWD.
46	ASME, Boiler and Pressure Vessel Code, Section XI, Subsection IWE.
47	ASME, Boiler and Pressure Vessel Code, Section XI, Subsection IWF.
48	ASME, Boiler and Pressure Vessel Code, Section XI, Subsection NF.
49	American Society for Testing and Materials (ASTM) A 516, “Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service.”
50	ASTM D 1796, “Standard Test Method for Water and Sediment in Fuel Oils by the Centrifuge Method (Laboratory Procedure).”

	REFERENCES
Number	**Reference**
51	ASTM D 2709, “Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge.”
52	ASTM D 2276, “Standard Test Method for Particulate Contaminant in Aviation Fuel by Line Sampling.”
53	ASTM D 4057, “Standard Practice for Manual Sampling of Petroleum and Petroleum Products.”
54	ASTM D 6217, “Test Method for Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration.”
55	American National Standards Institute (ANSI) / Instrument Society of America (ISA) S7.3, “Quality Standard for Instrument Air.”
56	ANSI/ISA Z86.1-1973, “Commodity Specification for Air and Drager Operating Instruction.”
57	ANSI N45.2.6, “Qualification of Inspection, Examination, and Testing Personnel for the Construction Phase of Nuclear Power Plants.”
58	ANSI N45.2.9, “Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants,” 1974.
59	ASTM D 5163-96, “Standard Guide for Establishing Procedures To Monitor the Performance of Safety Related Coatings in an Operating Nuclear Power Plant.”
60	ASTM E 185-82, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels."
61	American Petroleum Institute (API) 575, “Inspection of Atmospheric and Low-Pressure Storage Tanks.”
62	Audit and Review Plan for Plant Aging Management Programs and Reviews for Vermont Yankee Nuclear Power Station, April 11, 2006.
63	Audit and Review Report for Plant Aging Management Reviews and Programs for Monticello Nuclear Generating Plant, October 12, 2005.
64	Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, Appendix A, August 1976.
65	Fire Protection Safety Evaluation Report, August 29, 1979.
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67	General Electric Service Information Letter (SIL)-409, “Incore Dry Tube Cracks.”

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Number	**Reference**
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69	General Electric Topical Report NEDC-32983P, “General Electric (GE) Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation.”
70	Letter from NRC to Nuclear Energy Institute (NEI) and Union of Concerned Scientists, “Standardized Format for License Renewal Applications (MB7344),” April 7, 2003.
71	American Society for Metals International, “Metals Handbook,” Ninth Edition.
72	Vermont Yankee Nuclear Power Station Updated Final Safety Analysis Report (UFSAR), Revision 21.
73	NEDO-32205-A, Revision 1, “10 CFR 50 Appendix G Equivalent Margin Analysis for Low Upper Shelf Energy in BWR/2-6 Vessels,” February 1994.
74	NEI 94-01, “Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J,” March 1996.
75	NEI 95-10, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule,” Revision 6, June 2005.
76	NUMARC 93-01, Revision 2, “Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” April 1996.
77	SAND96-0344, “Aging Management Guideline for Commercial Nuclear Power Plants-Electrical Cable and Terminations,” Sandia National Laboratories, September 1996.
78	NRC Bulletin 1988-08, “Thermal Stresses in Piping Connected to Reactor Coolant Systems,” August 8, 1988.
79	NRC Bulletin 2001-01, “Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles,” August 3, 2001.
80	NRC Bulletin 2002-01, “Reactor Pressure Vessel Head and Vessel Head Penetration Nozzle Inspection Programs,” March 18, 2002.
81	NRC Bulletin 2002-02, “Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity,” August 9, 2002.
82	NRC Generic Letter (GL) 80-95, “Generic Activity A-10,” November 13, 1980.
83	NRC GL 81-11, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking (NUREG-0619),” February 29, 1981.

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Number	**Reference**
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88	NRC GL 89-13, “Service Water System Problems Affecting Safety-Related Equipment,” July 18, 1989.
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91	NRC GL 98-05, “Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief from Augmented Inspection.”
92	NRC Generic Safety Issue (GSI)-166, “Adequacy of the Fatigue Life of Metal Components.”
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95	NRC IN 87-28, “Air System Problems at U.S. Light Water Reactors,” June 22, 1987.
96	NRC IN 87-67, “Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11,” December 31, 1987.
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98	NRC IN 2001-09, “Main Feedwater System Degradation in Safety-Related ASME Code Class 2 Piping Inside the Containment of a Pressurized Water Reactor,” June 12, 2001.
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100	NRC RG 1.14, “Reactor Coolant Pump Flywheel Integrity,” August 1975.

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Number	**Reference**
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